

The Integrated Target Commitment Planning and Control

– Procedure and History –

Eckart Zwicker

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Introduction and Preface

For more than fifty years, I have been concerned with the question of how equation models can be used to describe and influence the relationships in a company. The result is the development of a normative theory for operational planning and control. This theory can be seen as a further development of the flexible plan cost and contribution margin accounting towards a comprehensive model-based operational planning and control theory for companies.¹

It is designed as a tool for the corporate management (top management) to realize the setpoint values of their top targets (e.g., operating result) through a "responsibility delegation" which can be controlled by numbers. This "responsibility delegation" is made possible by developing an equation model which connects the quantitative top targets of the corporate management with specific quantitative "area targets" that have to be achieved by certain responsibility areas in the company. These area targets are parameters of the equation model.

Annual operational planning with this equation model can then proceed in the following way: Suppose that corporate management selects operating result as the top target of its annual operational planning and intends for the next year to generate an operating result of € 10 million. To achieve this, it negotiates with its responsibility areas on the numerical values of their area targets they have to achieve. The corporate management will seek to negotiate these area targets such that the intended operating result for € 10 million is generated as far as possible. The effect of a change of some area targets on the operating result can be determined by a calculation with the equation model within seconds.²

This procedure appears very simple. However, if you have the plan to develop a consistent quantitative normative theory of planning and control by "target commitment" for any company, then many problems arise. I have developed such a normative theory under the name *Integrated Target Commitment Planning and Control*. It is abbreviated to *Integrated Target Commitment Planning*.³

It contains provisions on how to design corporate models using equations and use these models to execute an operational planning and control.

To demonstrate the favorability of this planning and control theory over existing approaches a computer system named "INZPLA-System" was developed. Its objective was to transfer the provisions of the Integrated Target Commitment Planning for the development of the planning models and the planning and control process with these models as far as possible to a computer system. This INZPLA-System has been successfully implemented in practice. It took many years to transfer and to implement the provisions of the Integrated Target Commitment Planning in this system.⁴

This planning and control system is described on the following pages. A description is also provided of the ideas and user experiences that helped to turn this system into what it is today.

¹ In support of this statement, see pages 57 and 516.

² A "calculation with the equation model" is to determine the numerical values of the variables (y_i) of the equations in an equation system $y_i = \dots C_i = 1, \dots, n$) using a computer. See to this procedure on page 24

³ It's further abbreviation is INZPLA. It is the German abbreviation for "Integrated Target Commitment Planning" (*Integrierte Zielverpflichtungsplanung*). This abbreviation is also used here.

⁴ The INZPLA-System contains more than 850.000 lines of code including a special "calculation compiler", see page 628.

These considerations should achieve that a reader who is interested in this theory could better assess its possibilities and limitations.

Introducing a new concept or even a normative theory in an established field is not easy. This assertion applies in particular for the theory of the Integrated Target Commitment Planning, since the use of equation models is not very common in management accounting, cost accounting, and company planning.

Almost every text, which deals with these areas, contains small example calculations. However, it is very rarely pointed out that they are calculations of an equation model. The equation models, which could be reconstructed for these example calculations generally, consist of very few equations, yet in real-life corporate operational planning; such equation models contain thousands, sometimes even millions of equations.

Hardly any author points that such calculations base on definition and hypothesis equations. Neither is it mentioned that the parameters and the endogenous variables in these equations could and also should possess a specific interpretation as elements of a planning and control theory.⁵

However, this interpretation of cost and performance accounting (budgeting) by using equations, whose structure and semantics are extensively analyzed, forms the basis of the theory of the Integrated Target Commitment Planning.

Using the INZPLA-System very large equation models were generated for various companies, which used them to carry out their yearly and under yearly operational company planning. For instance, one of the world's largest cost-performance models was developed for Thyssen-Krupp Steel that describes the overall quantity and cost flow of the company's production processes. The quantitative flow and "cost flow" of the production processes described by the model run up to 33 stages.

The top target of the planning is the operating result, which is, therefore, also the top variable of the model.⁶ ThyssenKrupp Steel used this model for four years to plan their total operating result.⁷ It contains more than 2.6 million equations and around two hundred thousand model parameters. The ThyssenKrupp Steel model and the planning models developed for other companies are characterized by the fact that their structure and semantics coincide with the standards of the Integrated Target Commitment Planning⁸

Besides the planning models, the INZPLA-System (which realizes the theory of the Integrated Target Commitment Planning) was also used to develop actual value models of cost accounting systems. For example, an activity-based costing model was created for Landesbank Berlin. This model included actual annual costs of approximately DM 400 million that were assigned to more than 1.200 elementary activities. The model describes the cost and the quantity of these elementary activities and their allocation on the main processes as well as how the costs of these main processes are allocated on certain products (s.p.169).

To my knowledge, there is no one in the field of management accounting, cost accounting and company planning who has dealt so extensively with equation models and the development of planning and control procedures based on equation models. Neither did the developers of the

⁵ For the distinction between definition and hypothesis equation, see page 30.

⁶ The top variable of a model is the variable of the equation model whose numerical value is calculated as the last since it is influenced by all other variables and parameters of the model.

⁷ See for the development and application of this system, see page 336.

⁸ See the diagrams to identify the features of some of these models in Fig. 8 on p. 44 and Fig. 39 on p. 145.

SAP-CO system, who created a comprehensive software system for the planning of the operating result, work with explicit equation models. Instead, their planning system is based on the concept of a "calculating database", that is, the planner triggers manually step-by-step specific arithmetic operations within the framework of certain "CO modules" working on the database of these modules (s.p.333). However, in principle these diverse arithmetic operations and instructions to the system, which are performed, using different modules of the SAP-CO system, can be reconstructed in the form of an equation model.

As reported below (s.p.325), these database-related arithmetic operations of the SAP-CO system was reconstructed as a closed equation model from SAP data tableaux. Thus a software was developed (called INZPLA-Connect) to achieve this task. The result was an equation model, which was able to calculate one alternative of changed parameters by calculating the values of thousands or millions of equations up to the definition equation of the operating result in a few seconds (s.p.335). With the SAP-CO system, you need some days.⁹

It took years to decode the SAP data tableaux and develop a software system that was capable of generating adequate equation models. This laborious work was only done as a way to prove not only the applicability of this normative theory but also its superiority by comparing it with other procedures already used. The development of an *applicable normative theory of operational company planning and control* was the target of all my activities.

With INZPLA-Connect, all over one hundred thousand applications of the plan cost-performance calculations realized in the SAP-CO module can be transferred to an Integrated Target Commitment Planning model using a transfer instructions and specific additional semantic identification of the model variables (but no structural model changes).

In this way, cost-performance models were developed for some large German companies, with which planning could now be carried out following the provisions of the Integrated Target Commitment Planning. As mentioned above, an "INZPLA equation model" was generated for Thyssen-Krupp Steel and used by the central controlling department over several years to carry out the annual operational planning of the total operating result. Thus and also in the context of further applications, the Integrated Target Commitment Planning proved its worth in practice.¹⁰

The theory of the Integrated Target Commitment Planning involves a planning procedure, which cannot be derived from the classical decision theory. It is a non-optimizing planning procedure that makes (responsibility) areas in a company responsible for achieving specific values of targets (area targets). Such behavior can be traced back to Herbert Simon's theory of a satisficing decision maker. Since both the corporate management and the responsibility areas (represented by area managers) behave during an operational planning as satisficer and not as optimizer.¹¹

Therefore, the theory of the Integrated Target Commitment Planning has proven to be a normative theory that represents a satisficing planning procedure for corporate operational planning. It can, therefore, be interpreted as a *normative reconstruction of Herbert Simon's de-*

⁹ To achieve the extreme reduction of the calculation time I developed a "calculation compiler". Without this compiler, the system could not have been applied. See page 627.

¹⁰ For the application of this system at ThyssenKrupp Steel and its further use, see page 343.

¹¹ See for Simon's theory of a satisficing decision maker, p. 479.

scriptive theory of bounded rationality, which describes a satisficing decision maker.

However, it also emerges as a normative reconstruction of a "*planning through target commitment*", an approach that is applied (to a greater or lesser extent) in practice and is often called "*management by objectives*" and characterized by the slogan "*make people responsible for numbers*".

However, the theory of the Integrated Target Commitment Planning can also be reconstructed and interpreted as a variant of the normative agency theory. In this variant of the normative agency theory with several agents, corporate management acts as a principal and the responsibility areas act as agents. It is shown that this variant of the normative agency theory can be reconciled without contradiction with a satisficing planning by target commitment.¹²

The obvious question is why an operating planning model that was developed for a company should only be used for a satisficing but not for an optimizing planning of the operating result. In annual operational planning models of companies, the operating result is almost always used as a top target. In such cases, corporate management ought to be interested in using planning procedures, which allow maximizing this top target. Such a maximization and thus choosing the best alternative from a set of alternatives is the primary objective of the decision theory.

To make such a demand is apparent, but alas, it is not feasible. In fact, company planning models are almost never used to maximize an operating result. To perform an optimization with a planning model one would need decision variables. However, the operational planning models that companies currently use for their annual planning almost never contain (completely controllable) decision variables. The aggregation level of these models is so high that their parameters are not completely controllable and hence cannot be used as decision variables.¹³

Yet it is always possible to find parameters in these models that can be declared as targets for whose achievement an (area) manager of a (responsibility) area could be made responsible. These are the already mentioned area targets.

However, if decision variables appear in a corporate operational planning model, then it is an absolute must to apply an optimizing planning in the sense of the classical decision theory. In such cases, an optimizing planning can be connected free of contradictions with the application of the Integrated Target Commitment Planning.¹⁴ In other words, the planning procedures of the Integrated Target Commitment Planning and optimization can be realized simultaneously and without contradiction with a so-called INZPLA-model.

Thus, the theory of the Integrated Target Commitment Planning has proven to be a theoretically founded yet also practically applicable normative theory in the field of an operational company planning and control that integrates classical optimization theory, the normative theory of satisficing behavior, and the normative agency theory to a comprehensive normative theory for operational company planning and control.

Optimizing planning, which is propagated in the literature as the "definitive" planning proce-

¹² For this purpose, a further variant of the normative agency theory was developed that is referred to as "*hidden-effort agency theory*". It was designed to substitute the hidden action agency theory, which is not applicable in the case of an operational planning. See page 381.

¹³ See the justification for this assertion on pages 26 and 468.

¹⁴ To the interaction between optimized planning and Target Commitment Planning, see pages 70 and 380.

ture, is based on the application of objective functions containing a set of decision variables. These objective functions are to optimize by choosing adequate values of their decision variables. However, decision theory provides no information on how to achieve these objective functions. Instead, the planner must somehow develop them.

By contrast, the theory of the Integrated Target Commitment Planning involves a *model configuration system* that enables any company the generation of a cost-performance model with the operating result as a top target.¹⁵

The model configuration system is characterized by the fact that, in the best case, the model developer does not need to insert even one equation by manual input. The definition and hypothesis equations that describe the company in question are instead generated by the parameterization and connection of the equations delivered by a so-called *hyperstructure model*.¹⁶

A planning alternative, which is represented by the model, consists of a number of values of the areas targets in question and the calculation of all variables of the model up to the operating result using these values as model parameters. In the case of the ThyssenKrupp Steel model, you have to calculate 2.6 million variables in order to determine the operating result of one planning alternative.

The model configuration system has made it possible to develop planning models for various companies. The transfer program (INZPLA-Connect) enabled the transfer of SAP-CO planning systems that have already been used by various companies to the INZPLA-System. Therefore, these companies can directly use the INZPLA-System by substituting the planning procedure of the SAP-CO system.¹⁷

Since INZPLA-Connect could transfer all alternatives of the SAP-model configuration systems in an INZPLA-model, each SAP-CO model of one of the more than 100.000 users could be transferred in an INZPLA-model. And such a transferred model fulfill the semantics and structural model features which are necessary to use the planning and control procedures of the Integrated Target Commitment Planning.

In contrast to the application area claimed by the decision theory or the normative agency theory, the theory of the Integrated Target Commitment Planning is, however, limited to the field of a comprehensive operational company planning. This form of planning requires an annual planning horizon and monthly intervals. As the top target, operating result or other targets (even several targets) can be used.

Only because of this restriction, it was possible to develop a hyperstructure modeling system, which allows the efficient development of new company planning models in the form of equation models. Furthermore, it allows (together with INZPLA-Connect) the already mentioned reconstruction of the structural relationships of existing SAP-CO operational company planning applications as equation models of the Integrated Target Commitment Planning.

These claims may not sound modest, so in the following, I try to justify them in detail. In the description of the theory of the Integrated Target Commitment Planning that follows, reference is also made to other texts that deal in depth with the structure and procedures of this

¹⁵ Other top targets can be generated too. See: Zwicker, E., *Applications of alternative top targets in cost-performance models*, Berlin 2000, www.Inzpla.de/IN10-2000e.pdf. (Text in German, title translated).

¹⁶ On hyperstructure models, see page 498.

¹⁷ See to INZPLA-Connect page 333.

theory. If someone is interested in studying this theory and its technical realization in detail, he has the possibility. All of these texts are accessible online.¹⁸

This following text differs from a non-fiction book in two ways. On the one hand, it describes the theory of the Integrated Target Commitment Planning and compares it with other concepts and theories. This is the usual procedure of a non-fiction book. On the other hand, however, it outlines the circumstances and considerations that led to the development of this normative theory and its elements. This approach is a little rarer to find.

Moreover, the text describes my encounter with people during my professional life who has impressed me in many ways. Finally, it includes some insights that I have gained, as well as some anecdotes drawn from my life in academia. That seems a bit much to be at once.

To account for this, the passages that deal with these three areas of different information feature various background colors. The sections that contain purely factual information about the theory of the Integrated Target Commitment Planning and its realization with the INZPLA-System have a white background. This factual information also includes a comparison of the theory of the Integrated Target Commitment Planning with the approaches of other authors such as Robert Kaplan or John D.C. Little.

The factual information section also includes a description of the System Dynamics concept (a method for developing dynamic models) and a further development of this concept. It further includes the development of an analytic tool, which questions the validity of the world models of Forrester and Meadows. However, the section on Systems Dynamics accounts for only a small fraction of the text that is almost completely dedicated to the theory of the Integrated Target Commitment Planning.¹⁹

Texts that describe the considerations that led me to develop the theory of the Integrated Target Commitment Planning and how it was developed are shaded in grey. They describe, for instance, how the theories, concepts, and findings of Herbert Simon, Gunnar Eliasson, and Charles Bonini have meant that the theory of the Integrated Target Commitment Planning has developed to a conclusive normative theory. It is reported on the importance of the contributions of Wolfgang Kilger in the field of cost and performance accounting, but also about how they have led me to follow a different path.

Further, this section describes the difficulties, which have to be overcome while developing this planning, and control theory, such as issues concerning the reasonable level of aggregation of the planning models with which the theory of the Integrated Target Commitment Planning should be applied. In the gray text area, it is reported why my colleagues Teemu Malmi and Alfred Wagenhofer, without knowing it, have made a great contribution for the further development and consolidation of the theory of the Integrated Target Commitment Planning.

The section shaded in grey also describes the efforts that were made to apply the theory of the Integrated Target Commitment Planning with the INZPLA-System in practice.

It covers the successful attempts at decoding the SAP-CO data tableaus in order to transfer the SAP-CO applications of companies such as ThyssenKrupp Steel, Volkswagen, Deutsche Bank or Schering “into the INZPLA-System”. Likewise, I report on a vain attempt to awaken the interest of Hasso Plattner for the INZPLA-System, and I describe the memorable perfor-

¹⁸ These texts comprises about 1,800 pages. See a compilation on page 631.

¹⁹ On the concept of System Dynamics, see page 11.

mance of the SAP chief-developer for an operational planning system, Dr. Sinzig, at ThyssenKrupp Steel. Finally, you can read what I would recommend Larry Ellison to use the INZPLA-System.

The texts shaded in yellow cover the experiences, insights, and events of my career in academia, most of which are related to the theory of the Integrated Target Commitment Planning and my "model- and method-based world view". They include the description of an incident that I regard as the "greatest performance" of my academic career. However, after this performance, no one applauded; instead, there was a great silence. This section also reports how I became fairly well known among my colleagues in the field of business administration and also at TU Berlin, however, not thanks to my scientific contributions. You find a discussion of the question that typically arises among many professors of business administration and other fields too – "Who is the greatest of us?" as well as the question "How can you find out who is the greatest using Blohm's evaluation method?" And of course, I disclose who is, using Blohm's method, the greatest.

Furthermore, the yellow section describes my encounters with Karl Deutsch, Hanns Martin Schoenfeld, Walter Goldberg, Robert Scapens, Anthony Hopwood, August Wilhelm Scheer, Wilhelm Krelle, Thomas Kuhn, Carl Hempel, Dennis Meadows, Jay W. Forrester, Michael Scott Morton, and others. And you will find a laudatio on Herbert Simon, a scientist for whom I have great admiration.

At the end of this work you can read, as it is expected in the U.S. by a university professor, my "last lecture". Following the claim of such a speech, I communicate what "important points" I would recommend for the next generation.

So this book is no one book, but three books in one that differ in that the pages of the individual books are colored differently. The no colored technical part contains 393 pages, the grey colored part on the history of origins consists of 123 pages. And the more entertaining and personal colored yellow part covers 137 pages.

Readers who are only interested in operational planning and control systems or the possibilities and limitations of the System Dynamics concept for company planning or questions as the structure of multi-dimensional profit hierarchies and their analysis, should leave aside the yellow sections and refer only to the white text.

The gray text may serve to better understand the normative theory of the Integrated Target Commitment Planning or its longer name "*Integrated Target Commitment Planning and Control*." The genesis of a theory or an invention may be attractive if one is interested in the actual theory or invention. The yellow text transmits little factual knowledge. If, however, this work should have an entertainment value, then it is located there

What remains of this introduction as an essence? The all-dominant assertion is:

With the Integrated Target Commitment Planning and Control, a theory was developed that unifies the classical decision theory, the „normatively turned“ Simon's theory of a satisficing decision maker, the normative agency theory and the concept of "planning through target commitment" to a comprehensive normative operational planning and control theory of companies. And this theory has proven itself in practice.

1. Company's profit and financial planning models as a starting point

The development of models for the planning of companies was already the subject of my dissertation, and that is more than fifty years ago. I have dealt with this topic continuously until now. From the very beginning, my goal was not only to systematize company models according to specific criteria, but also to develop such models and apply them in companies.

To put this plan into practice, I started studying equation models to describe the accounting system. Publications on so-called financial planning models were offered here. Such models were almost exclusively described by English language authors and are referred to as "financial planning models" or "company planning models".²⁰ However, if you look at them more closely, they turned out to be company result and financial planning models and no comprehensive company models.

These company result and financial planning models consisted of algebraic and mostly linear equations that led to a plan balance sheet, a planned P&L and a financial plan. The values that characterize these plans (such as the asset values of the plan balance sheet, for example) were described using definition equations. These definition equations contained on the right-hand side specific definition components (e.g., corporate taxes), which were, in turn, specified by further equations (e.g., a tax calculation formula).

To calculate these models faster and more elegantly under different assumptions (e.g., the change of a sales value), I programmed an "equation-calculation system". This "equation-calculation system" and its further permanent development formed the basis of my work with models to carry out operational company planning.²¹

The company results and financial planning models, which I analyzed in detail, showed considerable differences. The different levels of aggregation were particularly remarkable. In the case of the lowest aggregation level, they consisted only of the definition equations of the variables occurring in the plan balance sheet, the plan P&L and the financial plan of a company. In other cases, they contained a more or less large number of equations, which explained the variables of these three plans in more detail.

I entered the equations of these financial planning models "for practice" into my equation-calculation system and then used parameter changes to make specific alternative calculations. Among the models, I entered into my equation-calculation system was a model of Welsch, Hilton and Gordon, which they described in detail in their work "*Budgeting: Profit Planning and Control*".²² Of all the financial planning models I studied, I liked this model best. In contrast to the other models, it was much disaggregated and led deeper into the field of cost ac-

²⁰ See, for example, Bryant, J. W. (Ed.), *Financial Modeling in Corporate Management*, Wiley, 1982 and Grinyer, P.H., Wooller, J., *Corporate Models today: A new Tool for financial Management*, London 1978. Software systems such as Corporate Planner, CO-Planner or Professional Planner have their focus in this modeling area. See for an overview: Dahnken, O., Keller, P., Bange C., *Integrierte Unternehmensplanung - 11 Software-Lösungen für die Erfolgs-, Bilanz- und Finanzplanung*, Würzburg 2005.

²¹ For the structure of an equation-calculation system, see page 24. For the significance of this equation-calculation system for the entire INZPLA-System, see page 627. At that time there were still no spreadsheet programs like Excel and also no personal computers.

²² Welsch, G. A., Hilton, R. W., Gordon, P. N., *Budgeting: Profit, Planning and Control*, New Jersey, 1969.

counting. I found the strong disaggregation of this model to be an advantage. It was already clear to me that highly aggregated cost items (such as wages as a whole) which appeared as model parameters in many financial planning models were not suitable for serving as directly controllable parameters of planning.

The model is described in detail by the authors using a numerical example. It was the first model of which it could be assumed that it originated from a practical application because of its detailing.

Studying these models increased my knowledge of the possible structural equations in corporate result and financial planning models, but I was still looking for a general construction principle to develop such models.

While studying Richard Mattessich's work, with the topic "*The Scientific Foundations of Accounting*", I came across this construction principle.²³ In this work, Mattessich shows that a double-entry accounting system can be described using a matrix. In such an accounting matrix, the assets, liabilities and expense accounts correspond to the rows, and the assets, liability and revenue accounts correspond to the columns. The intersection points of the rows and columns in the matrix are fields in which the cumulative postings (debit posting line to credit posting column) are entered during a planning period.

Once you have formulated such a matrix, you can use a program system to generate "automatically" the entire definition equations of the plan balance sheet, the planned income statement, and the financial plan.

Convinced of this concept, I developed a program system with which one could develop such an accounting matrix, whose elements were covered with plan values. Each comprehensive company planning model should be required to describe the variables of these three plans through definition equations. However, this is only possible if the model includes all the cumulative postings of a plan account closing, and this can (in my opinion) be displayed with an accounting matrix as clearly as in no other way. The accounting matrix, therefore, formed the core of a configuration system I developed to generate such corporate result and financing planning models or CRFI planning models, as I henceforth abbreviated them.²⁴

All of the approximately fifteen to twenty CRFI planning models analyzed up to then were reconstructed and modeled by me in the light of such an accounting matrix.

However, the posting records accumulated over the planning period in the matrix fields (e.g., "bank balances" on "sales receivables") do not only form the model parameters of the equations of such a CRFI model.²⁵ A number of these matrix variables (such as corporate taxes) can be further specified by equations. In view of the existing CRFI models, I wondered what

²³ Mattessich, R., *Die wissenschaftlichen Grundlagen des Rechnungswesens*, Düsseldorf, 1970. There exists no English version.

²⁴ The accounting matrix of a CRFI model was, therefore, also later the central construction element of the work of Hummen and Kalz, who developed an approach for generating a CRFI model in the system of the Integrated Target Commitment Planning. Hummen, J. P., *Conception of a Model for equation- and table-based Company Result and financial Planning*, Diss. Berlin 2004 and Kalz, A., *Conceptual Development of an equation- and table-based Model for parallel Accounting according to HGB and IAS*, Diss. TU Berlin 2005. (texts in German, title translated, the German titles can be found on p. 637)

²⁵ Model parameters are the quantities of an equation model to which a value must be assigned to calculate the values of the (explained) variables on the left side of the equations.

level of aggregation such models should have. This question can also be formulated as follows: Which equations that explain the components of the accounting matrix should be included in the CRFI model of any company?

However, there was another question that came to my mind: is it possible to develop a configuration system for a CRFI model, with which the structural equations of the CRFI model of a company in question can be generated without further input of equations using specific configuration instructions alone? A configuration system to be developed would be all the better, the less company-specific structural equations would have to be added by manual input to the structural equations already generated by the configuration system. I tried to develop such a configuration concept for CRFI models. However, two problems arose.

The first problem was that I did not find a principle to determine the "appropriate" aggregation level of a CRFI model. In other words, which structural equations should a CRFI model contain? Of course, the CRFI model should always be able to allow plan account closing. Therefore, the elements of the accounting matrix must exist at least as model parameters. This was a necessary but not a sufficient demarcation criterion. How I managed to answer this question is reported later (s.p.60). It was an open question for several years.

However, the second problem was even more severe. I had the intention to design a planning model with which the annual operational planning of an entire company can be carried out. In (model-based) company planning, the planner works with a forecast model that is characterized by the fact that he can influence specific model parameters. With this model, the planner attempts to determine these controllable parameters of the model in such a way that the set-point values of the top targets (in the model) are achieved.

For example, the "return on equity" and "liquid fund" can be used as top targets of such planning in a CRFI model.²⁶ A CRFI model can be used to perform planning if there are model parameters that can be completely controlled. This includes, for example, the model parameters "borrowing or repayment of bank loans", which are completely controllable within certain limits. However, a CRFI model also contains model parameters such as sales and costs, which appear in a highly aggregated form as "input variables" of the model. These highly aggregated variables, such as the manufacturing costs of a product, are not suitable as parameters for planning the top target of a CRFI model because they cannot be directly influenced at this aggregation level.

In some companies, for example, the production costs of a product are caused by several production areas, but also by a large number of service cost centers that allocate their activities directly or indirectly to these production areas.²⁷

²⁶ A CRFI planning model with these top targets is described in: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, Berlin 2010, p. 56, www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated). A more comprehensive CRFI model within the framework of a two-step comprehensive company planning is discussed in: Zwicker, E., *The Kilger Model - Structure and Configuration and its Connection with a CRFI Model in the Context of a two-step Comprehensive Company Planning*, (137 pages), Berlin 2003, www.Inzpla.de/IN30-2003h.pdf. (Text in German, title translated).

²⁷ In the planning model of ThyssenKrupp Steel mentioned below, there are products that run through 33

The production costs are required in a CRFI model for the (plan) account balancing.²⁸ However, the level of aggregation with which they are used there is too high that they can be influenced by a responsible person and thus be planned. Therefore, planning (in the form of influencing production costs) can only take place at a lower aggregation level.

One thing was evident to me: If I wanted to develop a comprehensive (model-based) planning system on the basis of the operational accounting system, then the cost parameters and sales figures acting as model parameters in a CRFI model must be disaggregated to such an extent that their realization can be transferred to a person in responsibility.

If the goal should be to develop models whose parameter values certain people should achieve, then it is obvious to deal with cost and performance accounting, since it describes costs and sales in detail. Therefore, I turned to study cost and performance accounting. This study I have been doing so intensively that for a long time the original objective, i.e., the development of a CRFI model, has almost completely faded into the background. From now on, "my top targets" were no longer for me the CRFI top targets such as "return on equity" and "liquid fund", there was only one top target, and that was the *operating result* as the top target of a budgeted cost-performance model.

2. Forrester's System Dynamics and why it is not suitable for company modeling

Before I report on my experience with cost-performance models, however, I want to make a parenthesis. In my postdoctoral thesis, I had intensively dealt with the System Dynamics concept of J. W. Forrester. It is a concept for the modeling of systems and thus also of companies. This work was done with the purpose of examining whether Forrester's modeling concept was suitable for developing practice-relevant company planning models. The result was negative.

In the following, I briefly describe my experiences with the System Dynamics concept and explain why it is not suitable for the development of company planning models.

In my habilitation thesis, I originally only wanted to describe the use of dynamic models in companies. However, the intensive study of structure, semantics, and analysis of difference equation models (and differential equation models) led me to move away more and more from exclusively business application. Therefore, the work ultimately resulted in the systematic presentation of dynamic models and their analysis in economics and social sciences. For example, I have tried to classify dynamic models (in the form of difference equations) according to specific semantic criteria and describe the analysis methods that can be performed with these models.

Wilhelm Krelle, who was intensively involved with dynamic models in econometrics and studied my work, wrote to me that this work has obviously been "written beside the comput-

production areas. See page 336.

²⁸ In an actual CRFI model to be created after the end of the plan year, a corresponding actual account balancing must be carried out. This is the account balancing that is also practiced in accounting. However, it is reproduced in the actual model only in aggregated form. For the construction of actual models. See. p. 112.

er", and he was right.²⁹ All analyses and researches were supported by computer programs and all examples are supported by simulations and calculations.

The examples come from the entire field of economics and social sciences, but especially from economics, where the use of dynamic models has a high level of development. For this reason, the title of this more than 600-page book was also: "Simulation and Analysis of Dynamic Systems in the Economic and Social Sciences".³⁰

However, models of business administration are not neglected. And that is because I have been studying the dynamic modeling concept of Jay W. Forrester, which he originally called "Industrial Dynamics". Using this concept, Forrester developed dynamic models of companies.³¹ Later on, he extended this modeling concept to systems of all kinds and gave it the name "System Dynamics" (which documents this extension). However, the modeling method used remained unchanged.

With its modeling system, Forrester has developed a model of the Sprague Electric Company. He treated this "Sprague Model" comprehensively in a monograph in which he describes his concept at the same time.³² Forrester's modeling concept was thoroughly analyzed in my work. The System Dynamics concept has been widely used. Hundreds of models have been developed, there are different workgroups that only work with System Dynamics models, several journals are dedicated to this topic alone, and there are various conferences a year that deal only with System Dynamics.³³

I tried to analyze Forrester's approach from a model and science theoretical point of view and concluded that it was based on five paradigms that I formulated and described in detail.³⁴

The first paradigm requires that a so called feedback heuristic should be used to develop a System Dynamics model. This approach to the development of models requires that the development of a System Dynamics model should be carried out in a first step by identifying specific feedback loops that can be observed in reality and described using diagrams. In a second step, these causal diagrams are refined into so-called System Dynamics diagrams. They also document certain feedback circles because of the feedback heuristic. These diagrams provide the basis for formulating certain equations in a third step. They are formulated using the System Dynamics equation language DYNAMO, whose syntax and semantics correspond to Forrester's modeling concept.

²⁹ I first met Wilhelm Krelle as a member of a working group of the Robert Bosch Foundation for the development of simulation models in the health care. After that, we always remained in the scientific exchange of ideas. See p. 20. For example, he had developed an econometric model of the Federal Republic of Germany that contained a simultaneous nonlinear system of equations for which he found no solution. This resulted in a detailed discussion as to how a solution could perhaps be found after all.

³⁰ See: Zwicker, E., *Simulation and Analysis of dynamic Systems in the economic and social Sciences*. 1981 (618 pages). Pages 1 to 163 are accessed via www.Inzpla.de/DS-001-163.pdf. To call up the remaining PDF files of this work, please refer to the bibliography on page 631. (Text in German, title translated).

³¹ To a brief presentation, see: Zwicker, E., *System Dynamics in Inventory and Production Planning, an Introduction and critical Overview*. In: Operations Research Spectrum 1 (1980), p. 143-168, www.Inzpla.de/Syst-Dynamics.pdf. In English.

³² Forrester J. W., *Industrial Dynamics*, Waltham, MA 1961.

³³ The term "System Dynamics" led to 65,900,000 entries when it was called up under Google on 1.4.2014.

³⁴ Forrester does not formulate these paradigms himself. He also does not discuss them as a method and describes their advantages and disadvantages. They result solely from my reconstruction of his procedure.

Forrester believes that the whole world can be described through a system of levels using level equations that have an inflow and (mostly) an outflow. These inflows and outflows are described by rate equations. This level-rate interpretation of the world is the second paradigm. The dynamic effect, i.e., the time-delayed influence between the model variables, is caused by the fact that the values of the levels have a delayed effect on the input and output rates of other levels (but also on their own). Forrester's level-rate interpretation as a category for modeling System Dynamics models is already expressed in the System Dynamics diagrams and, of course, in the System Dynamics equation language DYNAMO.

Furthermore, Forrester requires that only systems can be modeled in which no exogenous time-dependent variables occur as influencing variables in their feedback circuits. This requirement, which describes the third paradigm, is referred to as the requirement of system closeness. A System Dynamics model is, therefore, not allowed to have exogenously specified inflow and outflow rates of the levels.³⁵

The infinitesimal postulate is Forrester's fourth paradigm. It requires that the modeling of a system in question should only be done with using differential equations. The last and fifth paradigm is the recursion demand. It requires that the links between the inflow and outflow rates and levels must not be described by simultaneous equations. System Dynamics models must, therefore, always be recursive models because they are not allowed to have simultaneous equations. Recursive models are models whose equations can be sorted in such a way that a calculation in this sort order (e.g., from top to bottom) allows the values of the explanatory variables on the hypothesis or definition equation to be calculated correctly. This is the case because all values of the explanatory variables on the right side of these equations have already been calculated correctly before. This sort order is not available for simultaneous equations.³⁶

It has already been pointed out that these paradigms were not explicitly postulated by Forrester, but could only be reconstructed based on his approach. For example, the recursion demand can be recognized by the fact that Forrester's models only allow the modeling of recursive relations between the so-called auxiliary variables.

This is only made clear by the fact that in the language DYNAMO, which was especially developed for the modeling of System Dynamics models, simultaneous equations between the auxiliary variables are identified as false specifications and, therefore, a model with such simultaneous equations cannot be generated.

On the one hand, Forrester's paradigms are helpful in formulating models, but on the other hand, they also significantly restrict the possibilities of modeling systems. Therefore, I developed a modeling concept called FOLR (Feedback oriented Level Rate Modeling), which retains the feedback heuristic and level-rate interpretation of Forrester's approach, but demands the deletion of the remaining three paradigms of the Forrester approach, because they limit the modeling potential.

³⁵ Only within the framework of the so-called "test response analysis" propagated by Forrester is a model inflow rate specified by specific test functions (e.g., pulse or step functions) which serve to test the system behavior. This is an exogenous time dependent input.

³⁶ For a detailed description of simultaneous and recursive models using structure matrices see Zwicker, E., *Simultaneous and recursive Planning Models: Structure, Semantics and Application*, (30 pages), Berlin 2003, www.lnzpla.de/IN25-2003c.pdf. (Text in German, title translated).

The described feedback heuristic, on the other hand, is retained because it is a reasonable procedure to successively concretize causal diagrams of a system in such a way that one eventually reaches levels with inflows and outflows, and the question arises as to how these inflows and outflows depend on other levels. The level-rate interpretation is a way of looking at things, with which one can try to describe the phenomena of reality.

The remaining three paradigms of Forrester's model development paradigms (recursion and infinitesimal and closeness) are only constraints that prevent a comprehensive modeling. Why shouldn't the inflow or outflow rate of a level not be described by a time series? It is not always possible (what Forrester requires) to specify all variables of a system endogenously, i.e., as elements of a feedback circle.

The exclusive use of differential equations assumes that the temporal progression of the values of a variable (V) to be described by a model can only be adequately described by the fact that its infinitesimal small rate of change (dV/dt) acts as an explained variable of an equation whose explanatory variables have values that refer to the time t . This severely restricts the set of potential structural equations for modeling time-delaying relationships (so-called distributed lags). For example, so-called pipeline delays cannot be modeled with differential equations.

Therefore, I replaced the infinitesimal postulate with the discrete time postulate, which allows modeling with any kind of difference equations and thus any type of time delay.

The recursion demand is also an unnecessary restriction. It should be mentioned that we reconstructed some cost-performance models, which were used in practice for an annual operational planning on the basis of the SAP-CO module (for example, at Volkswagen, Daimler Benz, ThyssenKrupp Steel), as equation models and simulated them afterward. All these models had simultaneous equations (s.p.627). Therefore, none of them could have been formulated using the System Dynamics concept.

The System Dynamics concept is intuitively very appealing, since it is simple and plausible and because everybody can quickly develop a model using the simulation language DYNAMO. For many years, I was the only one in Berlin to hold System Dynamics courses at the Technical University of Berlin, in which students from all faculties took part. The participants enjoyed these courses because they were able to develop "their own models" on the computer with little previous knowledge. And because of the level-rate interpretation of the model relationships and the system-dynamics diagrams, they were also able to "understand" these models. I have developed System Dynamics models myself, e.g., for the Federal Environment Agency a model of the drinking water supply of the Federal Republic of Germany together with Dietmar Winje.

However, it turned out that the System Dynamics concept is not suitable for developing operational planning models for companies, i.e., the objective of my research activities. The infinitesimal postulate that variables should only be explained by equations with infinitesimal small rates of change is not acceptable in such models. The development of company models should be based on the assumption of a period classification (e.g., months or years). A variable to be explained in the model (on the left side of a model equation) is determined by variables of the same period or past periods (on the right side of the model equation). To describe such relationships, however, one needs difference equations or algebraic equations.

The infinitesimal postulate, the recursion demand and the requirement of system closeness are no longer valid in the FOLR modeling concept, as described. However, even the two paradigms of Forrester's approach remaining in the FOLR modeling concept (feedback heuristic and level-rate interpretation) are not suitable as "entry" to generate operational models of company planning with them. If one wants to formulate a cost-performance model, then it is not useful to look in the company for feedbacks, which ultimately lead to the equations of this cost-performance model by increasing concretization. The reason for this is because in a cost-performance model, there is hardly any feedback.

Instead, the sales quantity-driven planning of a cost-performance model goes "in one direction", i.e., it is "feedback-free". Only quantity loops in the quantity structure can be interpreted as feedback relationships. According to Forrester, however, they are not permissible because they are described by simultaneous equations.

The question arises whether cost centers with an interdependent settlement, which are known from cost accounting, describe feedback relationships in the sense of Forrester. However, this is not the case because these reciprocal price allocations between cost centers do not describe causal, but rather definitional relationships. They are circular definitions, which (in contrast to their general prohibition by today's definition theory) lead to a solution and are, therefore, permissible.³⁷ However, since they are described by simultaneous equations, their use would be prohibited by Forrester's recursion demand in any case. Since the operational planning systems of one-year planning always contain plan cost accounting and, as already mentioned, cost centers with an interdependent settlement almost always occur in such systems, the System Dynamics concept is not suitable for modeling operational planning for this reason alone.

As is described later, the model development heuristic of the Integrated Target Commitment Planning consists of identifying specific reference objects in a company that are interconnected. These relationships are identified using a semantic concept which I called as order quantity-price interpretation. The model development heuristic of the Integrated Target Commitment Planning is therefore to model the relationships between these reference objects using these order quantity-price interpretation. The relationships within these reference objects are generated using hyper model tableaux.³⁸ Ideally, these describe all possible relationships that can exist between the input and output variables of a reference object (such as a cost center). By parameterizing (or configuring) such a hyper model tableau, the model developer selects exactly, those structural equations that describe the reference object in question with its relationships to other reference objects.³⁹

The use of Forrester's model development heuristic (feedback heuristic and level-rate interpretation), which are also included in the FOLR modeling concept, would, therefore, be inappropriate for the creation of a cost-performance model. With the parameterization of the hyper model tableaux and their linking, a better object-related generation method of models is available than that propagated by Forrester.

³⁷ For this form of a circular definition, see page 534.

³⁸ From the standpoint of model theory, these are the elements of a hyperstructure model. See page 498.

³⁹ See to cases of a model development heuristic page 539.

I had the opportunity to talk to Jay W. Forrester about his System Dynamics concept. The conversation could be called "tense". I asked him mainly technical questions but also some moderately critical ones.

For example, I asked him whether the decision rule used in his Sprague Electric Company model to determine the raw material does not have a fundamental defect. He admitted this and said that he would no longer formulate this decision rule in this way.⁴⁰ I also asked him whether the almost exclusive and conceptual use of distributed lags in the form of third-order exponential delays would not limit the modeling potential of his approach too much.⁴¹ He said that all the modeling of systems he had done so far could have been successfully described with these exponential third order delays.

However, he already reacted to these questions so reluctantly and irritatedly that I feared that he would break off the conversation. In these circumstances, I did not dare to address him at all about the fact that I think it would be better to delete some of his modeling paradigms and replace them by others.

Forrester's performance in the field of modeling dynamic systems is undisputed. Terms such as feedback are commonplace in today's sophisticated colloquial language. However, it was only Forrester's feedback heuristic that showed how to describe feedback relationships with dynamic models in a simple way by successively sharpening hypotheses and how to examine their dynamic behavior under various assumptions with the help of computers.

Anyone who works in the field of system analysis or is involved in modeling systems does not know the System Dynamics concept as an exotic procedure but as a constructive and appealing method for modeling dynamic systems. Otherwise, I would not have held a course on it for years.

When Thomas S. Kuhn visited the Institute for Advanced Study in Berlin in 1983, I took the opportunity to address him on his concept of a mini-revolution.⁴² Kuhn coined the term "mini-revolution" and uses it as a delimitation to the concept of a true scientific revolution (as in physics the transition to quantum theory). However, he mentions this term only briefly in the appendix to the second edition (1970) of his work on the structure of scientific revolutions and does not include it in any theory.⁴³ In this context, he does not even mention, what would

⁴⁰ The decision rule for the specification of the raw material order rate RMPF.KL for the time interval KL (Industrial Dynamics, 1961, p.228) in the Sprague Electric model depends as a (simulable) difference equation not only from the values of other levels but also from two rate variables of the previous period JK (namely PCOF.JK and PIF.JK). I pointed out to Forrester that such a connection was not possible in the context of the formulation of differential equations and would not make sense empirically either.

⁴¹ Exponential delays of 3rd order, form a class of distributed lags, with which one can describe the (delayed) relationships between an input and output stream. The mathematical form of their weight functions corresponds to a 3rd order Pascal distribution (known from probability theory). In the context of the difference equations with which Forrester's differential equation models are simulated in DYNAMO. It has a single peak and can be characterized by only one parameter that describes the average delay of the output stream of such a "distributed lag level" to his input stream.

⁴² "Thomas Samuel Kuhn [...] was an American science theorist and science historian. He is one of the most important philosophers of science of the 20th century". (Wikipedia 26.1.2009). "The central theme of his work is the study of paradigms that influence the actions of researchers. His central work, which made him famous, is 'The Structure of Scientific Revolutions'".

⁴³ The first edition was published in 1962, and in the third edition in 1996 he uses no longer this term, since

be plausible, that a "mini-revolution" come about only because new "mini-paradigms" suppress the old "mini-paradigms". Therefore, I asked him whether the five paradigms of Forrester's modeling paradigms mentioned above could be called "mini-paradigms" of a "mini-revolution" in the field of system modeling. Since Kuhn and Forrester were then colleagues at MIT, Kuhn knew both Forrester and his approach. However, he apparently was not willing to give a concrete answer and only said that one could see it that way. However, he admitted that "mini-revolutions" are caused by a change of "mini-paradigms".

Forrester has also developed the first version of the so-called world model commissioned by the Club of Rome in the form of a System Dynamics model. The further development of this model by Meadows and the publication of its results hit the whole world like a bomb because this MIT study led to a relatively short-term devastating forecast of the entire human race. The two System Dynamics forecasting models were examined in detail by me. I report on it in the next section.

Forrester is said to have been disappointed because he did not receive the Nobel Prize in economics for his modeling concept. In my view, he would have been worthy of it, especially when compared to some other prize winners.⁴⁴

Forrester's fame is undisputed anyway. He was originally an electrical engineer and developed the System Dynamics concept based on his experience in modeling control loop systems. During this time, he also developed the magnetic core memory. It corresponds to today's RAM. In 1962, when I developed the first programs of my life on an IBM 1401 at IBM in Hamburg as a working student in the assembler language Autocoder, this for those times "high-tech computer" had a Forresterian magnetic core memory of 8 K bytes (8,192 bytes). Forrester is a pioneer of computer development, and his picture hangs in every computer museum and all technical museums, which are also devoted to computer technology. It can be found at the Science Museum in London, the Boston Computer Museum and the Nixdorf Computer Museum in Paderborn. As I was told, the license revenues from this patent were (at that time) the highest that MIT had ever achieved. Forrester was, therefore, successful in every respect. Of all the people I have met personally, he will probably have the greatest fame.⁴⁵

the admission of the existence of such "mini-revolution" probably leads to difficulties in distinguishing it from the real scientific revolutions.

⁴⁴ Although he cannot keep up with the fundamental work of Jan Tinbergen and Ragnar Frisch "*for having developed and applied dynamic models for the analysis of economic processes*" (formulation of the Nobel Prize Committee).

⁴⁵ Like John D.C. Little, Jay W. Forrester was one of about twelve so-called MIT Institute Professors who are "*all world leaders in their field*" (see page 284). Little's concept of a Decision-Calculus-Modeling for *managerial models* I deal with later in detail in comparison to the Integrated Target Commitment Planning (see page 224). There you can also read about a conversation with Little (see page 285).

3. *How the world models of Forrester and Meadows caused me to lose sight of the company planning models*

Dennis Meadows, a professor at MIT, published, as mentioned above, in 1972, a System Dynamics model, which was generally referred to as "*the world model*". This publication was described in the New York Times as "*one of the most important documents of our age, ... which can change the course of humanity*" (New Statesman) and "*in its effects can only be compared with the Communist Manifesto of Karl Marx*".⁴⁶ Meadows was received by prime ministers, spoke to the UN and had a worldwide reputation that no scientist could match in the last fifty years. His work was translated into thirty-seven languages and had a total circulation of twelve million copies. According to Meadows' study, Dennis Gabor, Nobel laureate in physics, concluded: "*We are on a catastrophic course, and if we do nothing, we will experience a catastrophe that the world has not yet experienced in its entire history*".⁴⁷ Previously, as mentioned, Forrester had already published a first version of this world model (as a publication of the Club of Rome). His predictions do not differ from those of Meadows, which differentiated the "Forrester model" more strongly. However, only the publication of the work of Meadows became a "world event".

I was one of the first to analyze in detail the Meadows and Forrester models with their predictions of an overall catastrophe (but also of a rescue strategy) and I came to results that question the prognostic relevance of these predictions and their rescue proposals.

My results have received quite a lot of attention because only a few experts (in contrast to econometric models) had a more in-depth knowledge of the modeling concept of System Dynamics and hence were able to analyze these models on a computer level critically. The structural equations of the Meadows model were published much later after the "forecast announcement". Right after the release, however, I had acquired a version from MIT via an acquaintance.⁴⁸

Unfortunately, I can only comment on my critical analyses very briefly. A more detailed description, which should nevertheless be generally understandable, is contained in the text "*Possibilities and Limits of model-based Forecasting of socio-economic Developments; illustrated by the World Models of Meadows and Forrester*".⁴⁹

Meadow's model predicts an increase in the world's population until 2025, after which a catastrophic reduction in the number of world inhabitants will occur, triggered by pollution, famines, and more before the population development finally moves towards an equilibrium. There will be an "overshot and collapse behavior of the population".⁵⁰

⁴⁶ All quotations are cited with reference in Zwicker, E., Possibilities and limits of model-based forecasting of socio-economic developments, illustrated by the world models of Meadows and Forrester", p. 4, www.Inzpla.de/Weltmodell-Analyse.pdf. (Text in German, title translated).

⁴⁷ Gabor, D., *Assessing the Limits to Growth*, in: The Times, Higher Education Supplement, 31.3.72.

⁴⁸ The forecast of the catastrophic world development and its possible avoidance was published in the following work: Meadows, D. L. et al., *The Limits to Growth. A Report for the Club of Rome's Project on the Predicament of Mankind*. New York, 1972. The system of equations was published in: Meadows, D. L. et al., *Dynamics of Growth in a finite World*, Cambridge, Mass. 1974.

⁴⁹ www.Inzpla.de/Weltmodell-Analyse.pdf. (Text in German, title translated).

⁵⁰ See for a more detailed description of the relevant hypothetical connections: Zwicker, E., *Possibilities and limits..*, op. cit., p. 10f., www.Inzpla.de/Weltmodell-Analyse.pdf. (Text in German, title translated).

I did not examine the models of Meadows and Forrester concerning the validity of individual hypothesis equations but rather carried out a computer-aided general "implication analysis". For example, I developed a method for the backward prediction (so-called retrodiction) of the world models, starting from their initial values in 1900 "into the past before 1900". The Forresterian world model used an initial level of the world's population of 1.65 billion in 1900. I used my retrodiction method to calculate the variables of the model and thus also the world population from 1900 to 1880. It turned out that this backward forecast led to a steadily growing population, which would have amounted to 4.4 billion in 1880. Therefore, if the model was forecasted to advance again from 1880 onwards, by 1900 (i.e., within twenty years), there was a catastrophic reduction in the world's population (by 1880 from 780 million deaths alone) to the initial value of the world model of 1.65 billion in 1900. This was the first analysis.

Even more severe, however, was the second analysis in the form of a combined sensitivity analysis, which I carried out with the Meadows model. The validity claim of the two world models is based on an insensitivity assertion. Meadows claims that the catastrophic development of the world's population, as predicted by his model, is insensitive to model parameters. This is shown by the variation of certain parameters (e.g., doubling the food yield). Even if these parameters change strongly in a "favorable" direction, Meadows proved that the catastrophic "overshoot and collapse behavior" of the population remains unchanged. The catastrophe seems to be inevitable. However, Meadows shows a way out only if the population growth is reduced to two children per family and the industrial growth is stopped (new investments = disinvestments), a continuous development of the world population to a balance can be realized.

With the help of a search procedure for selecting combinations of sensitive model parameters, I was able to show that with a variation of three model parameters (capital coefficient, consumption rate and average lifetime of industrial capital) it was possible to generate no more than ten percent of virtually every course of the world's population beyond 1972. Thus it was also possible to reconstruct the course of growth which, according to Meadows, could only be achieved with the help of the two drastic measures (birth control and growth stop).⁵¹ Falsifying the assertion of insensitivity casts doubt on the validity of the whole model.

These results, which everyone, even without any further knowledge of the hypotheses of the model, could understand, caused a considerable amount of attention. The model and the "computer prediction of the end of the world" were a current topic of discussion, but there were always only critics of certain hypotheses (such as the inadequate consideration of technical progress, etc.). I presented my theses at various events, and the audience was always delighted that someone contradicted the prognoses of this computer model *"by a team from*

⁵¹ The procedure used to determine these sensitive parameters is a curve fitting procedure. The course of the population is determined and the parameter values, which mainly realize this course (according to a least squares criterion), are determined within the framework of an optimizing search procedure. However, it is also possible to arrive at a similar result by patient trial-and-error simulation with different parameter combinations.

the world-famous Massachusetts Institute of Technology (MIT)" with such plausible arguments on the "computer level".⁵²

I reported on this at the International Congress for Thermodynamics in Berlin. In the main seminar of Hermann Haken in Stuttgart, I gave (on 2.2.1982) a lecture on the retrodiction procedure.⁵³ And Walter Goldberg invited me to a lecture at the University of Gothenburg.⁵⁴ My report, as mentioned above, was always received with quite a bit of applause, as was the case with the fellows of the Institute for Advanced Study in Berlin, which was certainly not least due to a certain malicious joy at the "exposure" of the doomsday prophet and at the same time world rescuer Meadows.

A few years later, the well-known German philosopher Odo Marquardt gave a speech at the Production Engineering Center in Berlin. When a colleague from the Faculty of Philosophy wanted to introduce us to each other afterward, he said, "*I know you.*" "*Aha, how this?*" You told at the Institute for Advanced Study in Berlin about the backward prognosis of the world model. I was very impressed by that; I don't forget something like that".

The idea of running a model backward seems to be quite original. However, in astronomy, it is a common procedure. Usually, however, such a procedure is not feasible at all because, in contrast to the two world models, there is probably no dynamic econometric model, which, like the world models, is closed, i.e., does not possess any exogenously specified time courses of certain variables. In my opinion, however, the "destructive" factor for the validity claim of the model is the described falsification of the assertion of insensitivity.

In 1973, I had a long conversation with Dennis Meadows about his model. He listened very carefully when I also gave him a detailed description about the methods of analyzing his model, but he practically raised no objection. Only on the subject of retrodiction, he said, "*My model should forecast forward and not backward*". He seemed very sympathetic to me and did not let himself be taken out of his good mood by my objections in the slightest. Considering that Wilhelm Krelle, to whom I had sent a copy of my report, replied in a letter to me that my investigations were "*very convincing and basically devastating*", Meadows' reaction was astonishingly calm.

At the end of the conversation, I asked him what it felt like to be "world-famous". He shrugged his shoulders and said something very sensible: "*the half-life of fame is very short*".⁵⁵ After all, he seemed to be somewhat impressed by the methods, which I used to analyze the two world models and their results. Because he dedicated his book to me with a handwritten entry, which seemed very unusual to me for a colleague (and then still from MIT).⁵⁶

⁵² Formulation from "Die Zeit" of 18.8.72 with reference to the model.

⁵³ Herman Haken is one of the most important theoretical physicists in Germany and the founder of synergetic. This is an approach that deals with the modeling and analysis of elements of any kind between which there are interactions within a complex dynamic system. Herman Haken has been a member of the medal Pour le mérite since 1984.

⁵⁴ Walter Goldberg was an optional member of the Nobel Prize Committee for Economics and was heavily involved in ensuring that Herbert Simon (as Simon also reports in his memoirs about him) was the first non-economist to receive the Nobel Prize for Economics. See page 551.

⁵⁵ This apt expression "*half-life of glory is very short*" cannot yet be found on Google 1.2.2014.

⁵⁶ "*For Prof. Zwicker with great respect for your research in the dynamics of systems.*"

After this meeting, I noticed that Meadows had had a discussion with two authors (Cole and Curnow) about the acceptance of retrodiction as a validation method for world models. The results of this discussion (described by Cole and Curnow) appeared in 1973 in an article in *Nature*.⁵⁷ I read this article carefully and concluded that Meadows, as well as Cole and Curnow, apparently had some deficiencies in the area of analysis of difference equations. The consequence of this is that her reflections on the applicability of retrodiction tend to miss the point.

Cole and Curnow use a retrodiction method for the retrodiction of world models (it is so-called by me DT-minus method). Meadows, who strictly rejected retrodiction as a numerically inadequate procedure, substantiated this with the example of an unsuccessful retrodiction of the Forrester world model from 1940 backward with the DT-minus method. With my method, however, this retrodiction can be carried out successfully.

Cole and Curnow are not able to disprove Meadow's argument about the numerical insufficiency of any retrodiction with the world models. With my method, it was possible to show on a mathematically unambiguous basis under which circumstances in closed (homogeneous) systems of difference equations as in both world models a retrodiction is possible.⁵⁸

Another shortcoming of the discussion is the following: Since Cole and Curnow did not recognize the problem of determining the initial values in distributed-lag hypotheses in the delay-level equations of System Dynamics models, they also concealed the fact that the world model of Meadows mostly works with unrealistic initial values, so that Meadows' arguments are obsolete because of this.

These critical remarks about the arguments of the two opponents, which were accepted as worthy of publication by such a renowned journal as *Nature*, could be regarded by some readers as somewhat arrogant. Therefore, these objections were substantiated in a specific text. It is titled, "*Why the discussion between Meadows and Cole-Curnow in Nature about the retrodiction of world models misses the point*".⁵⁹

⁵⁷ Cole, H. S., Curnow, R. C. *Backcasting with the World Dynamics Models*. In: *Nature* Vol. 243, May 1973, p. 63-65.

⁵⁸ Cole and Curnow simply set the time increment DT in the level equations negative in their backward simulation of the course of time (hence DT minus method). I was able to show that this procedure for calculating the variable values from t to t-1 proves to be the first (and thus inadequate step) of a multi-step iteration procedure, I developed for solving non-linear simultaneous systems of equations.

⁵⁹ Zwicker, E., *Why the discussion between Meadows and Cole-Curnow in Nature about the retrodiction of the world model misses the point*. www.Inzpla.de/Retrodiktion-Nature.pdf. (Text in German, title translated).

4. Focusing on cost-performance models

After it emerged out that the System Dynamics concept is not suitable for developing a company's planning models, I turned to the development of company result and financial planning models (CRFI models), as already described, and concluded that it was more useful to first deal with a subsystem of company planning models, namely cost-performance models.

This was the beginning of my entry into the world of cost and performance accounting.

The book that stimulated me the most was Wolfgang Kilger's book "*Flexible Plankostenrechnung und Deckungsbeitragsrechnung*"⁶⁰ I have studied this book very thoroughly. Kilger described a concrete example of the application of a flexible plan cost accounting and performance planning. This example, which describes the flexible cost-performance planning of a company using a system of interconnected tableaus, runs through the entire book. Kilger's text mainly refers to this example. It is also a realistic example because it reflects the experience Kilger gained during his work at the management consultancy Plaut.

Of course, I immediately began to reconstruct this example as an equation model. (A description of the relations in his tableaus by using equations was not carried out by Kilger). During this reconstruction, there were some deficits, but they should not diminish Kilger's performance in any way.

Kilger practices a procedure for allocating secondary variable costs, in which he uses so-called "*coverage reference sizes*" (DM-Deckungsbezugsgrößen) as a measure of cost allocation. This is a special cost allocation procedure introduced and named by Kilger.⁶¹ The reconstruction of the examples using an allocation with these "*coverage reference sizes*" in his tableaus shows that such a type of allocation of variable costs cannot be described by a system of equations. In this procedure, you have to assume an amount of the variable costs of an allocating cost center A without this cost center having a reference variable to which the variability refers. However, this means that the variable costs in A cannot be defined at all.

I had to remove this calculation construct from the so-called "Kilger model", which I wanted to develop.⁶² Furthermore, it was found that in the tableaus describing Kilger's model, certain parameters of the reconstructed equation model do not occur explicitly. For example, the "variable costs" of a cost element are not calculated based on the equation

variable costs = proportional cost rate • employment

Instead, the variable costs of a cost element are entered as numerical values in a cost column.

⁶⁰ Kilger, W., *Flexible Plankostenrechnung und Deckungsbeitragsrechnung*, diverse Editions, only in German. Title translated, "*Flexible Plan Cost- and Contribution Margin Accounting*".

⁶¹ For a brief description of this procedure, see: Zwicker, E., *Integrated Target Commitment Planning and Control - a Procedure of a comprehensive Company Planning and Control*, op. cit., p. 83f., www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated). Or a detailed analysis of the problem of using "DM-Deckungsbezugsgrößen", see: Zwicker, E., *Classic Cost and Performance Accounting in the Light of the Integrated Target Commitment Planning*. Berlin 2002, p. 6-17, (67 pages), www.Inzpla.de/IN15-2002a.pdf. (Text in German, title translated).

⁶² These variable costs of cost center A (without a reference variable), which were allocated to another cost center B (with a reference variable) and were displayed there as variable costs of cost center B, were allocated like fixed costs.

Since the tableau also contains the amount of the employment value of this cost center (for example, in machine hours), you can calculate the proportional cost rate yourself by dividing the variable costs by the employment.

However, the proportional cost rate is a model parameter in a cost-performance model. Therefore, it should be presented explicitly in a model tableau. In addition to the proportional cost rates, other types of model parameters are not explicitly included in Kilger's tableaus.

This indirect parameter definition was (and still is) extremely confusing. Therefore, I developed a system of model tableaus that contain these parameters in an explicit form.⁶³ However, that is not all: The model tableaus are constructed in such a way that all structural equations in which the parameters occur are visible in the model tableaus.⁶⁴

It is, therefore, possible to obtain the equations of the entire cost-performance model by taking them from the model tableaus and entering them into an equation-calculation system like an Excel tableau as cell formulas.

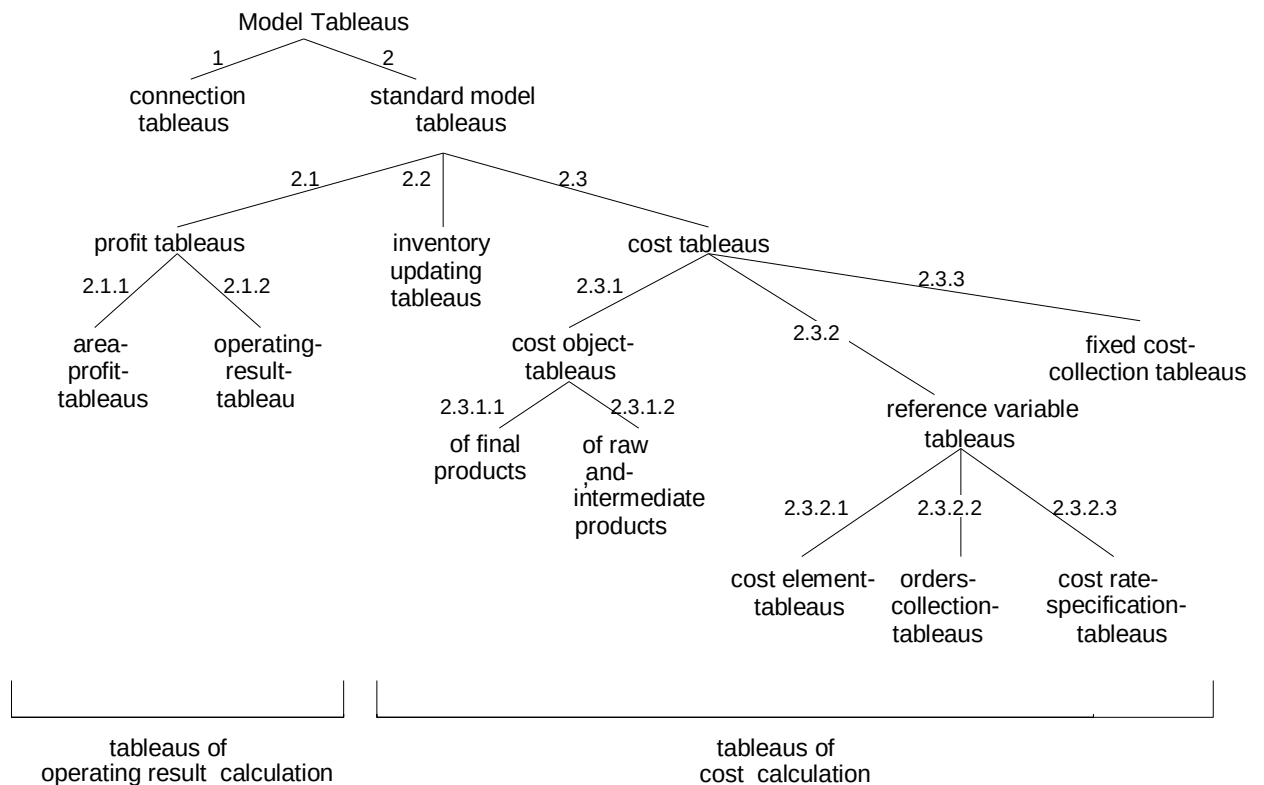


Fig. 1: Types of model tableaus of a cost-performance model

⁶³ A description of the conversion of Kilger's cost center tableaus into the corresponding model tableaus of an Integrated Target Commitment Planning can be found in: Zwicker, E., *Classic Cost and Performance Accounting in the Light of the Integrated Target Commitment Planning*, op. cit., p. 18f., www.Inzpla.de/IN15-2002a.pdf. (Text in German, title translated).

⁶⁴ A brief description of the structure of these model tableaus, including examples, can be found on pages 25, 33, and 44f., in: Zwicker, E., *Integrated Target Commitment Planning and Control - a Procedure of a comprehensive Company Planning and Control* op. cit., www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated). For a detailed description of the entire model tableau system, see: Zwicker, E. *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, Berlin 2000, (133 pages), www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated).

***An equation-calculation system is a program system in which equations can be entered in symbolic form as well as the numerical values of the model parameters. The system checks the equations for their formal correctness and further checks whether the values of all parameters are specified in the equations. It then uses certain methods to calculate the numerical values of the symbolic variables on the left side of the equations. How the variable values are calculated depends on whether it is a recursive or simultaneous system of equations.⁶⁵ In the simple one-equation model "Profit = Sales - Costs", for example, the system calculates the value of the profit with 200 by specifying the values of the model parameters Sales = 1,000 and Costs = 800 ***

Kilger's planning example could be completely reconstructed with the developed model tableaux. The Kilger model led to 197 model tableaux containing 2,079 model parameters and 19,418 (endogenous) variables to be calculated.⁶⁶

The development of this model tableau system led to a much better overview of the structure and semantics of the cost-performance models described. For this reason, I developed a configuration system with which such model tableaux can be created for a company in question.

Fig. 1 shows an overview of the developed model tableaux. If only the model tableaux which are named there as standard model tableaux, are used to describe a cost-performance model, then such a model should be referred to as a standard cost-performance model.

Since it was possible to represent both the cost-performance model of Kilger and the cost-performance models of the SAP-CO system with these standard model tableaux, I considered it justified to describe the cost-performance models that can be described by the model tableau system as standard cost-performance models. Structural equations, which cannot be described by the given equations in the model tableaux, but which are required in a company to model its relations, can be entered as additional equations directly in so-called connection tableaux (see 1 in Fig. 1). This makes it possible to develop any type of a cost-performance model (i.e., also non-standard cost-performance models).

Between the model tableaux generated in this way (with their model tableau specific structural equations), there are certain relationships that come to effect at the model level when a variable explained in a tableau A by an equation is included as an explanatory variable in an equation in a tableau B.

The resulting relationships between the model tableaux are always structured in such a way that a so-called order quantity-price interpretation can be applied to them.⁶⁷ A model tableau A (as a fictitious order unit) places an order (as an output variable of A) to a model tableau B (as an input variable of B) and receives a price from B (as an output variable of B and an input variable of A). Therefore, you can also say that the reference objects represented by a

⁶⁵ See on this: Zwicker, E., *Simultaneous and recursive Planning Models: Structure, Semantics and Application*, (30 pages) Berlin 2003, www.Inzpla.de/IN25-2003c.pdf. (Text in German, title translated).

⁶⁶ For a detailed description of the Kilger model, see: Zwicker, E., *The Kilger Model - Structure and Configuration and its Connection with a CRFI Model in the Context of a two-step Comprehensive Company Planning*, Berlin 2003, www.Inzpla.de/IN30-2003h.pdf. (Text in German, title translated).

⁶⁷ See the advantages of such a presentation in: Zwicker, E., *Integrated Target Commitment Planning and Control - a Procedure of a comprehensive Company Planning and Control* op. cit., p. 98, www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated).

model tableau are linked by order quantity-price relationships.

The order quantities and the price as input and output variables of the tableaus are still divided into real and fictitious order quantities and real and fictitious prices. With this division, it is possible to describe all the allocations that occur between the model tableaus (or reference objects). This shows that all the eleven allocation types between the reference objects provided by the SAP model configuration system can be replaced by these two allocation types without loss of information (s.p.334).

Since the described order quantity-price interpretation was used between the reference objects represented by certain model tableaus, you only need to specify a purchase order in the form of an order quantity for another reference object (or model tableau) when you configure the relationships between the reference objects (or model tableaus). The opposite price relationship, in the form of an equation with the price as an explained variable, is then generated by the configuration system itself.

If all the structural relationships of a company in question can be captured by the potentially available structural relationships of the model tableau system, then the development of a plan cost-performance model can be carried out without a manual input of the equations, which results in a minimal formulation burden. The original 19,418 equations of the Kilger model, which I had to manually type into my "equation-calculation system" at the beginning, could now be generated using the configuration system and the associated generation of model tableaus without entering one single equation. The configuration system is characterized by the fact that you only have to generate a full cost version using the model tableaus. The corresponding marginal cost model (with its equations and a corresponding marginal cost model tableau system) is then automatically generated by the configuration system.⁶⁸

⁶⁸ For the simultaneous generation of further plan versions such as the full cost version, see page 147.

5. Searching for a planning method

I hoped to use this system of model tableaux not only to describe the Kilger model but also to develop a plan cost-performance model that can be used by any company, whose structural equations coincide with the structural equations of the existing model tableaux so that ideally no further equations have to be entered manually. However, before I could continue along this way, I had to solve a fundamental problem.

My goal was to develop a model-based comprehensive planning procedure, which (in an ideal case) is computer-supported and applicable for every company. With the development of the model tableau system and the typification of the model parameters contained in the model tableaux as well as the order quantity-price interpretation of the relationships between the model tableaux (reference objects), the goal was achieved, to present a plan cost-performance model in a precise form. However, a planning procedure was not connected with this model representation. The question I was asking myself was, how this model-based planning procedure should be organized.

As an established model-supported planning procedure, only the optimizing planning, which is based on the decision theory, was suitable. Since the planning models I use consist only of deterministic (algebraic) equations and difference equations, they are subject to the norms of the deterministic decision theory. These require the definition of a target variable and the existence of certain entirely controllable (decision) parameters that influence this target variable. The optimization consists in finding the values of the completely controllable (decision) parameters that extremize, i.e., maximize or minimize, this target variable.

In the case of a plan cost-performance model, this target is (almost) always the operating result.⁶⁹ The operating result is therefore the top variable of a cost-performance model that is directly or indirectly influenced by all model parameters. To carry out an optimizing planning, it is necessary that the plan cost-performance model contains completely controllable parameters whose values are selected in such a way that the operating result is maximized. If we now look at the types of model parameters such as consumption quantity rates, production coefficients, sales quantities, etc. occurring in the model tableaux of the Kilger model, then these cannot be completely influenced, i.e., not like a "regulating variable" without any burden. In other words, in Kilger's plan cost-performance model (and thus also in the structural equations of the model tableaux) no parameter could be used as a completely controllable model parameter to maximize the operating result. The same applies to all companies whose SAP cost-performance models are always able of being completely reconstructed by using the model tableaux.

However, how can such a model then be used to realize a "planning" that is to be performed with a planning procedure that is not only theoretically justified but also accepted by practi-

⁶⁹ For the definition of the operating result in cost-performance models, see: Zwicker, E., *Alternative Definitions of the Operating Result in Cost-Performance Models of the Integrated Target Commitment Planning*, Berlin 2016 (19 pages), www.lnzpla.de/IN49-2016.pdf. (Text in German, title translated). For the use of other targets, see: Zwicker, E., *Use of alternative Top Targets in Cost-Performance Models*, (7 pages), Berlin 2000, www.lnzpla.de/IN10-2000e.pdf. (Text in German, title translated).

tioners as an "appropriate procedure"? I already had an idea of this because, as is described elsewhere, I had studied the work of Herbert Simon, Gunnar Eliasson and Charles Bonini, and I realized that an optimizing planning was out of the question (s.p.474). Their remarks make it more or less clear that this must be a planning procedure in which targets must be negotiated between the corporate management and certain responsibility areas.

In the literature on company planning, there is a consensus on specific steps that are to be taken in planning.⁷⁰ A differentiation is made between bottom-up planning, top-down planning, and countercurrent planning. These three consecutive steps lead to a planning triad. The description of these three planning steps can be found in every textbook of general business administration. One could, therefore, think that the authors, who mention these planning steps have more precise ideas as to how such a planning takes place "in detail". This detail would be practiced by them if they would answered the question: How can these planning steps be implemented using a plan cost-performance model?

In view of the fact that thousands of companies worldwide use the SAP-CO system and, therefore, use cost-performance models for their annual planning, the question of how to implement these planning steps in a plan cost-performance model is obvious. However, if one starts from the model tableaux of the Kilger model with its typical model parameters, it is rather unclear how to carry out bottom-up, top-down and counter-current planning with this model on the base of a "systematic planning procedure".

It was clear to me that a planning procedure that works with such planning steps is only acceptable if the model parameters in the model tableaux can be differentiated in terms of a planning logic in such a way that the planning procedure they operate with applies to any company that can be described by the model tableaux. However, with what planning procedure?

In the entire planning literature and also in management theory, it is demanded that one should make people responsible for numbers in a company. Terms such as "*responsibility accounting*" or "*management by objectives*" express this idea of responsibility for the realization of certain numerical values.

All this and various practical reports confirmed my opinion that the "planning" conducted in practice under the name of "operational company planning" is more or less clearly a "planning by target commitment".

Gunnar Eliasson's work provided the definitive conviction that this view was the right one. His work was the reason for my decision. Eliasson describes the formal planning in various European companies as the result of extensive personal discussions and generalizes it to a descriptive theory of planning behavior in the case of a comprehensive formal planning and budgeting in companies.⁷¹

Eliasson distinguishes like other authors between bottom-up, top-down and confrontation planning. He calls confrontation planning as "*top-down bottom-up bargaining*" (p.235), which takes place within the framework of a "*bargaining group*". During confrontation planning (or bargaining planning), the values of certain target commitments are negotiated between the

⁷⁰ Instead of "company planning" the terms "*corporate planning*" and "*the*" are also used.

⁷¹ Eliasson, G., *Business Economic Planning - Theory, Practice and Comparison*, Stockholm 1976.

corporate management and the responsibility areas. He considers such an agreement of targets (*subgoals*) between the corporate management and the subordinate areas of responsibility to be an essential element of formal planning systems in companies.

In the description of these planning steps, the justification for their necessity and the classification of his observations in a theoretical context, Gunnar Eliasson surpasses all other authors, who have commented on this topic, to an extent that is astonishing. His analyses are unsurpassed to this day.⁷² However, Eliasson does not deal with the implementation of the planning procedures observed by him in the context of a planning model. And there was also no other literature on how such a target commitment planning is to be carried out systematically on the basis of the parameters of a cost-performance model.

In one case, however, planning is carried out using a target commitment in the frame of a planning procedure. This commitment is represented by the target cost function occurring in the flexible plan cost accounting. Such a target cost function can at least be used in such a way that the manager of a cost center must commit himself in advance not to exceed certain values of the costs of a cost element depending on the actual employment. The points of this "non-exceed limit" form the coordinates of the target cost function. However, by fulfilling this target cost function, the cost center manager also commits himself to adhere to certain model parameters. These are the variable unit costs (VUC) and the fixed costs (FC) of the cost function:⁷³

$$CO = FC + VUC \cdot EP \quad (1)$$

Based on this knowledge, it is obvious to divide the model parameters in the Kilger model according to whether one can oblige (as with the model parameters FC and VUC) a responsibility area to adhere to these parameters. Formulated as a question: Is it possible to find certain types of model parameters in the structural equations of a cost-performance model for which certain areas can be held responsible?

I concluded that in addition to the model parameters of the cost function, i.e., FC and VUC, further model parameters can be found which are suitable for acting as such "commitment variables". I named them basic targets because the responsibility areas at the grassroots level are responsible for them.

However, it is also obvious that certain model parameters, such as the exchange rate, cannot be influenced by any responsibility area in a company. Model parameters over which the company has no control were, therefore, designated as uncontrollable basic parameters.

Furthermore, it became apparent that model parameters also appear in the model tableaux, which can be fully influenced, but whose amount must be determined before the procedure to be described for a target commitment planning. These are the decision parameters (for example, a depreciation rate). Finally, if there are model parameters that can be fully influenced and can be realized by the responsibility areas without any burden, then they should be re-

⁷² For a further assessment of Eliasson's contribution to the development of the system of the Integrated Target Commitment Planning, see page 477.

⁷³ EP = Employment of the cost center.

ferred to as decision variables. They can be used to maximize the operating result as described above.⁷⁴ As superordinate term for these four parameters of the cost-performance model of a target commitment planning I have chosen the name basic parameters.

Then I came up with the idea that you can make someone responsible for the other types of model parameters, but in a different way.

Since the areas commit themselves to adhere the planned values (or target values) of their basic targets, I called this responsibility of adhering the target values of the basic targets as fulfillment responsibility. The variance between the setpoint and the actual value of a basic target is a measure of the fulfillment responsibility. There is no fulfillment responsibility for the uncontrollable basic parameters (such as the exchange rate), but someone is responsible for forecasting its value used in the model. In this way, you can declare a forecasting responsibility for the actual-plan variance of the uncontrollable basic parameters. For the completely controllable basic parameters, i.e., the decision parameters, and decision variables, there is a determination responsibility and a realization responsibility. The variance between the setpoint and the actual value is a measure of the realization responsibility.

Since in the models of such target commitment planning, each model parameter can be assigned to one of these responsibility categories, a certain person is always responsible for the plan vs actual variance of all model parameters in a certain way. This is a closed system realizing the demand: "*Make people responsible for numbers*".

With this responsibility classification of the model parameters of a cost-performance model, the basis was laid for developing the planning procedure of a target commitment planning. I called it Integrated Target Commitment Planning.

This procedure should consist of the three planning steps of the bottom-up-, top-down- and confrontation planning.⁷⁵ It should be a planning procedure that works with a plan cost-performance model whose relationships can be described by the model tableau system I have developed. This plan cost-performance model should then be included in the planning triad, which runs according to specific rules. Following the three planning steps should lead to the final planning model, which contains the final plan values of all model parameters for whose actual-plan-variance someone in the company is always "responsible" in one of three types of responsibility.

With regard to the model parameters, which were selected by me as basic targets, there was another insight that led to the construct of a target commitment function.

Once again, Kilger's *Flexible Plan Cost- and Contribution Margin Accounting* served as the starting point for a generalization. The fixed costs (FC) and the variable unit costs (VUC) form the parameters of the target cost function in the flexible plan cost accounting system.

⁷⁴ However, no decision variables occur in the model tableau system of a standard cost-performance model. This does not exclude the possibility that they may occur in a planning model of a company whose structural equations cannot be not exclusively described with the model tableaux.

⁷⁵ The name *countercurrent planning* (Gegenstromplanung), which is used in German planning literature and goes back to Wild. I replaced it by the more drastic term "*confrontation planning*". Eliasson uses the term "top-down-bottom-up bargaining" (p.235). Other terms are "*negotiating step*" or "*bargaining step*". At Schering AG, this step is called the "*crumple phase*".

This target cost function is the most commonly used type of a group of hypothesis equations in the model that I have called target commitment functions. Almost all basic targets in the model tableaux can be interpreted as parameters of a specific target commitment function. A (responsibility) area is always responsible for complying the values declared by the target commitment function.

The structural equations of an Integrated Target Commitment Planning model and its semantic peculiarities are described below in a brief excursion. In view of the hypothesis equations to be used, such a model is characterized by special features.

The target commitment function mentioned above is one of the three types of a hypothesis equation that can occur in an Integrated Target Commitment Planning model. These hypothesis equations together with the definition equations form the (structural) equations of the model.

A hypothesis equation is an equation whose explained variable (on the left side of the equation) is an observation variable. The explanatory variables (on the right-hand side of the equation) consist of either hypothesis parameters or observation variables. A hypothesis equation must be falsifiable. Therefore, it must be possible to give observation values of the variables that serve as explanatory variables, and when they occur, it must be possible to say that the hypothesis is wrong.

The following example is given to illustrate this. In the structural equation "material costs = 1,000 + 5 • employment" the material costs and the employment are observation variables. The values "1,000" and "5" are (non-observable) hypothesis parameters. A prediction statement made based on this equation is a hypothesis because it is falsifiable. For example, assuming that the employment will amount to 2,000 units, the material cost hypothesis would be used to forecast a material cost amount of 11,000 € ($11,000 = 1,000 + 5 \cdot 2,000$). However, since it is possible that in the case of this forecast, material costs may also arise that are not equal to € 11,000, this hypothesis is falsified. Since this forecasts statement or ex-ante hypothesis can be falsified, it is an (empirically verifiable) hypothesis.

Equations such as "profit = sales value - costs" cannot be falsified because their explained variables, as the profit in the example, are not observation variables. Therefore, such equations are definition equations.

An INZPLA-model contains three types of hypothesis equations: target commitment functions, decision rules, and uncontrollable hypothesis equations. Target commitment functions contain only basic targets as hypothesis parameters. Decision rules have only decision parameters as hypothesis parameters, and the uncontrollable hypothesis equations possess only uncontrollable basic parameters. There are no other types of hypothesis equations allowed.⁷⁶ The exhaustive subdivision of the hypotheses of a standard cost-performance model into three types and their corresponding parameters is an essential feature of this type of an INZPLA-model.

⁷⁶ For more information, see: Zwicker, E., *Integrated Target Commitment Planning and Control....*, op. cit., p. 70f., www.lnzpla.de/IN37-2008c.pdf. (Text in German, title translated).

Let us return to the target commitment functions, which represent in the model the "target commitment behavior" of those responsible. If you follow the link between the target commitment functions of a plan cost-performance model of the Integrated Target Commitment Planning, you will find that many of the costs declared in the cost object and cost center tableaux depend directly or indirectly on the sales quantities via order quantity chains, so that a sales quantity-driven planning can be carried out. These costs, which are dependent on sales quantities, are the variable costs (in terms of sales quantities). Since these costs are linked to sales quantities via chains of target commitment functions, you can calculate the plan cost-performance model with different values of the sales quantities without having to make new target commitment with a production area each time the latter's planned employment changes as a result.⁷⁷ However it is necessary that the newly calculated employments lie in the so-called commitment range of the target commitment function. That is an interval of the employment in the target commitment function for which the production area has committed itself not to exceed the target values, e.g., for cost or consumption. If the range is kept, the production area cannot claim that the business basis for their target commitment would not be maintained.

As an example, it is assumed that the central planning during confrontation planning with a sales area agrees on the value of a sales quantity commitment for an article of 12,000 units. The original bottom-up value of this sales quantity was 10,000 units. However, it is assumed that even before this agreement was reached, final values of the variable unit costs were already agreed upon between the central planning and a production area X. At this time, a planned employment of 40,000 machine hours was assumed. The increase in the sales quantity from 10,000 to 12,000 units leads to a value of the planned employment in X of 42,000 machine hours, according to a new calculation of the model.

Does a new negotiation of the variable unit costs now have to be carried out with the production area X? As long as the increased planned employment is within the commitment range of the target commitment functions of the production area X, it is not necessary to negotiate new basic target values with X. Therefore, if the planning alternatives determined during the confrontation planning in the production areas lead to employment values that lie in their commitment ranges, no renegotiation with these areas are necessary.

The change in the planned employment from 40,000 to 42,000 machine hours in X described above is not only caused by a subsequent change in certain sales quantity. The planned employment of a production area is the sum of certain chain components of the form:⁷⁸

$$M_1 \cdot M_2 \cdot \dots \cdot M_v \cdot IQD \quad (2)$$

IQD (as the **initial quantity driver**) is a sales quantity or a fixed consumption quantity, and the quantities M_1 to M_v are basic parameters that are specifically named quantity multipliers.

⁷⁷ This type of a sales quantity-driven planning with different values of the sales quantities as planning alternatives is not possible with a cost allocation procedure based on Kilger's allocation method with *coverage reference size*. The idea of using the Kilger model to carry out such a sales quantity-driven planning is obvious. Kilger was also familiar with the concept of such a sales quantity-driven planning, but he did not implement it. See Kilger's comment on page 57.

⁷⁸ See page 104.

They represent the consumption quantity rates, scrap rates and production coefficients of the production areas that follow the production area X in the production chain. Even if these model parameters that serve as basic targets in the production chain of the following production areas are changed during confrontation planning, production area X cannot protest if the planned employment resulting from this change is within the commitment range of its target commitment functions (for example, a target cost function).

In this way, it is possible to carry out a planning procedure that allows you calculating the cost-performance models for all changes to the basic targets in an area without having to re-negotiate the basic targets in other areas. Such a one-step model calculation without contradiction when changing the basic targets of a given responsibility area is a fundamental prerequisite for the application of the Integrated Target Commitment Planning procedure.

Model tableaux of a single-reference variable cost center. The model tableaux are of fundamental importance in the Integrated Target Commitment Planning and Control. They contain all the information that is relevant to a planner. These are the structural equations of the model, the names of all parameters and variables and their values for a specific planning alternative. In addition, the planner will be informed by colored fields which planning logic status the basic parameters (as basic targets, uncontrollable basic parameters, decision parameters or decision variables) possesses in a model tableau. The values of these model parameters can be changed directly in the model tableaux if you want to calculate another planning alternative with these changed values. The planner recognizes in a model tableau using a color-coded marking which variables are so-called input and output variables.

Input variables are variables, such as a calculation rate or an order quantity that are specified in another tableau but are required in this tableau to calculate the value of a variable in this tableau. Output variables of a tableau are variables whose values are specified in this tableau but are required in one tableau or several other tableaux to calculate the value of a variable in this tableau or these tableaux. The output variable of a tableau is, therefore, always an input variable of another tableau. By clicking on the fields in which the numerical values of these quantities are indicated, one jumps into the tableaux from which (in the case of input variables) these variables originate or (in the case of output variables) are required. In doing so, the fields in the tableaux are "jumped on" in which the numerical value of the input or output variable is indicated.

Now after the planning logic status of the model parameters has also been described, the structure of one of these model tableaux is to be discussed using an example.⁷⁹

Fig. 2 shows the structure of the cost element tableau.⁸⁰ It is one of the tableaux of a reference variable unit and describes the determination of the total costs as well as the cost allocation rates of this reference variable unit. If a cost center has only one reference variable for allocat-

⁷⁹ For a detailed description of the construction of all model tableaux, see: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, Berlin 2000, (133 pages), www.Inzpla.de/IN06-2000a.pdf. Text in German, title translated.

⁸⁰ See in Fig. 1 on page 23 the classification of this tableau in the model tableau system with 2.3.2.1.

ing its costs, that is, it is a single-reference variable cost center. In this case the total costs incurred in the cost center are determined on the basis of this tableau (in column 10).⁸¹

	1	2	3=1*2	4	5=2*4	6=3*4	7	8=7*1	9=5+7	10=6+8	11=9	art commitment
cost element	price	consumption quantity rate	proportional- cost rate	employ- ment	consumption quantity variable	variable costs	consumption quantity fix	fixed costs	consumption quantity total	cost element total	order - quantity	
travel								50.000		50.000		1
repair	30						100	3.000	100	3.000	100	2
lubricant			0,20	10.000		2.000				2.000		3
electricity	0,20	15	3,00	10.000	150.000	30.000			150.000	30.000	150.000	4
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		⋮	⋮	⋮	
Total costs reference variable unit (€)										Σ	700.000	
Employment (mach. hour)										9000 ≤	10.000	≤ 11.000
Full cost rate (€ / mach. hour)										=	70,00	

employment (mach. hour)

Fig. 2: Cost element tableau of a cost center⁸²

The cost rates of this reference variable unit are listed in the lowest field of column 10. Since this example is a cost element tableau in full cost accounting, the full cost rate of the reference variable unit of 70 €/machine hour is determined here.⁸³ The four lines in Fig. 2 show how a cost element (in column 10) can be explained by different structural equations. The four structural equations contain four different types of model parameters, which, from the view of the Integrated Target Commitment Planning, can be potential basic targets.

Before an Integrated Target Commitment Planning starts, the central planning decides whether these model parameters should have the status of a basic target or another status, such as that of an uncontrollable basic parameter.⁸⁴ The cost centers will often point out that a parameter chosen by the central planning as a (negotiable) basic target cannot be influenced by them at all and it, therefore, makes no sense to negotiate a change in its bottom-up value. If the central planning agrees with this, the parameter is declared as an uncontrollable basic parameter. In the following, it is assumed that all four model parameters in the cost element tableau in Fig. 2 have the status of basic targets.

Under this assumption, there are four types of basic targets.

The first line shows the model parameter in column 8. It forms the commitment type of a cost value commitment. The example shows the travel expenses are independent of employment, but its amount can be negotiated. The second line contains a fixed consumption commitment (column 7) as a model parameter and a basic target. The third line contains a proportional cost rate commitment (column 3). Finally, the fourth line contains a consumption quantity rate

⁸¹ This only applies to single-stage cost accounting systems. In multi-stage cost accounting systems, the cost object tableaus of the intermediate products they create are also assigned to the cost centers. The costs incurred there are also costs that are "attributable" to the cost centers.

⁸² The calculation rule in the header of column 3 only applies if a consumption quantity rate commitment exists as in the fourth row.

⁸³ The corresponding model tableau system of marginal costing, which is always generated by the INZPLA-System, would supply the variable unit costs of this reference variable unit.

⁸⁴ For the other types of basic parameters in the other model tableaus, the procedure is the same.

commitment (column 2). The amount of these values is negotiated during the planning procedure, and the agreement is made to adhere to a certain setpoint value. However, these are only the potential basic targets that can occur in a cost element tableau. In addition to these four potential basic targets, however, a standard cost-performance model contains in its other model tableaus further basic parameters that can be considered as basic targets.

The model tableau also shows that the four basic targets are parameters of a target commitment function.⁸⁵ In contrast to the example, for a cost element that corresponds to one row of the tableau, two of the basic targets mentioned can be included in the explanation equation for this cost element. In this case, you get two types of hypothesis equation to explain a cost element (CO). The first one has the form

$$CO = FC + VUC \cdot EP \quad (3)$$

with: CO - costs, FC - fixed costs, VUC - variable unit costs, EP- employment

The second explanation equation of a cost element (CO) is represented by

$$CO = FCQ \cdot PP + CQR \cdot PP \cdot EP \quad (4)$$

with: FCQ - fixe consumption quantity, PP - procurement price, CQR - consumption quantity rate.

The cost function (3) is the target cost function in a flexible plan cost accounting. The hypothesis equation of costs (4) can be converted into

$$CO = TCQ \cdot PP \quad (5)$$

The total consumption quantity (TCQ) in (5) is described by a consumption quantity hypothesis, which is also a target commitment function. It has the form.⁸⁶

$$TCQ = FCQ + CQR \cdot EP \quad (6)$$

The commitment range of the target commitment functions is also shown in the cost element tableau in Fig. 2. It ranges from 9,000 to 11,000 machine hours.

As mentioned above, Kilger also uses tableaus to calculate the total costs of a cost center and its full and variable unit costs. These tableaus do not follow the requirements of a model tableau used for the Integrated Target Commitment Planning. To illustrate this, one of the cost center tableaus quoted by Kilger was converted into a model tableau, which corresponds to the structure of the cost element tableau described in Fig. 2.⁸⁷

⁸⁵ The planning described, whose goal is to meet certain setpoint values of the basic targets, is the pure basic Target Commitment Planning still to be discussed. In the context of the pure area Target Commitment Planning, which is also still to be discussed, however, these setpoint values of the basic targets do not need to be attained. The only deciding factor here is compliance with the setpoint value of an area target, see page 201.

⁸⁶ In the example in Fig. 2 on page 33, one of the two basic targets (FC, VUC and FCQ, CQR) is alternately set to zero in equation (3) and (4). They are, therefore, one-parametric cost and consumption quantity functions. For further target commitment functions in the model tableau system of the Integrated Target Commitment Planning, see: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., www.Inzpla.de/IN07-2000b.pdf. (Text in German, title translated).

⁸⁷ See: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated*

If a cost center has several reference variable units, that is, it is a multi-reference variable cost center, then each reference variable unit is assigned such a cost element tableau to this cost center. In the case of cost accounting modeling at Schering AG, cost centers comprised up to 9 reference variable units.⁸⁸

Kilger's cost center tableaus are often used as examples in books of cost and performance accounting. However, there are also authors such as Schweitzer and Küpper who have developed their own cost center tableaus. However, these tableaus also do not meet the requirements of a model tableau used in the context of an Integrated Target Commitment Planning. For example, they do not contain the structural equations of the cost-performance model in explicit form. Therefore, their parameters are not entirely explicit and are not identified by names.⁸⁹

Target Commitment Planning, op. cit., p. 22f., www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated)

⁸⁸ See on this: Zwicker, E., *The Model Tableau System...*, p. 33, www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated)

⁸⁹ See in detail: Zwicker, E., *Classic Cost and Performance Accounting in the Light of the Integrated Target Commitment Planning*, op. cit., p. 35f., www.Inzpla.de/IN15-2002a.pdf. (Text in German, title translated).

6. Integrated Target Commitment Planning as a solution

In this way, a new planning procedure was developed, which I named as already mentioned Integrated Target Commitment Planning. A planning by target commitment exists because the values of the model parameters, which are changed during the planning process, function as commitment targets (basic targets) of the areas. The change in the bottom-up values of these commitment targets during the not yet described planning procedure is intended to ensure that the setpoint of a top target (such as the setpoint of the operating result) required by the corporate management is achieved. The planning, i.e. the top target oriented change of certain model parameters, therefore comes about through a commitment of the areas to realize certain values of these model parameters (the basic targets of the areas). This target commitment planning is "integrated" because the basic targets (commitment targets of the areas) are systematically and comprehensively linked to the top targets of the corporate management through an equation model.

Pure basic Target Commitment Planning. The first planning procedure developed in the Integrated Target Commitment Planning system was described by me as pure basic Commitment Planning.⁹⁰

It will be described below. An optimizing planning is identified by its objective function and the specified constraints. The pure basic Target Commitment Planning also has a kind of objective function, which describes the connection between the top target declared by the corporate management and the basic targets to be achieved by the areas. Such an objective function, or rather a target connecting function of a standard cost-performance model with the operating result as the top target, is shown in Fig. 3 and is called a reduced top target equation.

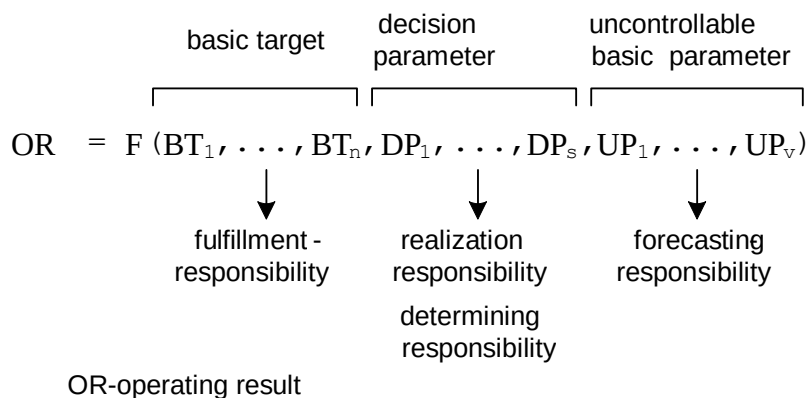


Fig. 3: Development of a reduced top target equation with the operating result (OR) as the top target

How do you arrive at such a reduced top target equation and what advantages does it have? As can already be seen in Fig. 3 we assume that the top target of an annual operating plan

⁹⁰ See the planning procedure marked 2.2.1 in Fig. 39 on page 145, which gives an overview of the Integrated Target Commitment Planning procedures.

should be the operating result. Furthermore, it is assumed that a developer has developed a plan cost-performance model of a company using the mentioned model tableaux.

It is now conceivable that by appropriate algebraic transformations, an equation is derived from a plan cost-performance model in which an endogenous variable is described as a function of all model parameters. Such an equation is called a reduced equation. A reduced top target equation is given as mentioned above if, on the one hand, the explained variable of a reduced equation is the top target of an Integrated Target Commitment Planning in question. On the other hand, such a top target equation requires that the model parameters on the right-hand side of the equation could be characterized as basic parameters of an Integrated Target Commitment Planning.

Equation in Fig. 3 fulfills these requirements, since, as mentioned above, it is assumed that the operating result (OR) should serve as the top target. The model parameters of a standard plan cost-performance model, which are shown in Fig. 3 can be traced back to three of the four types of basic parameters of an Integrated Target Commitment Planning, namely to basic targets, decision parameters, and uncontrollable basic parameters.

Fig. 3 also shows the types of responsibilities already discussed which are associated with the three types of the basic parameters. The decision parameters and the uncontrollable basic parameters remain unchanged during the planning procedure of the Integrated Target Commitment Planning. During this planning procedure, the course of which will be discussed in detail, only the basic targets are changed. They are the commitment targets of the responsibility areas. The setpoint values of the basic targets are negotiated with each area as a result of the planning procedure. The negotiation and ultimately the agreement to adhere to certain setpoint values of the basic targets can be carried out (because of the structure of the planning model) with the areas in any arbitrary order.⁹¹ It is, therefore, not necessary to negotiate first with the sales areas to achieve their final sales quantity commitment. Every area manager who conducts the negotiations with the central planning (as a representative of the corporate management) has an idea of the burden that comes to him through the realization of certain values of his basic targets. This connection can be characterized by a burden function, even though it only occurs in the head of the area manager, i.e.,⁹²

$$BUA = F(BT_1, \dots, BT_v) \quad (7)$$

BUA - total burden of an area manager, BT - basic target of the area

All basic targets are characterized by their direction of burden. The change of a basic target (BT) in its direction of a burden increase leads to an increase in the total burden of the area manager (BUA).

During the negotiation of the basic targets with the central planning, an area manager constantly checks how the values in question of his basic targets affect his total burden (BUA) to realize them. The hypothesis system of the Integrated Target Commitment Planning model is characterized by the fact that the changes in the basic target values of one area manager do not influence the burden of another area manager. Therefore, the sum of the burden of all area

⁹¹ See, however, the meaning of the commitment range that plays a role during the negotiation on page 31

⁹² The sum of the basic targets in the burden functions of the area managers corresponds to the n basic targets of the reduced equation of the operating result in Fig. 3 on page 36.

managers (SBA) can be marked as follows:

$$SBA = F_1(BT_{1,1}, \dots, BT_{1,v1}) + \dots + F_u(BT_{u,1}, \dots, BT_{u,vu}) \quad (8)$$

(F_i - burden function of area manager i)

After all basic target values of the reduced top target equation in Fig. 3 have been negotiated with the areas the annual planning has been finished.

The subsequent ongoing monitoring of the basic targets during the year and the rolling residual annual forecast from actual basic targets and "last estimate of the basic parameters" for the remainder of the year are not discussed here. However, this procedure is possible on a monthly basis because the planning model of an Integrated Target Commitment Planning works with an annual horizon on a monthly basis. The areas' target commitments are annual commitments that are disaggregated to monthly commitments by the system or in some other way. The annual model, therefore, always consists of twelve monthly models whose flow variables (e.g., the monthly operating results) are aggregated to annual values (e.g., the annual operating result as a top target) using an "aggregation model section".

The setpoint-actual control of the basic target commitments already takes place monthly during the planning year. Only the final annual control is considered in this description. It is carried out in the form of a setpoint-actual control of the basic targets. The variance between the setpoint and the actual values of the basic targets is a measure of over- or under fulfillment of the basic target commitment.⁹³

However, the "year-end control" does not only refer to achieving the setpoint values of the basic targets. As mentioned and can be seen from Fig. 3, for each of the three types of a basic parameter in the reduced top target equation of the operating result someone is "responsible" in a certain way. This results in a closed system of responsibility allocations, in which monitoring the fulfillment of the basic target commitments is by far the most important for the corporate management.

However the basic targets are the only "driver variables" of the operating result that can be influenced by the corporate management during the planning procedure.

In practical cases, the reduced top target equation of the operating result would have to be derived from a model that contains many equations. In the case of the ThyssenKrupp Steel model, it would be 2.6 million equations. If such a reduced top target equation were available, the planning steps during the planning triad could be performed with this reduced equation alone, because it links the basic targets to be changed for each planning step with the top target, i.e., the operating result. It was pointed out at the beginning that this type of a target commitment planning could be described as *"integrated"* (s.p.36) *"because the basic targets (commitment targets) of the areas are systematically and comprehensively linked to the top targets of the corporate management through an equation model"*.

This link between the basic targets as targets for the areas and the operating result as a target for the corporate management is fully described by the reduced top target equation in Fig. 3.

Planning procedure. The planning procedure is as already mentioned (s.p.29) divided into three planning steps, bottom-up planning, top-down planning and confrontation planning. The design of these planning steps is described in more detail using the example discussed below.

⁹³ However, it is also possible to carry out a setpoint-actual control at a higher aggregation level than the "basic target level", see page 79.

During the planning triad, several planning alternatives are generated. With regard to the reduced top target equation, each computation of such a planning alternative consists of calculating a value of the operating result depending on different values of the basic targets.

For example, at the beginning of the bottom-up planning, the basic targets BT_1 to BT_n in Fig. 3 are assigned the (voluntary) bottom-up commitment values of the areas, and the following "calculation" of the equation leads to the value of the bottom-up operating result. During the other steps, the calculation of the model (equivalent to the calculation of the reduced top target equation) is carried out based on various considerations. The considerations that underlie these "model calculations" and the planning alternatives determined in the three steps of the planning triad will be explained immediately afterward using an example.

First, however, the question of how to arrive at an INZPLA-model from which such a reduced top target equation could then be derived (at least theoretically) is to be discussed.

As already mentioned, each INZPLA-model should be characterized by the fact that the change in the basic targets of an area does not influence the burden of the area managers in the other areas. The model configuration system always leads to plan cost-performance models that meet this requirement for a "burden insensitivity" of an area with regard to the change of basic targets of other areas.

For practical purposes, it is much more important that every application of the SAP-CO system implemented in practice can be transferred to an Integrated Target Commitment Planning model. And, since this is possible, each SAP-CO planning model used in practice also allows its model parameters to be divided into the three categories described. Therefore, if certain model parameters are declared as basic parameters in an SAP cost-performance model, which can always be transferred to an INZPLA cost-performance model, then the burden insensitivity to other responsibility areas expressed by (8) always applies to their change.⁹⁴ Under these circumstances, you are able to use the cost-performance model transformed from the SAP-CO system to carry out an Integrated Target Commitment Planning.

All companies that work with the SAP-CO system practice a more or less explicit "planning by target commitment". The pure basic Target Commitment Planning is a procedure with which such a "planning by target commitment" can now be realized consistently in the context of an SAP-CO system.

Example of a pure basic Target Commitment Planning. The pure basic Target Commitment Planning is now to be described using a simple example. The standard cost-performance model used in this example is referred to as a furniture model because the company described produces beds and sofas. Fig. 4 provides an overview of the important variables of this model for a pure basic Target Commitment Planning.

The operating result was selected as the top target. It is connected with the eighteen parameters of the model by certain equations, the structure of which is then discussed.

As mentioned above, these model parameters are referred to as basic parameters of the cost-performance model of the Integrated Target Commitment Planning and are divided into three categories: basic targets, uncontrollable basic parameters and decision parameters.⁹⁵

As described, a person responsible for a particular type of responsibility is in charge of the

⁹⁴ For the system (INZPLA-Connect) with which the transfer is implemented, see page 325.

⁹⁵ For this classification, see page 28f.

variance between the final plan values and the actual values of these three types of basic parameters. In the present case, four responsibility areas have a fulfillment responsibility. These are the assembly, the woodworking, the upholstery, and the sales area.

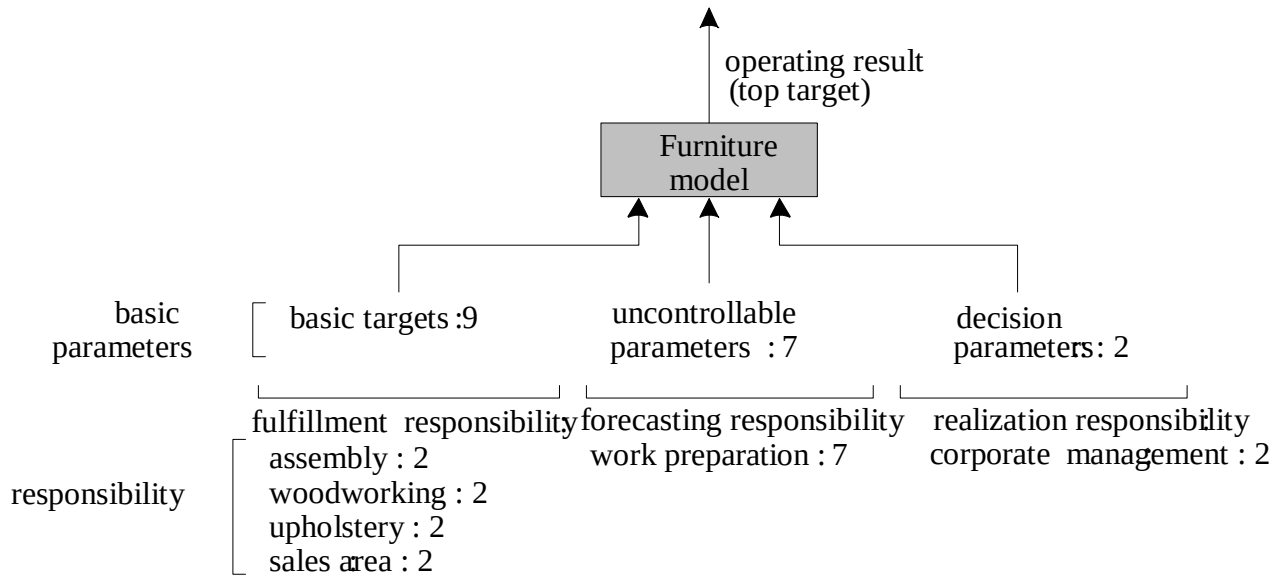


Fig. 4: Basic parameters of the cost-performance model of a company in the furniture industry (furniture model)

The three production areas each have two basic targets; the sales area has three basic targets. The work preparation is responsible for forecasting the seven uncontrollable basic parameters (mostly production coefficients). The corporate management is responsible for determining and implementing the two decision parameters. These are the sales prices of the beds and sofas to be manufactured. The corporate management is, therefore, responsible for the variance between the value of the sales prices that it has determined and the realized values.

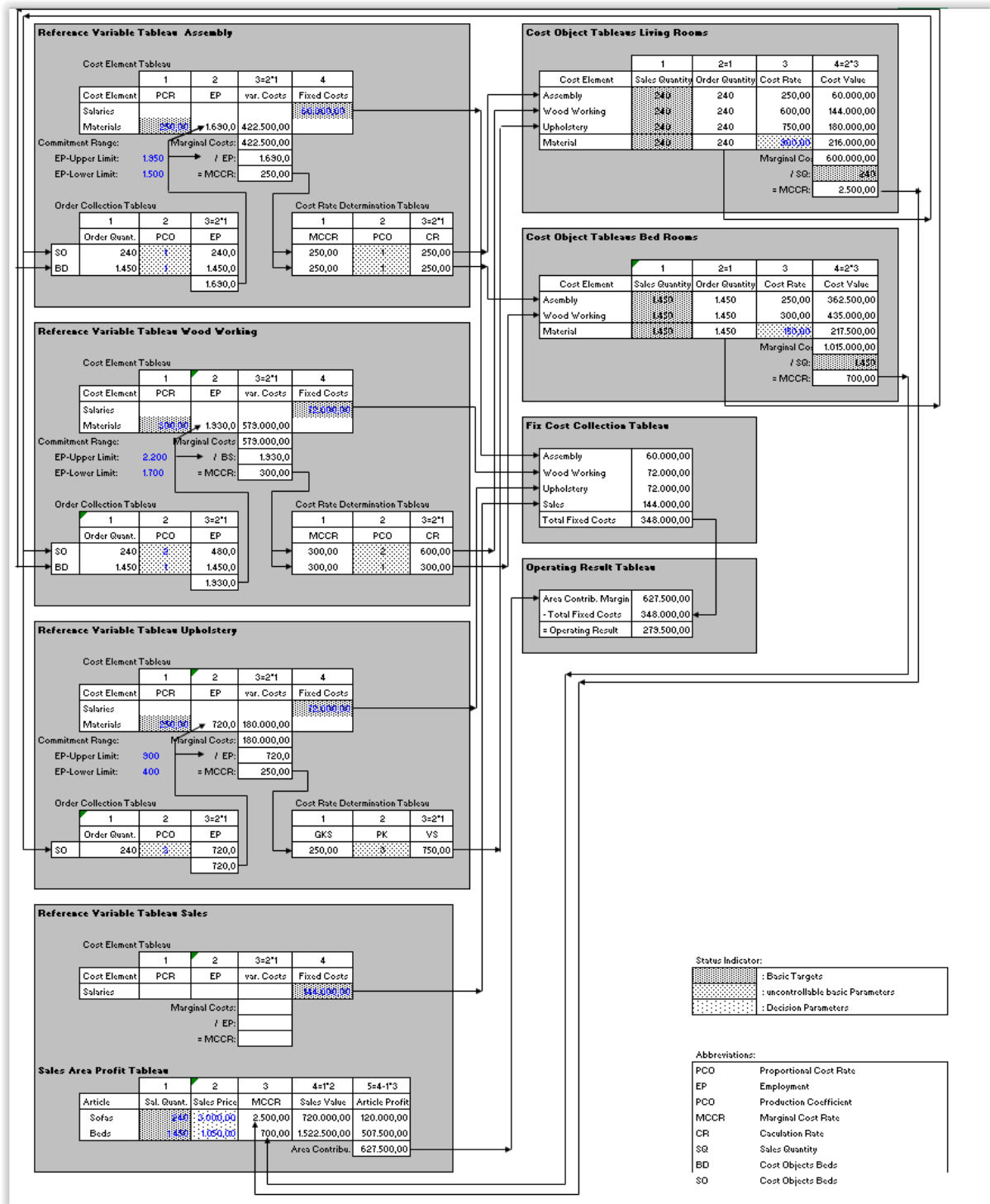
Fig. 5 shows the model tableau system of the marginal cost version (or the marginal cost model) of the cost-performance model used for planning. The cost element tableaus of the four responsibility areas form "slimmed-down" versions of the general type of a cost element tableau described in Fig. 2. The model contains hypothesis and definition equations.

The variable costs (VC) in the cost element tableau of the "woodworking" cost center are determined using the hypothesis equation is

$$\begin{aligned} VC &= PCR \cdot EP \\ 579.000 &= 300 \cdot 1.930 \end{aligned}$$

VC - variable costs, PCR - proportional cost rate, EP - employment.

Since the proportional cost rate (PCR) is to be a basic target this hypothesis equation is also a target commitment function.

Fig. 5: Model tableau system of the furniture model ⁹⁶

The order quantity of 480 machine hours required for processing the sofas results from the hypothesis equation

$$OQ = PCO \cdot SO$$

$$480 = 2 \cdot 240$$

⁹⁶ The model is based on an example from Müller-Merbach, see: Müller-Merbach, H., Einführung in die Betriebswirtschaftslehre, 2nd Ed., München 1976, p. 20f.

OQ - order quantity, PCO - production coefficient, SO - sofas

Since the production coefficient (PCO) should be an uncontrollable basic parameter, this hypothesis equation is an uncontrollable hypothesis equation.

A definition equation, i.e., the second type of a structural equation, is, for example, the equation to determine the total fixed costs of 348,000 € in the fixed-cost collection tableau.

Top Target		Unit	Bottom-Up-Planning	Top-Down-Planning	Confrontation Planning
Operating Result		€	279.500,—	328.000,—	304.753,50
	Basic Target Assembly				
	Proportional Cost Rate Material Cost	€/Mshr.	250,—	245,72	248,—
	Salaries	€	60.000,—	60.000,—	60.000,—
	Basic Target Wood Working				
	Proportional Cost Rate Material Cost	€/Mshr.	300,—	294,86	297,50
	Salaries	€	72.000,—	72.000,—	72.000,—
	Basic Target Upholstery				
	Proportional Cost Rate Material Cost	€/Mshr.	250,—	247,59	249,50
	Salaries	€	72.000,—	69.840,—	70.000,—
	Basic Target Sales				
	Sales Quantity Sofas	Unit	240	243	241
	Sales Quantity Beds	Unit	1.450	1.523	1.490
	Salaries	€	144.000,—	144.000,—	144.000,—
	Decision Parameters				
	Sales Price Sofas	€/Unit	3.000,—	3.000,—	3.000,—
	Sales Price Beds	€/Unit	1.050,—	1.050,—	1.050,—
	Non-controllable basic Parameters				
	Production Coefficient				
	Sofas Assembly	Mshr./Unit	1	1	1
	Beds Assembly	Mshr./Unit	1	1	1
	Sofas Woodworking	Mshr./Unit	2	2	2
	Beds Woodworking	Mshr./Unit	1	1	1
	Sofas Upholstery	Mshr./Unit	3	3	3
	Single Material Cost Rate				
	Sofas	€/Unit	900,—	900,—	900,—
	Beds	€/Unit	150,—	150,—	150,—

Fig. 6: Top target and basic parameter values of the furniture model during the individual planning steps

Based on the two cost element tableaus of the sold finished products (see type 2.3.1.1. in Fig. 1), the marginal costs of the manufactured sofas and beds are determined in Fig. 5. The model tableau system of the furniture model contains still other types of model tableaus, which are not described further. However, they should be largely self-explanatory.⁹⁷ The basic targets, uncontrollable basic parameters, and decision parameters listed in Fig. 6 can be found in the tableaus with their numerical values. The top target "operating result" is determined in the so-called operating result tableau and amounts to € 279,500. The figures from the model tableau system describe the case of a bottom-up planning as the first step in the planning triad.

Fig. 6 shows the results of the assumed process of a planning procedure with this model. The columns correspond to the results of the three planning steps. The lines describe the values of

⁹⁷ For a detailed discussion of this example, see: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 28f., Berlin 2010, www.Inzppla.de/IN37-2008c.pdf, (Text in German, title translated)

the eighteen basic parameters during the three planning steps. The top line shows the value of the operating result as a result of the three planning steps.

Of the seven uncontrollable basic parameters, five are production coefficients, and two describe the assumed uncontrollable direct material costs of the sofas and beds. As mentioned above, their values remain unchanged for all three planning steps. The same applies to the two decision parameters, i.e., the sales prices of the sofas and beds. Only the nine basic targets can be changed in the course of planning. The first column shows the values of the basic parameters of the bottom-up planning.

The bottom-up values of the basic parameters are communicated to the controlling department as "voluntary target commitments" by those responsible for these figures. The values of the basic targets always come from the area managers. They enter these values in the model. The calculation of the model leads to the already mentioned bottom-up value of the operating result of € 279,500. This is the end of the bottom-up planning.

It is assumed, but this is also often the case, that the corporate management does not agree with this value. It is, therefore, assumed that the central planning department will have to determine a planning alternative that will lead to an operating result of no less than € 328,000.

This is the start of the top-down planning, which is carried out solely by a controller. His task is to find values of the basic targets for the four areas, which on the one hand are considered reasonable in relation to the areas, but on the other hand also lead to a value of the operating result, which corresponds to the requirements of the corporate management. In this example, it is assumed that the controller in his function as a "top-down planner" finds numerical values for the basic targets of the four areas that precisely meet the setpoint value of € 328,000 required by the corporate management. This concludes the top-down planning.

Type of basic parameter	Furniture model	Kilger model	Thyssen-Krupp Steel model
cost value	4	282	36.015
proportional cost rate	5	63	3.864
consumption quantity	0	210	137.431
consumption quantity rate	0	420	37.933
procurement price	0	154	5.617
sales quantity	2	37	209
sales price	2	37	209
production coefficient	5	416	9.594
allocation parameter	0	460	1.122
sum	18	2.079	231.994

Fig. 7: Types and number of basic parameters of selected cost-performance models.

This is followed by the third step of the planning triad, i.e., the confrontation planning. Within this process, the controller, as a representative of the corporate management, negotiates with the four areas about the amount of their setpoints basic targets to be finally agreed upon.⁹⁸

⁹⁸ This negotiation can be carried out on the basis of an if-then-calculation tableau. For a description of such a planning tableau, see page 172

It is assumed that the values listed in the column "confrontation planning" represent the plan values of the basic targets that were finally negotiated. The areas have thus committed themselves to achieve these values. The corporate management accepts this then the final planned operating result is only € 304,753.50 and that the originally requested top-down value of € 328,000 could not be achieved.

With the acceptance of the final plan value of the operating result by the corporate management, the annual plan is finished. Fig. 7 shows an overview of the number and type of basic parameters in the furniture model described and the Kilger model, which always served as a reference model mentioned above.

The cost-performance model used by Thyssen-Krupp Steel for the 2008/2009 annual planning shows completely different dimensions in the number of basic parameters. In addition, Fig. 8 also shows the number of equations of the three cost-performance models, whose "peak equation" always forms the definition equation of the operating result.

Name of the cost-performance model	Number of equations
Furniture model	41
Kilger model	19,418
ThyssenKrupp Steel model	2,609,035

Fig. 8: Number of equations and endogenous variables of different cost-performance models described with the INZPLA-System

Fig. 39 on page 145 shows a systematization of the planning procedures of the Integrated Target Commitment Planning. It also shows the types of models that can be used for these planning procedures. This systematization is generated in the form of matrix in which the rows correspond to the planning procedures and the columns correspond to the models to be used. The pure basic Target Commitment Planning is indicated by column 1a and the standard cost-performance model to be used for planning (as in the case of the furniture model) by column 11.

Responsibility-related planning.

The procedure of a pure basic Target Commitment Planning is to be viewed again on the base of Fig. 9 under the aspect of responsibility-relatedness, which is considered essential.

Fig. 9 describes the operating result as a function of all basic parameter of the cost-performance model, i.e., in the form of a reduced top target equation. This is already shown in Fig. 3, but will be extended here.⁹⁹ As already shown in Fig. 3 the operating result as a top target is determined entirely by the numerical values of the three types of the basic parameters of an Integrated Target Commitment Planning. The operating result depends, therefore, only from model parameters, for which someone in a certain type of responsibility is responsible.

⁹⁹ For the concrete structure of such a reduced equation of the operating result in the case of a standard cost-performance model, see: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, Berlin 2007, p. 94f., (301 pages), www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

The demand "*Make people responsible for numbers*" thus undergoes a precisely model-based explication.

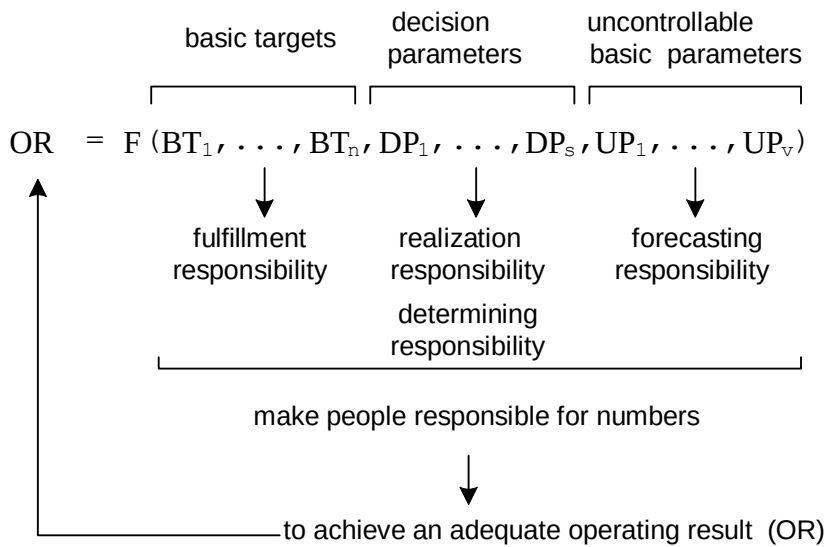


Fig. 9: Relationships between the responsibility model parameters (basic parameters) and the operating result (top target) in the system of the Integrated Target Commitment Planning

In the case of a pure basic Target Commitment Planning with the operating result as the top target, one can additionally ask, "*For which target should people be made responsible?*" The answer is, "*To achieve an adequate operating result*". The final planned value of the operating result desired by the corporate management is thus achieved by trying to make specific persons responsible for the final planned values of certain model parameters in a specific type of responsibility.

During the planning procedure, only the values of the basic targets are changed by negotiation with the responsibility areas, as described. The purpose of this planning procedure is, therefore, to change the basic bottom-up target commitments with a view to "improve" the bottom-up operating result.

Mixed optimization basic Target Commitment Planning.

Mixed optimization basic Target Commitment Planning is a variant of the Integrated Target Commitment Planning. It is not of great practical relevance, because no model parameters can be found in the cost-performance models of a flexible plan cost accounting and also in the SAP-CO models with which you can run an optimization. The following explanations are, therefore, only intended to give those familiar with an optimizing planning a connection from the pure Integrated Target Commitment Planning to a form of the Integrated Target Commitment Planning, which includes also an optimization or an optimizing planning.

So far, we have only discussed standard cost-performance models. They assume that there are only three types of model parameters. These are the basic targets, decision parameters and uncontrollable basic parameters. However, as mentioned (s.p.29) there is another type of basic

parameters and these are the decision variables. Decision variables are characterized by the fact that they can be changed by the corporate management such as manipulated variables in control loops, and that their change does not influence the burden of the area managers. They are parameters that corporate management alone can determine because their change does not influence the burdens of the area manager and those have, therefore, no objections to their change by the corporate management. So what does the corporate management use these values for? To maximize his operating result.

In such a case, the reduced top target equation of the operating result derived from the cost-performance model is.

$$OR = F(BT_1, \dots, BT_n, DP_1, \dots, DP_s, UP_1, \dots, UP_v, DV_1, \dots, DV_u) \quad (9)$$

OR - operating result, BT - basic target, DP - decision parameter, UP - uncontrollable basic parameter, DV- decision variable

In contrast to the reduced top target equation of the operating result in the case of a pure Integrated Target Commitment Planning (see Fig. 3), it also contains the decision variables DV_1 to DV_u , which are used to maximize the operating result. Their determination is carried out entirely in the sense of the classical (deterministic) decision theory. This is because the corporate management as decision maker maximizes his utility, i.e., the operating result, with these decision variables (or control variables). As mentioned the area managers will not object to the change of these decision variables because such a change will (by definition) not affect the burden of their areas. They have nothing to do with optimization, so to speak.

However, what role does the negotiation process of the basic targets play in this case, which was previously described as a planning step of a pure Integrated Target Commitment Planning? Even if decision variables are present, a planning triad is still practiced and various planning alternatives of the operating result under discussion are calculated by using the reduced top target equation (9).¹⁰⁰

In the case of a "calculation" of a planning alternative, however, the values of the decision variables must also be determined and, as already mentioned, these are used to maximize the operating result (OR). This maximization is always carried out if at least one value of the basic targets BT_1 to BT_n was changed compared to the planning alternative determined before in order to determine the effect of a new planning alternative on the operating result. This new value combination of the basic targets is used in (9), and then the values of the decision variables in (9) are determined, which maximize the operating result.

At the end of the confrontation planning, when the final values of all basic targets have been negotiated with the areas, the basic target vector with the (Final Plan) values $BT_1^{FP}, \dots, BT_n^{FP}$ is obtained. With these values used in (9), the corporate management then maximizes the operating result for the last time using the decision variables DV_1 to DV_u . The area managers are

¹⁰⁰ In this context it is assumed that, which in principle is always possible, that the reduced equation of the operating result has been determined.

not informed about this maximization. This is what the controller does "in his office". Probably no controller has yet performed such an optimization. On the one hand, as mentioned above, the SAP-CO system does not allow such an optimization and, on the other hand (as I claim), no practice-relevant cost-performance models can be found that have model parameters which can be used as decision variables in the way described here.

In the text "*The Integrated Target Commitment Planning and Control - a process of a comprehensive company planning and control*", the previously described furniture model is modified in such a way that a mixed optimization basic Target Commitment Planning can be carried out with it.¹⁰¹ In view of the low practical relevance, this detailed example is not given in this text.

The following text describes the mixed optimization basic Target Commitment Planning using two examples. The first example is a mixed optimization basic Target Commitment Planning, in which the operating result is not the top target, but the "return on equity" and the "liquid fund" are selected as top targets of a comprehensive company planning model. In this example (s.p.68), the return on equity is maximized under the restriction that a certain amount of liquid fund is not undershot.

The planning procedure, even if it is not carried out using a cost-performance model, remains unchanged. By defining the basic target values for the responsibility areas, the target function for maximizing the return on equity and the reduced liquidity equation for maintaining a level of liquidity that should not be undercut are determined in such a way that maximisation can be carried out as the second final step in determining the intended planning alternative.

The second example is a "mini-model", with the operating result as the top target, which consists of only three equations with four basic targets of a single responsibility area and one decision variable (s.p.377). This example is actually used to discuss the relationship between the Integrated Target Commitment Planning and the microeconomic pricing theory, but it also proves to be a mixed optimization basic Target Commitment Planning.

As already mentioned, Fig. 39 on page 145 compares the possible planning procedures of an Integrated Target Commitment Planning with the models with which such a planning can be carried out. The mixed optimization basic Target Commitment Planning is described by the intersection of line 2b and column 12.

Pure area Target Commitment Planning. After the *pure basic Target Commitment Planning* and the *mixed optimization basic Target Commitment Planning*, I developed another planning procedure, which was described as pure area Target Commitment Planning. (See 1.1.1.1 in Fig. 38 on page 144 and the intersection point of lines 1a and column 11 in Fig. 39 on page 145). The "*pure area Target Commitment Planning*" works with the same model tableau system as the "*pure basic Target Commitment Planning*", that is, the standard model tableaux listed in Fig. 1.

¹⁰¹ Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 43f., Berlin 2010, www.Inzpla.de/IN37-2008c.pdf, (Text in German, title translated)

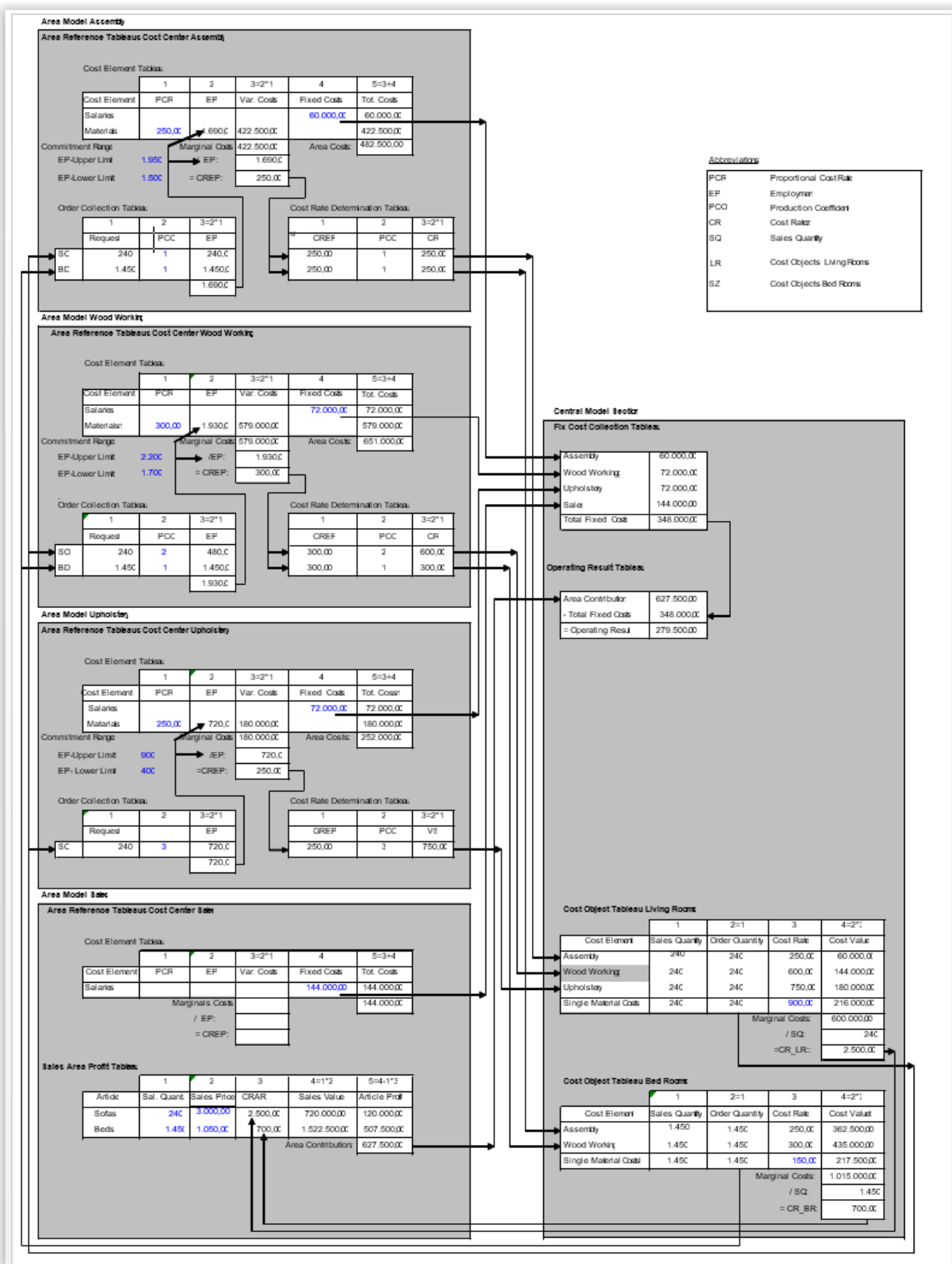


Fig. 10: Central model of a pure area Target Commitment Planning

The standard cost-performance model used as for a pure basic Target Commitment Planning is therefore also used for a pure area Target Commitment Planning. It is used in the planning

procedure by the central planning department as its central model.¹⁰² In addition to this central model, each area also has its own area model. The area models are partial models of the central model. During the planning process, a coordination takes place between the area models and the central model, which can also be described as a coordination between the areas and the central planning department based on their models.

If the central model contains decision variables in addition to the basic targets, then the case of a *mixed optimization area Target Commitment Planning* (1.1.1.2 in Fig. 38 on page 144 and the intersection of line 2a and column 11 in Fig. 39 on page 145) exists.

However, only the “*pure area Target Commitment Planning*” is of practical relevance, because cost-performance models, as has been claimed several times, almost never possess decision variables, which are necessary to carry out an optimization. But also the relevance of a “*pure area Target Commitment Planning*” is low compared to the “*pure basic Target Commitment Planning*” if one chooses its practical application as a criterion. In my view, however, it is preferable to a “*pure basic Target Commitment Planning*”. The “*pure area Target Commitment Planning*” has the advantage over the “*pure basic Target Commitment Planning*” in offering the areas more possibilities to fulfill their targets through suitable actions.

A further advantage of the “*pure area Target Commitment Planning*” is that “the target fulfillment” of an area can only be assessed based on one variable, namely the setpoint-actual variance of its area target. However, this only applies to pure cost centers, that is, cost centers without sales quantity responsibility. The criterion of its target fulfillment is solely the setpoint-actual variance of its area target.

By contrast, cost centers with a sales quantity responsibility, i.e., sales areas, are assessed with regard to their target fulfillment based on the setpoint-actual variance from two area targets.¹⁰³ These area targets are the area contribution margin and the area costs.

The control following a pure basic Target Commitment Planning, on the other hand, requires that the setpoint-actual control is to be carried out for each basic target. Some areas in the form of pure cost centers have a few dozen basic targets and sales areas often have to take the sales quantity responsibility for hundreds of articles. It is, therefore, still advantageous for a sales area manager to be assessed on the basis of the setpoint-actual variance of only two area targets.

The pure area Target Commitment Planning can be differentiated according to whether it is a single-level or multi-level area Target Commitment Planning.¹⁰⁴

The single-level area Target Commitment Planning is characterized by the fact that only the responsibility areas at the lowest level in the management hierarchy are held responsible for compliance with specific area targets.

¹⁰² It is slightly modified by introducing an additional column in the cost element tableaux to define the area costs.

¹⁰³ For an explanation of why two area targets instead of one area target are required for sales areas, see page 90.

¹⁰⁴ In the following, the attribute “pure” is omitted for a “*pure area Target Commitment Planning*” in order to reduce the terminology somewhat. However, it should be clear that the area Target Commitment Planning to be discussed is always a “pure” commitment planning, i.e., neither the central model nor its corresponding area models contain decision variables.

In multi-level area Target Commitment Planning, managers located in the management hierarchy above the executives at the lowest level (the primary responsibility areas) are also held responsible of the setpoint-actual variance for certain area targets. As in the case of the primary (executive) areas, these secondary responsibility areas are held responsible, depending on the circumstances, for the achievement of up to two area targets. In extreme cases, such a responsibility assignment to the positions in a management hierarchy is carried out up to the top of the company.

In the following, the single-level area Target Commitment Planning is described based on an example. Then the multi-level area Target Commitment Planning is discussed.

As in the case of the pure basic Target Commitment Planning, the area Target Commitment Planning is always followed by a control. However, the control procedure applied here is not discussed directly after the description of the two planning procedures. As in the case of the pure basic Target Commitment Planning, the treatment of the setpoint-actual control, which consists of whether the target commitments agreed as a result of the planning were met, takes place in a separate chapter (Chapter 8, p. 76). There, the control procedures of the basic and area Target Commitment Planning are described in a summary. Furthermore, the control procedures of an area Target Commitment Planning are systematized as elements of a comprehensive system of a normative and explorative variance analysis.

Single-level area Target Commitment Planning

The procedure of a single-level area Target Commitment Planning will be described using the example of the furniture model, which was already used in the discussion of the pure basic Target Commitment Planning. The cost element tableaus for the four responsibility areas of the furniture model described so far do not include the area costs. However, they are required as area targets for the four responsibility areas. In contrast to the original furniture model, the area costs (by adding column 5 to the cost element tableaus) are, therefore, included in the four area models.

Fig. 10 shows the slightly modified furniture model, which now serves as the central model for a single-level area Target Commitment Planning. The central model is divided into the area models of the four areas and a "central model section". It contains the structural equations that do not occur in the area models.

In the area profit tableaus of a pure basic Target Commitment Planning, the area contribution margin was already included as a model variable in the original furniture model (see Fig. 5). As already mentioned, it now serves as the second area target of the sales area.

The procedure of a pure area Target Commitment Planning is somewhat more complicated than the execution of a pure basic Target Commitment Planning.¹⁰⁵

Each area has its own area model with which it can plan its own area targets. However, this planning is coordinated with the central planning department.

¹⁰⁵ A detailed description of the area Target Commitment Planning and control can be found in: Zwicker, E., *Area Target Commitment Planning and Control of primary and secondary Areas of Responsibility in the System of the Integrated Target Commitment Planning*, Berlin 2000, www.Inzpla.de/IN09-2000d.pdf. (Text in German, title translated).

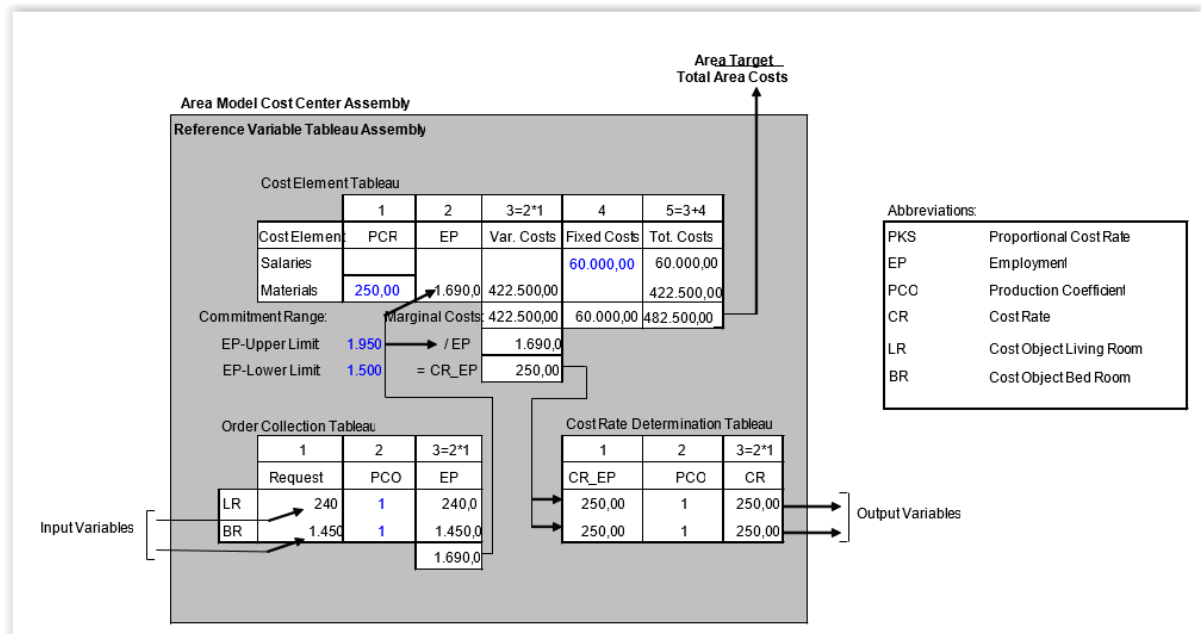


Fig. 11: Area model of the area "Assembly" within the scope of a pure area Target Commitment Planning

Procedure of the single-level area Target Commitment Planning

Like the basic area Target Commitment Planning, the area Target Commitment Planning is carried out in the form of a planning triad, whose steps (as in the basic target case) are referred to as bottom-up, top-down and confrontation planning. Within the scope of this planning, the area model and the central model are coordinated with each other. The area models are used by the responsibility areas to calculate planning alternatives in question with different values for their basic targets. The central planning, on the other hand, carries out its alternative planning calculations using its central model.

Bottom-up planning. To carry out the bottom-up planning, all areas (here assembly, wood-working, upholstery, and the sales department) inform the central planning department of their bottom-up target commitments. Furthermore, the persons responsible for determining the other basic parameters communicate their values to the central planning. In this way, the corporate management supplies the values it has set for both sales prices and the work preparation department communicates the values of the five production coefficients. These parameter values are also entered by the INZPLA-system into the area models in which they are required. For example, the values of the sales prices, which originate from the corporate management, are entered as decision parameters of the sales area in its area model.

After the specification of all bottom-up basic parameters, the bottom-up value of the operating result is calculated using the central model.

However, it is not always possible for all areas to calculate the bottom-up values of the area targets simultaneously using their area model. This is the case if the areas have model parameters that are endogenous variables in the central model.

In the example of the furniture model, for example, the area model of the sales area requires the bottom-up value of the two variable unit costs for a sofa and bed to calculate the bottom-up area contribution margin. Since they are endogenous variables of the central model, they

are only available once bottom-up planning has been carried out with the central model. All areas, therefore, communicate to the central planning the bottom-up values they have defined for the basic parameters of their area model. When the central planning has all the basic parameters of its central model together, a bottom-up calculation of its central model can be realized.

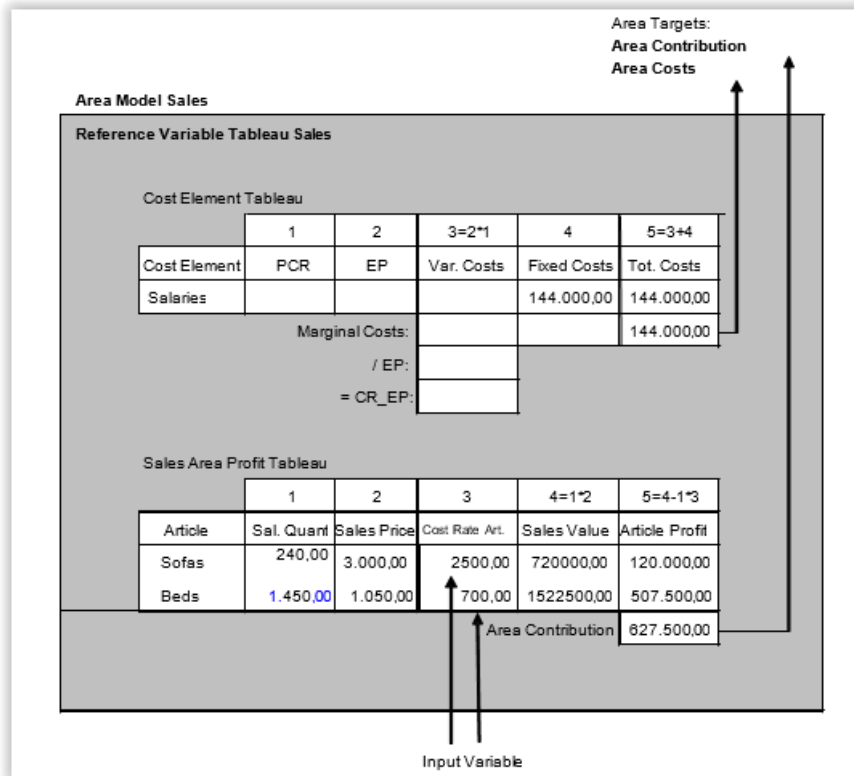


Fig. 12: Area model of the area "sales" within the scope of an area Target Commitment Planning

In the case of the furniture model, it also leads to the bottom-up values of the variable unit costs for sofas $VUC_{SO}^{BU} = 2,500 \text{ €/unit}$ and for beds $VUC_{BD}^{BU} = 700 \text{ €/unit}$. These values are forwarded by the INZPLA-system as parameters to the sales area model. As the sales area now has the bottom-up values of all basic parameters of its area model, this enables it to calculate the bottom-up value of its area contribution margin of € 627,500, which is already shown in Fig. 12.

In realistic cases, all area models have transfer prices that are invoiced by other cost centers for a particular activity and represent model parameters of these area models. The same applies to order quantities received from other cost centers. These transfer prices and order quantities are always endogenous variables of the central model.¹⁰⁶ Therefore, in realistic cases, almost all area models must be supplied with these endogenous bottom-up values by the central planning department after the bottom-up calculation of their central model. Only then

¹⁰⁶ These are the already mentioned order quantity-price relationships between cost centers (see page 24). For a detailed description of such order quantity-price relationships, see: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 34f., www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated)

they can use their area models to perform a bottom-up calculation to determine their bottom-up area targets.

Top-down planning. As is often the case with the pure basic Target Commitment Planning, the central planning should not agree with the bottom-up value of the operating result of € 279,500. Therefore, it is assumed that the central planning decides to carry out a top-down planning with the central model as in the case of a pure basic Target Commitment Planning. It leads to the top-down values of the basic targets and to the top-down values of the order quantities and transfer prices that are required as parameter values in the area models to calculate their top-down area targets.

When the central planning has completed its top-down planning, the calculated values of the top-down basic targets and the top-down values of the order quantities and transfer prices are transmitted to the area models that they require to calculate the top-down value of their area targets.

Confrontation planning. The area models of the top-down planning and the corresponding central model form the starting point of the confrontation planning. In this planning step, the final values of the basic targets are negotiated between the areas and the central planning, as in the case of a pure basic Target Commitment Planning. Each change of a basic target under discussion is entered simultaneously into the area model and the central model.

The area identifies the change in its area targets based on its area model, while the central planning identifies the impact of the change in question on the operating result.

Since the negotiations sometimes run over several months and are sometimes conducted simultaneously with other areas, the area models are permanently kept "up to date" through the central planning. This is achieved by ensuring that every change of the final order quantities and transfer prices, which concern an area model, are entered immediately by the central planning into the area model and lead there to a new calculation of the model.

For example, a cost center manager is continuously informed if the quantity of a service ordered from him by another cost center has changed "according to the latest status".¹⁰⁷ When the confrontation planning is finished, the pure cost areas calculate their setpoint area costs, while the sales areas calculate the setpoint values of their two area targets, that is, the area contribution margin and the area costs.

These final plan values serve as the basis for determining the setpoint area targets, which are necessary for the setpoint-actual control to be carried out at the end of the year. Based on these targets it is assessed whether an area has met its area commitments. The procedure to be followed here for calculating the setpoint area targets and actual area targets for the control procedure will be described as part of the control procedure for the Integrated Target Commitment Planning (s.p.82), which is yet to be discussed.

However, one point should already be mentioned. The constant import of the current values of the order quantities and transfer prices of the supplying and supplied cost areas from the cen-

¹⁰⁷ You can also convert the price and order quantity receipts to the current planning status at the end of the planning triad, that is, after all the target commitments have been concluded with the areas.

tral model results in new plan values of the area targets of an area in question. However, changing these plan values of the area targets is not important for the area, because its burden, which is connected with the realization of the area target, does not change when the plan values of the area targets are recalculated. This is because the actual comparison value of the area target is defined (s.p.84) such that a variance is only caused by the setpoint-actual variance of the basic targets of the area. Therefore, all other variances (and these are exactly the changing order quantities and transfer prices) between the planned and actual area targets which are not caused by the areas must therefore be "excluded." It should also be noted (p.90) that not all combinations of actual basic targets that lead to the actual area costs with which the setpoint area costs can be met or undercut are permitted as acceptable alternatives.

Multi-level area Target Commitment Planning

As already mentioned the area Target Commitment Planning can be used to make all managers of the management hierarchy in a company responsible for the setpoint-actual variance of one or two area targets.

The multi-level area Target Commitment Planning follows the same planning steps as the single-level area Target Commitment Planning described above, that is, in the form of the planning triad. The single-level area Target Commitment Planning, therefore, also takes place here. If you then terminate planning procedure, you have carried out a single-level area Target Commitment Planning. After completion of this process, however, it may be decided that certain superordinate areas of the primary responsibility areas should be made "responsible" for meeting certain setpoint area targets. They should be called secondary responsibility areas. These setpoint values are calculated based on the results of the single-level area Target Commitment Planning and provided to the manager of the secondary responsibility areas. When this decision is made, certain steps follow that lead to multi-level area Target Commitment Planning (and control).

After the end of the planning period, not only a setpoint-actual control of the target achievement for the primary responsibility areas is carried out based on the setpoint-actual variances of their area targets. In extreme cases, each head (of a secondary responsibility area) in the management hierarchy is assessed on the basis of the setpoint-actual variance of his area target or his two area targets. A secondary responsibility area has the area costs as its only area target if all primary responsibility areas that are subordinated to it have only costs but no sales responsibility.

If, on the other hand, primary responsibility areas that are responsible for sales quantities are subordinate to a secondary responsibility area, then this area has two area targets, as in the case of primary sales areas; the "area costs" and the "area contribution margin".

The question is how the setpoint and actual area targets of the heads of these secondary responsibility areas are to be defined in the management hierarchy. The reason for this is that these definitions must make it possible to hold these heads responsible for a variance between their setpoint values and the actual values of their area targets. First, however, the area contribution margins and the area costs of a secondary responsibility area must be defined. The

question of how the setpoint and the actual values required for the control of the secondary responsibility areas are to be defined is discussed later (s.p.80).

Definition of the area targets of the secondary responsibility areas.

The definition equations of the area targets of a secondary responsibility area are to be inserted into the area model of the area in question, which results from the combination and linking of the area models of the primary responsibility areas subordinate to it.

The area contribution margin of a secondary responsibility area is the sum of the area contribution margins of its subordinate primary sales areas.

The area costs of a secondary responsibility area correspond to the sum of all external delivery costs of the secondary responsibility area in question. These external delivery costs include all costs allocated to the cost element tableaus of the areas (cost centers) that are not subordinate (primary responsibility areas) to the secondary responsibility area in question. These are named as external areas (external cost centers). The external delivery costs also include the costs allocated to the cost object tableaus, which are assigned to the external areas (external cost centers). Finally, the external delivery costs also include the costs that the area model of the secondary responsibility area allocates directly to the fixed cost collection tableau if a cost-performance model in the form of a marginal cost version is used.¹⁰⁸

The sum of all external delivery costs, i.e., the area costs of the secondary responsibility area can be determined using the secondary responsibility area model in question. As mentioned above, the configuration system of the Integrated Target Commitment Planning develops such an area model (including its representation in the form of model tableaus) for each primary and secondary responsibility area.

In order to determine the external delivery costs of a secondary responsibility area, it is best to assume the fiction that all the primary cost centers (primary responsibility areas) subordinate to the manager of the secondary responsibility area in question have been merged into one unit under the responsibility of this manager. The "former" autonomous primary cost centers (primary responsibility areas) thus serve as reference variable units for this newly created cost center.

For a further consideration, it makes sense to present the area costs of a secondary responsibility area (its external delivery costs) in the form of its reduced equation, i.e., the costs of the secondary responsibility area as a function of the basic parameters of its area model.¹⁰⁹

This reduced definition equation of the area costs of the secondary responsibility area contain two types of components. On the one hand, pure cost values CW_1 to CW_n , such as an amount of travel expenses. The second type of cost components (CC) are so-called cost chains of the form

$$CC = OQ \cdot M_1 \cdot M_2 \cdot \dots \cdot M_n \cdot PP$$

CC - cost component, M_i - quantity multipliers, OQ - Order quantity of an external area (ex-

¹⁰⁸ All costs incurred finally "arrive" in the cost center tableaus of the finished products if there are no final or intermediate inventories. In the following, it is assumed that there are no inventories in the primary areas. Otherwise, the costs of inventory inflows and outflows must also be taken into account.

¹⁰⁹ For the definition of a reduced equation, see page 37.

ternal cost center) or an external supplier, PP - procurement price of an external area (cost center) or an external supplier.

Such chains can already occur in a single-reference variable cost center. However, such a cost chain can only contain at maximum two quantity multipliers. The costs are as follows

$$CO = OQ \cdot CQR \cdot PCO \cdot PP$$

CQR- Consumption quantity rate, PCO - Production coefficient

Secondary cost centers are always multiple-reference variable cost center. If, in a multiple-reference variable cost center, the reference variable units deliver intermediate products to each other within the framework of multilevel production, then such cost chains of the above form with more than two multipliers occur in the reduced equation of its external delivery costs. If a company has a multi-stage production then the head of the total production has such cost chains in the reduced equation of his secondary responsibility area model.

In specific cases, thousands of such cost chains occur, which form additive components of the reduced definition equation of the external delivery costs of an intermediate product or more generally of a delivered performance (s.p.98).

This description of the defining components of the area costs of secondary responsibility area centers (in the management hierarchy) is necessary to clarify how the setpoint and actual area costs of these secondary responsibility areas should be defined. They are characterized by the fact that their secondary responsibility area managers (in the management hierarchy) can be held responsible for the setpoint-actual variance of their area targets. However, as already mentioned at the beginning, the considerations regarding the definition of setpoint and actual area costs and the further design of the control procedure will first be discussed when the entire complex of control and variance analysis is dealt with in a separate chapter (Chapter 8, p.76) within the framework of the Integrated Target Commitment Planning.

Eliasson formulated in his study a desirable feature of the *"number game called planning"* by pointing out: The goal of a *"comprehensive plan is such that people at various places in the corporate hierarchy can be made responsible for numbers"* (p.220). With the help of the described multi-level area Target Commitment Planning, every leader in the corporate hierarchy can be made responsible for one setpoint-actual variance or two setpoint-actual variances.

Old wine in new bottles?

Thus, the pure basic Target Commitment Planning and the pure area Target Commitment Planning (without their control procedure) have been discussed. Together, these two planning procedures form the pure Integrated Target Commitment Planning, that is, a planning with basic targets but without decision variables. For cost-performance models, this type of planning is marked in Fig. 38 on page 144 by 1.1.1.1 and 1.1.2.1 and in Fig. 39 on page 143 by the intersection of lines 1a and 1b with column 11.

If one looks back at the description of the pure Integrated Target Commitment Planning, i.e., the pure basic and the pure area Target Commitment Planning, then the question arises, is such a procedure of planning by target commitment (in a more or less clear form) not already developed by Kilger? After all, the target cost functions he uses form an important element of

his flexible plan cost accounting, and adherence to their setpoint values depending on the actual employment is no doubt a type of a target commitment planning.

The following is to be said: Kilger introduces target cost functions, but he does not comment on the procedure for achieving such a target cost function.¹¹⁰ Kilger does not take up the idea that an area commits itself to such a function within the framework of a planning procedure. His target cost functions are used solely to check whether a cost center manager has kept the target value of this cost element for which a target cost function has been formulated. Kilger's goal is, therefore, to control the cost centers with regard to their factor consumption by using a setpoint-actual variance analysis with the planning of target cost functions.¹¹¹ The idea that a cost-performance model can also be used as a tool with which management "pushes through" its targets downwards is of no concern to Kilger.

Therefore, the tableau system of his model does not contain the definition of the operating result. In the marginal cost version of its tableau system (or its marginal cost model), the unit margins of the articles and the fixed costs form the "peak variables" of the model. In the full cost version (or the full cost model), the same applies to the full cost rates of the sold finished products (or articles).

Using these variables to define the operating result by an additional equation and to quote it in another tableau of his example would have been a trifle for Kilger, but he refrains from doing so. The operating result of a bottom-up-, top-down-, and confrontation planning is of no importance to him. Kilger, therefore, makes no distinction between single planning steps; he does not use the terms bottom-up, top-down and confrontation planning. He only talks about the fact that "a plan" is being made with his model.

The Kilger model reconstructed as an equation model can be used to carry out a sales quantity-driven planning. Without this possibility, as already mentioned, an Integrated Target Commitment Planning with its alternative calculations could not be realized. Kilger has not recognized the possibility inherent in his system. This shows the following statement from him. *"In the USA... a different procedure has been established for the determination of planned reference variables, and that is the so-called sales planning. The planned reference variables are derived directly from the planned sales quantities. The annual sales quantities are increased by scrap surcharges and converted to average monthly quantities. This procedure requires that the workflow planning determines which cost centers they use and how large the reference variables per product unit are."*¹¹²

¹¹⁰ See: Zwicker, E., *Classic Cost and Performance Accounting in the Light of the Integrated Target Commitment Planning*, op. cit., p.25, www.Inzpla.de/IN15-2002a.pdf. (Text in German, title translated). In this article, the texts of relevant authors are analyzed to see how they define a target cost function and classify it as elements of a planning procedure.

¹¹¹ See: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, Berlin 2007, p. 67, www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

¹¹² Kilger, W. *Einführung in die Kostenrechnung*, 3. Ed, Wiesbaden 1987, p. 201.

7. Refining and expanding the planning methods

After the model tableau system had been developed and the basic planning procedures for the three planning steps, i.e., bottom-up, top-down and confrontation planning had been established, the system was further refined and expanded. This process took many years.

Bottom-up planning of the second step.

The original single-step bottom-up planning was extended by a bottom-up planning of the second step. The bottom-up planning of the second step is only necessary if the bottom-up planning of the first step shows that the bottom-up values of the plan employment occurring in the production areas lie outside the commitment ranges of their employment.

In connection with the description of this bottom-up planning of the second step, I was able to show that the planning procedure of a linear production program planning described in every textbook of general business administration only receives an adequate planning logical classification, namely as a sub step of the cost and performance planning of a company, if it is integrated in the planning system of an Integrated Target Commitment Planning in the described manner.¹¹³ The marginal costs, the fixed total costs and the production coefficients of the finished products, which are used as unchanged parameters during the bottom-up planning of the second step (or linear production program planning), prove to be endogenous variables in the light of the planning procedure with a cost-performance model, which depend on a large number of basic targets. However, these basic targets are varied during the three planning steps as described.

From this point of view, a linear program planning as a second step of a bottom-up planning is only necessary if the previously performed bottom-up planning of the first step leads to non-compliance with the commitment areas of the production areas. The classic linear production program planning, on the other hand, is not embedded in a comprehensive planning procedure. It should simply be carried out without further specification.

A linear production program planning, as a possible second step of a bottom-up planning, must also be reevaluated with regard to its planning logical status. It is highlighted in the literature as a classic example of the application of the decision theory.¹¹⁴ From the point of view of the Integrated Target Commitment Planning, however, it is not. Rather, it proves to be a particular planning procedure of the Integrated Target Commitment Planning.

In the deterministic decision theory, all alternatives, i.e., permissible actions, are elements of a decision field. Each permissible alternative describes an action that can be completely realized by the decision maker without a burden. They are, therefore, completely controlled by the decision maker. In the light of the Integrated Target Commitment Planning, these actions are quantitative decision variables. The application of the deterministic decision theory in a model of the Integrated Target Commitment Planning is realized by carrying out an optimizing planning with these decision variables.

¹¹³ See in detail: Zwicker, E., *Linear Production Program Planning and its Relationship to the Bottom-up Planning of the Integrated Target Commitment Planning*, Berlin 2006, www.Inzpla.de/IN32-2006a.pdf. (Text in German, title translated).

¹¹⁴ See: Ewert, R., Wagenhofer, A., *Interne Unternehmensrechnung*, 7. Ed., Berlin 2008, p. 82f.

However, the alternatives in a linear production program planning and second step bottom-up planning are different combinations of sales quantities that cannot be completely controlled and, therefore, cannot be realized directly without burden. Consequently, they are no decision variables. They describe alternative sales quantity target commitments of the sales areas from which central controlling selects this alternative that maximizes the operating result while maintaining the employment constraints. The sales manager does not object to this selection because all combinations of sales quantities in question lead to a lower burden level compared with the burden of his original bottom-up sales quantity commitment. This reconstruction of the linear production program planning proves to be the optimization process of a new normative theory, namely the Integrated Target Commitment Planning and not the (valid, but here not applicable) normative theory namely the deterministic decision theory. If one accepts the Integrated Target Commitment Planning as a planning procedure, then some old views are to be abandoned.

The assertion that the optimization procedure of a linear production program planning cannot be subsumed under the decision theory, but represents a planning procedure that can only be applied in an appropriate manner, as a bottom-up planning of the second step of the normative planning theory named Integrated Target Commitment Planning is likely to meet with contradiction.

On the one hand, the acceptance of this assertion increases the validity claim of the Integrated Target Commitment Planning, because it shows that the classic example of linear optimization in companies can only be appropriately integrated into the operational planning of a company through the Integrated Target Commitment Planning. On the other hand, the acceptance of the assertion would invalidate the paradigm that any planning using an optimization is always an application of the decision theory.

For this reason, I spoke to Günter Bamberg, one of the leading representatives of the decision theory in Germany, to present my arguments to him.

He agreed with me that the decision theory is based on a decision maker who has decision alternatives that he (in contrast to the basic targets) can realize directly without any burden or whose direct realization he can initiate. He also agreed with my assessment that "sales quantities" are not quantities whose values a decision maker can directly realize. He also agreed with my conclusion that the optimization of a model of the linear production program planning, whose optimization parameters are sales quantities, is a planning procedure not covered by the decision theory.

However, one question that arises here is, if a linear production program planning is to be performed, must the sales quantities be the action variable for an optimization? Could not instead the production quantities be selected as optimizing action variables? After all, these can be realized directly by a decision maker who determines how much is to be produced. There is no doubt that the amount of production quantities is directly realizable.

However, it should be remembered that in sales-quantity-driven company planning models, the value to be selected for production quantities must be determined by a decision rule. If there exists no final inventory, this decision rule reads as follows

Production quantity = sales quantity.

(10)

If there exists a final inventory, the decision rule applies

Production quantity = -initial inventory level + sales quantity + setpoint value of final inventory level.

The setpoint value of the final inventory is a decision parameter whose value is determined before the bottom-up planning begins. The value of the initial inventory is an actual value that is known. The decision rule used in a linear production program planning in the case of a final inventory, therefore, has the form¹¹⁵

$$\text{Production quantity} = \text{"numerical value"} + \text{sales quantity.} \quad (11)$$

In both cases, therefore, the production quantities can be realized by following the two decision rules (10) and (11) which are linked to the sales quantities by these constant relationships so that the sales quantities form the parameters of the optimization.

However, in contrast to the production quantities considered in isolation, the sales quantities can no longer be realized directly by a decision maker. Rather, they only find an appropriate integration in the frame of the Integrated Target Commitment Planning if they function as target commitment alternatives for a sales area in the second planning step of the bottom-up planning. These target commitment alternatives, which form the alternatives of the optimization procedure, are alternatives of an optimization procedure of the Integrated Target Commitment Planning and not of the decision theory.

Top-down planning. Furthermore, a procedure was developed to systematically carry out a top-down planning, which is performed by the central planning. This top-down planning turns out to be a so-called 1: n target value analysis with a top target (the operating result) and n basic targets.¹¹⁶ It is often very difficult for a controller to find basic target values for a given value of the top target, which can be presented to the area managers as acceptable values to be realized. The procedure developed, known as GBM top-down planning, is intended to support a controller in carrying out the top-down planning.¹¹⁷

One- and two-step comprehensive company planning. As mentioned (s.p.9), my study of the construction of planning models began with the analysis of Company Result and Financial planning models (CRFI models) discussed in the literature. However, as described above, I soon gave up this activity and turned to the development of cost-performance models. The reason for this decision was that I had no idea what level of aggregation a comprehensive company model should have in order to be able to make a "meaningful" planning with it. After developing the model tableau system for plan cost-performance models, however, the level of aggregation to be selected and the model structure were clear to me.

I came to the conclusion that it makes sense to divide a comprehensive company model into two sub-models, namely a cost-performance model and a CRFI model. The CRFI model

¹¹⁵ The "numerical value" results from the difference between the numerical values "setpoint value of final inventory level" - "initial inventory".

¹¹⁶ For the procedure of a target value analysis, see: Zwicker, E., *Target Value Analyses as a Method of operational Company Planning*, Berlin 2001, (16 pages) www.Inzpla.de/IN12-2001b.pdf. (Text in German, title translated)

¹¹⁷ It is discussed in more detail on page 486. For a still more detailed description, see: Zwicker, E., *GBM Top-Down Planning, an algorithmic Procedure for Top-Down Planning in the System of the Integrated Target Commitment Planning*, Berlin 2000, www.Inzpla.de/IN07-2000b.pdf. (Text in German, title translated)

should contain the explanatory equations of the variables for calculating its top targets, which are not already used in the cost-performance model (for calculating the operating result). All variables that the CRFI model needs to calculate its top targets, and which have already been calculated in the cost-performance model, are transferred from this to the CRFI model. This created a clear demarcation of a company result and financial planning model (CRFI planning model) "downwards". A CRFI model of an Integrated Target Commitment Planning is now always defined in this way. Until then each model has been called a CRFI model (actual or plan model), which described an ex-ante or ex-post account closing and thus allows the generation of a plan balance sheet, a finance plan, and a plan profit and loss account. This definition was abandoned from then on.

Fig. 13 shows the relationships between a cost-performance model and a CRFI model. On the far right, a plan cost-performance model is presented as the central model of controlling. However, a comprehensive company planning cannot be carried out with this model.

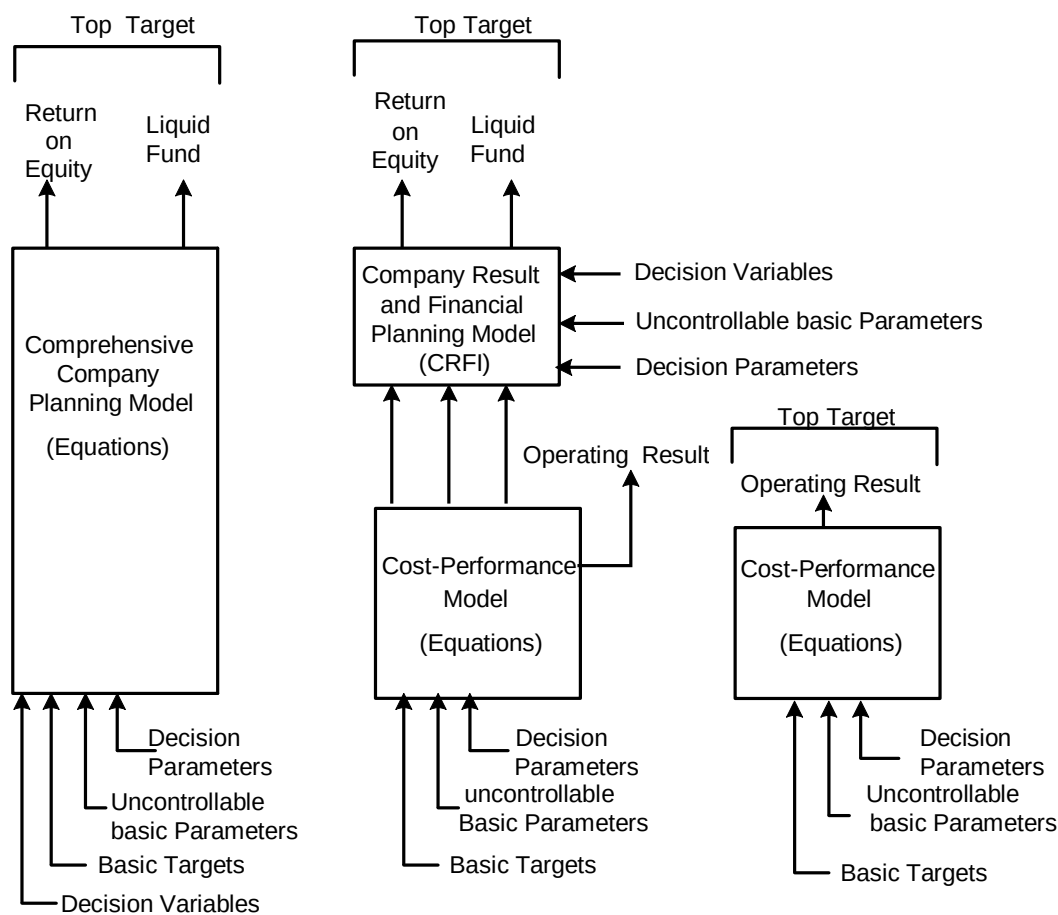


Fig. 13: Model types of the Integrated Target Commitment Planning

In the middle of Fig. 13 a comprehensive company model is shown which is divided in two submodels. These are the cost-performance model and the CRFI model. The cost-performance model transfers certain plan values to the CRFI model, which describes a plan account closing that leads to a plan balance sheet, plan P&L and a financial plan. The variables in these plans are then used to define certain top targets for profit planning (such as return on equity in the example) and financial planning (such as "liquid fund" in the example).

If one asks oneself the question, how in case of a comprehensive company planning a planning should be realized, it seems obvious to calculate the equations of the whole model once up to the top targets. Such a model is shown on the left side of Fig. 13. It contains the cost-performance model and the CRFI model as sub-models. I started from the view that such a model should be used for determining a planning alternative when I initially asked myself how a comprehensive company planning could be realized with a model.

In view of the ability to divide a comprehensive company model into a cost-performance model and a CRFI model, the question arises whether it is not feasible to carry out planning in two steps.¹¹⁸ In the first step, the operating result is planned using the cost-performance model, and in a second step, the CRFI model, which leads to the planning of the top targets "return on equity" and "liquid fund". The plan values, which the CRFI model requires and which were already planned with the cost-performance model during the first planning step, are, therefore, transferred to the CRFI model as fixed values when planning the second step.

On the one hand, this procedure is appropriate because it is very often done in practice. Most companies plan their operating results with SAP's CO module. However, the SAP system does not have a configuration system for creating a CRFI model and planning its top targets. Therefore, it is not possible to carry out a two-step or one-step comprehensive company planning with the SAP System.

For this reason, the values planned using the operating result planning of the SAP-CO system are transferred to a non-SAP planning system, which is then used to plan these top targets. In many cases, the CRFI model is formulated using Excel. However, this two-step approach also makes sense in the light of the Integrated Target Commitment Planning.

In the case of a standard cost model, the structure and semantics of this model type lead to the fact that although its variables affect the CRFI model, but no variable of the CRFI model affects a variable of a standard cost model. This one-way connection of the two models suggests a two-step approach since the structural relationships do not require a cyclical calculation of the two submodels to determine their plan values.

Another structural characteristic of both models is just as important to justify a two-step planning. If a standard cost-performance model is used to plan the first step, the CRFI model is no longer planned in the second step by changing the values of the basic targets. The planning of the basic targets and thus their numerical determination takes place exclusively in the course of the first planning step. Only the effects of this planning are taken into account by transferring certain values to the CRFI model (such as the total personnel costs).

A standard cost-performance model does not contain any decision variables as basic parameters. It is, therefore, used for a pure Integrated Target Commitment Planning.

In the CRFI model, on the other hand, the "target-oriented influencing of the model parameters" that characterizes a planning process takes place exclusively through the choice of certain values of decision variables.¹¹⁹

¹¹⁸ In the general overview of planning procedures in Fig. 38 on p 144 a one-step comprehensive company planning is systematized under 2.2.1 and a two-step comprehensive company planning under 2.2.2. In Fig. 39 on page 145, a one-step comprehensive company planning is characterized by 2.1.1 and a two-step planning by 2.1.2.

¹¹⁹ In the example of a comprehensive company plan on page 68, this is "borrowing or repayment of loans".

So a CRFI model must always have decision variables as basic parameters; otherwise, it cannot be used for planning. Therefore, the planning of the CRFI model to be carried out in the second step consists exclusively of an optimization.¹²⁰ A different planning procedure is, therefore, realized in each of the two steps. This dichotomy increases clarity.

When I first asked myself how a model-based comprehensive company planning should be carried out, I always started from an (equation) model of the whole company, which is calculated in one step with different planning alternatives. The idea of carrying out a two-step planning was completely out of my reach.

In the meantime, I have concluded that a two-step comprehensive company planning is preferable to a one-step planning with a comprehensive company model. Due to the one-way connection of the cost-performance model with a CRFI model and the fact that different planning procedures have to be executed with both models, the planning in the first step should plan the operating result as an "internal profit measure". In the second step with the CRFI model, the top targets of the entire company should be planned.

In the first step you also work with a profit figure, but the planning of the basic targets is oriented to plan only an "efficiency-oriented" profitability. It is a performance or efficiency planning. It should be separated from the CRFI planning, with which top targets such as liquidity and external profit sizes are planned.

The planning of the external profit sizes contained in the CRFI model, such as the return on equity, can be influenced by an appropriate choice of certain balance sheet policy decision parameters, i.e., by a balance sheet policy. The determination of these balance sheet policy decision parameters has nothing to do with the provision of performances and should, therefore, be separated from the "efficiency planning" used in cost and performance accounting.¹²¹

A two-step comprehensive company planning often also meets the organizational requirements of a company. In general, the planning of the cost-performance model is executed by the controlling (management accounting) department and the planning of the CRFI model by the finance department. If such an organizational separation exists, it also makes sense to split planning into two parts. The planning of the cost-performance model would then be carried out by the controlling department, while the finance department would be responsible for the planning of the CRFI model.

The bottom-up planning and the planning of the individual confrontation steps of a two-step comprehensive company planning is realized in two steps using the two models.¹²² After planning the first step, the cost-performance model transfers the plan values to the CRFI

¹²⁰ This planning procedure of the second step is described in Fig. 39 on page 145 by the crossing point of row 3 and column 10.

¹²¹ The balance sheet policy as a planning procedure within the framework of a CRFI model represents a special variant of CRFI planning. See also: Zwicker, E., *Integrated Target Commitment Planning and Control*..., op. cit., p. 76f., www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated)

¹²² For an example of such a two-step comprehensive company planning, see: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 61f., www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated). For a more detailed description of a two-step comprehensive company planning, see: Zwicker, E., *The Kilger Model - Structure and Configuration and its Connection with a CRFI Model in the Context of a two-step Comprehensive Company Planning*, Berlin 2003, www.Inzpla.de/IN30-2003h.pdf. (Text in German, title translated)

model, which requires them for planning the second step, as described.¹²³ The top-down planning proves to be somewhat more complicated and shows the disadvantages of carrying out a comprehensive company planning in two steps of a model calculation.¹²⁴

Convergence of accounting and one-step comprehensive company planning

However, there are also arguments in favor of carrying out one-step planning with a comprehensive company model. These arguments are discussed under the topic "convergence of accounting". The advantages and disadvantages of such convergence have long been discussed in the German accounting literature. Until now, it was customary in Germany to distinguish between internal and external accounting. "Internal company planning" will be executed based on an internal accounting system and leads to the planning of the operating result as a top target. However, to repeat it, the comprehensive planning of a company cannot stop at the operating result but must lead to the planning of certain top targets of an external accounting such as the return on equity. It must also include liquidity planning, which makes it necessary to use not only a profit target but also a liquidity target.

From this point of view, the plan cost-performance model is within the framework of internal accounting, whereas the CRFI model describes relationships (such as ex-ante account balancing) in external accounting.

In the English literature, no difference is made between internal and external accounting working with different targets. For this reason, no distinction is made between a one step and a two-step planning. Consequently, no internal profit such as the "Betriebsergebnis" is planned, followed by the planning of an external profit such as the return on equity. It should be noted that the "Betriebsergebnis" used by German companies does not correspond to the operating result that is also used in external accounting. It is rather a kind of residual profit, in whose definition equation the interest calculation (the imputed interest) of the operating assets occurs as a negative component. The depreciation used (imputed depreciation) on operating assets also differs from the balance sheet depreciation applied to these assets. Therefore, in Germany, there is a very specific definition used of the "internal operating result" (*Betriebsergebnis*).¹²⁵ The "earnings quantity" EVA (Economic Value Added) propagated in the USA is similar to this "Betriebsergebnis" in that there it works with a residual profit too. EVA is, therefore, not a profit term that can be derived directly from the items in the balance sheet and the income statement. For EVA, this negative component is the product of the net operating result after taxes (NOPAT) and the weighted average cost of capital (WACC).¹²⁶

In the German-language literature, there are also representatives who reject a differentiation of accounting into internal and external accounting with its different profit terms. Since in

¹²³ In many cases, the second step is only planned if the final plan value of the operating result was determined as the result of the first step.

¹²⁴ For a description of the top-down planning and the problems associated with it, see: Zwicker, E., *Integrated Target Commitment Planning and Control...*, op. cit., p. 71f. www.Inzpla.de/IN37-2008c.pdf.

¹²⁵ For the definition of the term "Betriebsergebnis" see: Zwicker, E., *Alternative Definitions of the Betriebsergebnis in Cost-Performance Models of the Integrated Target Commitment Planning*, Berlin 2016, (19 pages), www.Inzpla.de/IN49-2016.pdf. (Text in German, title translated)

¹²⁶ See the example of a top target relationship equation between the EVA and the US GAAP profit in: Zwicker, E., *Development of normative Management Accounting Theories in the Light of the Integrated Target Commitment Planning*, (47 pages), Berlin 2016, p. 12f., www.Inzpla.de/IN50-2016.pdf. (Text in German, title translated).

Germany today a differentiation is made on a large scale between internal accounting with the "Betriebsergebnis" as an internal profit and in external accounting with profit sizes such as return on equity, those representatives who propagate a uniform accounting with exclusively external profit terms as targets are referred to as representatives of a total convergence of accounting.

If one follows the demands of these representatives, then a two-step comprehensive company planning, which is propagated here, is superfluous. Then there should only a one-step comprehensive company planning be used which is operated with a comprehensive company planning model. The same applies to the actual models corresponding to these planning models.¹²⁷

Karlheinz Küting and Jim Hageman Snabe described in a monograph a comprehensive company planning model-based on convergent accounting.¹²⁸ Their model is described (like the Kilger model) in form of a numerical example on the basis of tableaux, covering the entire book. The tableaux would allow reconstructing this planning example as an equation model. This planning model contains several "ratios"... *"As the central planning variables..., which are also used to control the entire company"*.¹²⁹ From the point of view of the Integrated Target Commitment Planning, these are the top targets of a comprehensive company planning.

Küting and Hageman Snabe believe that with a *"trade balance sheet not distorted by tax-related facts"* (p.113), it is possible to use ratios from such a balance sheet, which can serve as the top targets for an operational planning and thus for planning and controlling of the responsibility areas.

The authors refer to the planning procedure they have applied: *"The planning is carried out according to the countercurrent procedure"* (p.113). Such countercurrent planning is implemented in the system of the Integrated Target Commitment Planning in the form of an "elaborated procedure" and can be performed with an if-then-calculation tableau described elsewhere (s.p.172). The advantages and disadvantages of convergence are discussed in detail by Küting and Hageman Snabe before they describe their comprehensive company planning model on the basis of a convergent accounting system (p.35-44).

Their arguments for carrying out operational planning based on a convergent accounting system will be examined in the following in the light of the Integrated Target Commitment Planning.

A convergent accounting system undoubtedly leads to a simplification and such a simplification is highly appreciated. It may sound trivial, but accounting is a rather complicated system. This becomes apparent when one wants to grasp the system relationships to such an extent that they can be redesigned. This is particularly evident when you look at accounting in the SAP system and study the many options and variants for its design.¹³⁰

The only question is whether it will be possible to successfully plan and control the operating

¹²⁷ For the structure of actual models, see page 112.

¹²⁸ Küting, K.H., Hagemann Snabe, J., i.a., *Geschäftsprozessbasiertes Rechnungswesen, Unternehmenstransparenz für den Mittelstand mit SAP Business Design*, 2nd Ed., Stuttgart 2011. Jim Hageman Snabe was CEO of SAP AG from 2010 to 2014.

¹²⁹ For more information on these ratios, see Küting, K.H., Hagemann Snabe, J., op. cit., p. 113.

¹³⁰ See the remarks on the complexity of cost object controlling page 148.

process while foregoing the “Betriebsergebnis” by only using the top targets of the external accounting for planning. If this would be the case, then from the point of view of the Integrated Target Commitment Planning a comprehensive company planning with a comprehensive company planning model would always have to be carried out. A two-step comprehensive company planning with the operating result as an “interim target” of the first planning step would thus no longer be necessary.

Küting and Hagemann Snabe have described for the first time such a one-step comprehensive company planning in a conclusive form using an example and have presented their arguments for justifying this approach in a much-differentiated manner.

Perhaps they had thus set the direction that will be taken in practice in the future.

I do not agree with the introduction of total convergence, although the arguments discussed in the literature and the advantages cited by Küting and Hagemann Snabe to justify their approach are quite clear to me.

To repeat it: A cost-performance model with the operating result (Betriebsergebnis) as a top target “bundles” all the basic targets of the responsibility areas to be defined by a target commitment into one “profit size”. This profit size is defined with imputed depreciation as well as imputed interest and the other “decision basis figures” in such a way that it reflects as accurately as possible the “real” profit from operating performance (without balance sheet and tax policy distortions).

My counterargument is that even a “*trade balance sheet not distorted by tax-related facts*” is also based on a balance sheet policy and this should not be mixed with the “efficiency planning” of the companies’ activities in their areas, which can best be operated with a cost-performance model.

A CRFI model has a large number of potential decision parameters, which should to be referred to as balance sheet and tax policy decision parameters.¹³¹ If a comprehensive planning is carried out, the planner can change the values of these decision parameters, with a stroke of the pen, subject to certain restrictions. With these balance sheet and tax policy decision parameters containing in a comprehensive company planning model, a company can practice a balance sheet and tax policy to influence its company result but also other balance sheet ratios.¹³²

One example of this is Lufthansa's approach, which would have had a loss of 4 billion in 1992 if it had calculated its net profit on the assumption made as so far by using a depreciation period for its aircraft of eight years. However, as it increased the depreciation period of its aircraft (a balance sheet policy decision parameter) for 1992 and the subsequent years from eight to twelve years, the loss for 1992 was reduced by one billion.

¹³¹ See in more detail: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 76f. www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated)

¹³² For the identification of such balance sheet and tax policy decision parameters as elements of a hierarchical classification of all basic parameters of the models of an Integrated Target Commitment Planning, see Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, Berlin 2007, p. 82f., www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

Such balance sheet policy decision parameters, whose selection and change are the result of sophisticated considerations, can serve to increase but also reduce a top target such as corporate earnings. The number of such "manipulatable parameters" available for this purpose, or more precisely the balance sheet policy decision parameters, is not inconsiderable.¹³³

A comprehensive company planning would, therefore, consist of a commitment planning with regard to the basic targets BT_1 to BT_m and a determination of the decision variables DV_1 to DV_s to maximize the company result. However, sometimes the corporate management deems it necessary to use the balance sheet and tax policy decision parameters contained in the model as (changeable) decision variables (DV). They are used in this case to maximize the company result or to achieve a setpoint value of the company result.¹³⁴

This makes planning relatively confusing, since two or (with the target value analysis) even three planning procedures are combined using different types of controllable basic parameters. If in a comprehensive company model the top target "corporate result" can be improved by means of accounting and tax policy corrections of the corresponding balance sheet policy decision parameters, why should a negotiation take place at all with the areas on the amount of their basic targets?

It seems to me that it makes more sense to draw a clear line of intersection, and this is when the decision is made to carry out a two-step comprehensive planning. In the first step, the pure basic Target Commitment Planning is used to plan a profit size (the "Betriebsergebnis" or the internal operating result) by changing the "efficiency commitment parameters" of the areas. Once this has been completed, the planning of the "exogenous" profit and the "exogenous balance sheet" as well as certain balance sheet ratios and, associated with this, the liquidity planning or, more generally, the financial planning, begins in the second step using the CRFI model.¹³⁵

In companies that use the SAP-CO system for their annual planning, the controlling department always plans the operating result first. This involves negotiating commitment targets with the areas (even if an Integrated Target Commitment Planning is not used). If the operating result is determined as the final planned value of the annual planning, then the results are made available to the balance sheet and finance department. These then carry out their financial and tax planning based on the figures of the operating result planning. Companies that use the SAP-CO system, therefore, proceed exactly as they would have done if they had followed the rules of a two-step comprehensive company planning for the Integrated Target Commitment Planning.

¹³³ See: Freidank, C. C., *Entscheidungsmodelle der Rechnungslegungspolitik, computergestützte Lösungsvorschläge für Kapitalgesellschaften*, Stuttgart 1990. See in particular the chapter "Einperiodige rechnungspolitische Entscheidungsmodelle", p. 95f and Freidank, C.C., Buchholz, A., *Auswirkungen von Steuer- und Bilanzreform auf rechnungslegungspolitische Entscheidungsmodelle*. In: Private und öffentliche Rechnungslegung. Wagner, F.W., Schildbach, T., Schneider, D. (Ed.), Wiesbaden, 2009. p. 109-133.

¹³⁴ This "setpoint value control" of the company result is carried out, if it is operated systematically, on the basis of a so-called target value analysis. See: Zwicker, E., *Target Value Analyses as a Method of operational Company Planning*, Berlin 2001, (16 pages) www.lnzpla.de/IN12-2001b.pdf. (Text in German, title translated).

¹³⁵ You can also plan a costing-based (or internal) balance sheet in internal accounting.

In a company with a sales value of several billion Euros, the head of Controlling, whom I knew well, said to me, *"We do our planning of the operating result (Betriebsergebnis) and when we are ready communicate this to our balance sheet people. They then retrieve the figures from our data-base and use them as the basis for their balance sheet and financial planning (using Excel, by the way). There are no questions. They ask the corporate management which balance sheet you want to have and then fiddle it all as desired. That is why our operating result (Betriebsergebnis) is a company secret. This is our real profit"*.

To the head of balance sheet and financial planning of the same company to whom I told that I had spoken to the head of a controlling department (of course not that of his company) and that he had used the phrase *"fiddle the balance sheet and get the result as desired"*, said, *"This is what people who know nothing about accounting say. It is how little Freddy imagines world history. Most of what he calls "fiddle" and we call balance sheet policy, we can only do once anyway."*

If a two-step comprehensive company planning is carried out, it is possible that only in the course of planning in the second step, i.e., planning using the CRFI model, is it recognized that, despite all the fiscal policy activities under consideration, a sufficient liquidity is not available. In addition, it may become apparent that the target values of the actual top targets of the entire company contained in the CRFI model, such as a setpoint value for the return on equity, are not achieved. Therefore, in such a case, the planning of the first step would have to be repeated using the cost-performance model. Whether the new plan variant of the first step now leads to a sufficient liquidity and also enables the other top target requirements, such as the requirement for a certain return on equity, to be met, can likewise only be assessed on the basis of the results of the second step. If the results are judged insufficient, the planning of the first step may have to be repeated. This cannot happen in a one-step comprehensive company planning.

Example of a one-step comprehensive company planning.

As mentioned above, my original goal was to develop models of a comprehensive company planning that should be used to carry out a one-step planning. These models should be disaggregated to such an extent that their model parameters can be "planned" by someone responsible for their realization.

This is achieved by applying the pure basic Target Commitment Planning described above. A comprehensive company model must, therefore, always have basic targets. However, since such a model must always have certain decision variables contained in the CRFI submodel in addition to the basic targets, the one-step comprehensive company planning to be practiced is always a mixed optimization basic Target Commitment Planning.

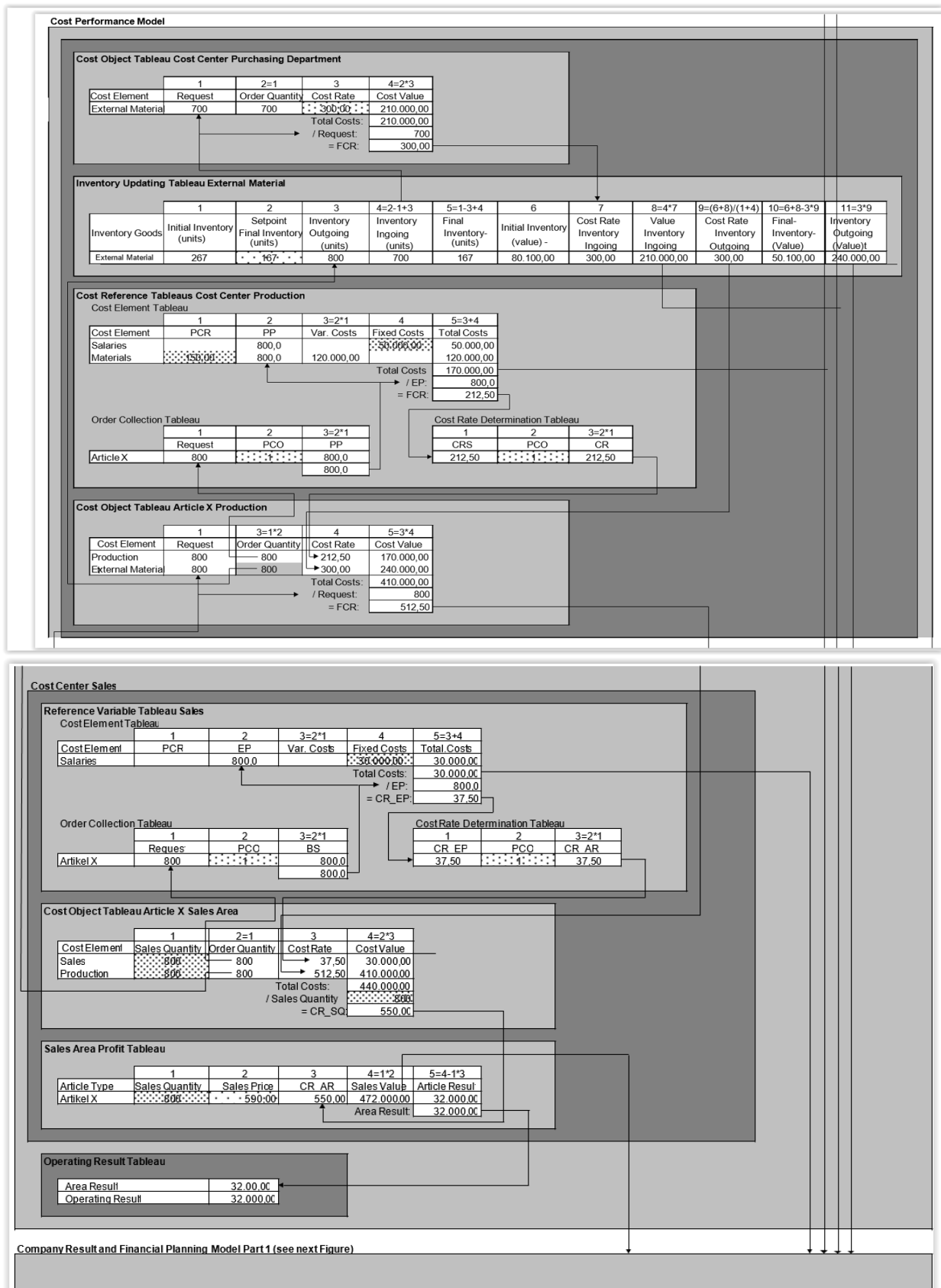


Fig. 14: Structure of the full cost version (of the full cost model) of the cost-performance model as part of a comprehensive company model

The following example shows that my original goal of carrying out a one-step comprehensive company planning is feasible and proves to be a mixed optimization basic Target Commitment Planning. The model tableau system of the company model used is shown in Fig. 14 to 16. It is a company that produces a single product and has two responsibility areas (sales and production), each with two basic targets.

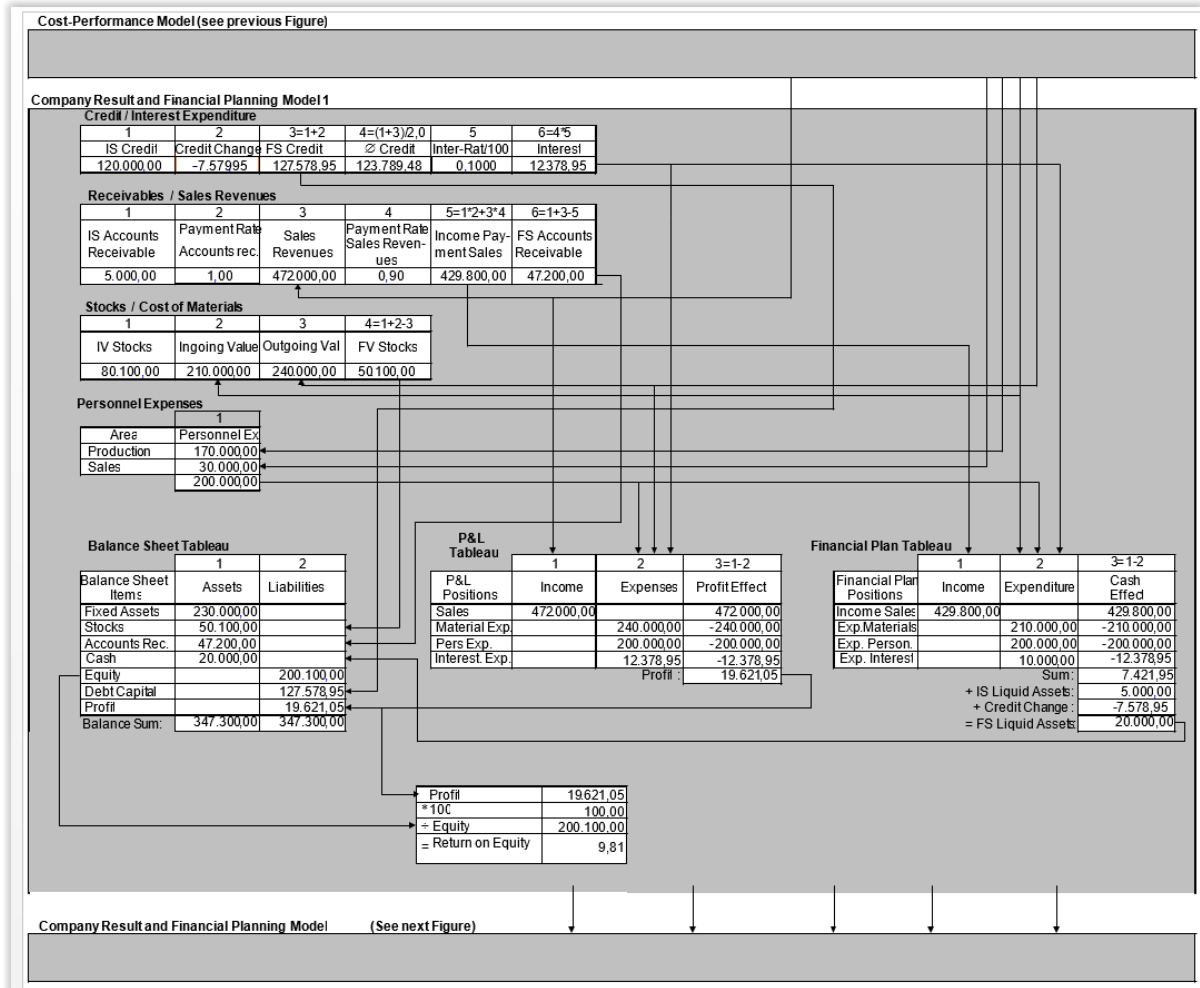


Fig. 15: Structure of company result and financial planning model 1 (CRFI sub-model 1) as part of an overall company planning model

Fig. 14 describes the model relationships of a full cost version of the cost-performance model used as a sub-model of the complete model. It also contains a so-called inventory updating tableau. It describes the flow of quantities and values of the raw material from purchasing as inventory receipt to delivery of the raw material to the production area. Inventory flow modeling is only possible if such inventory updating tableaus are used. It is the prerequisite for a sales quantity-driven planning. This is the only way to record the effects of a change in a sales quantity over all production stages up to the purchase quantities in one model calculation (one-step model calculation).

Such a model of the flow of quantities and values through the inventories is not provided for in Kilger's model example and is not discussed by him (s.p.57 and p.516). In the SAP-CO system, the flow of quantities and values through an inventory can only be carried out using an external invoice from the planner (for example, according to the inventory flow tableau

described). The output data (outgoing inventory quantity and transfer price of the inventory) must then be entered manually in the system for the next receiving production or sales area. This means that a one-step model calculation is no longer possible.¹³⁶

Figs. 14 and 15 show which variables are transferred from the cost-performance model (Fig. 14) to the CRFI model. The CRFI model is described by the model tableaux in Fig. 15. The plan balance sheet, the planned income statement and the financial plan, i.e., the plans of the ex-ante account balancing that are always required for such a model, are listed in the lower part. The CRFI model contains one decision variable in the form of the rate of change (borrowing or repayment) of bank loans.

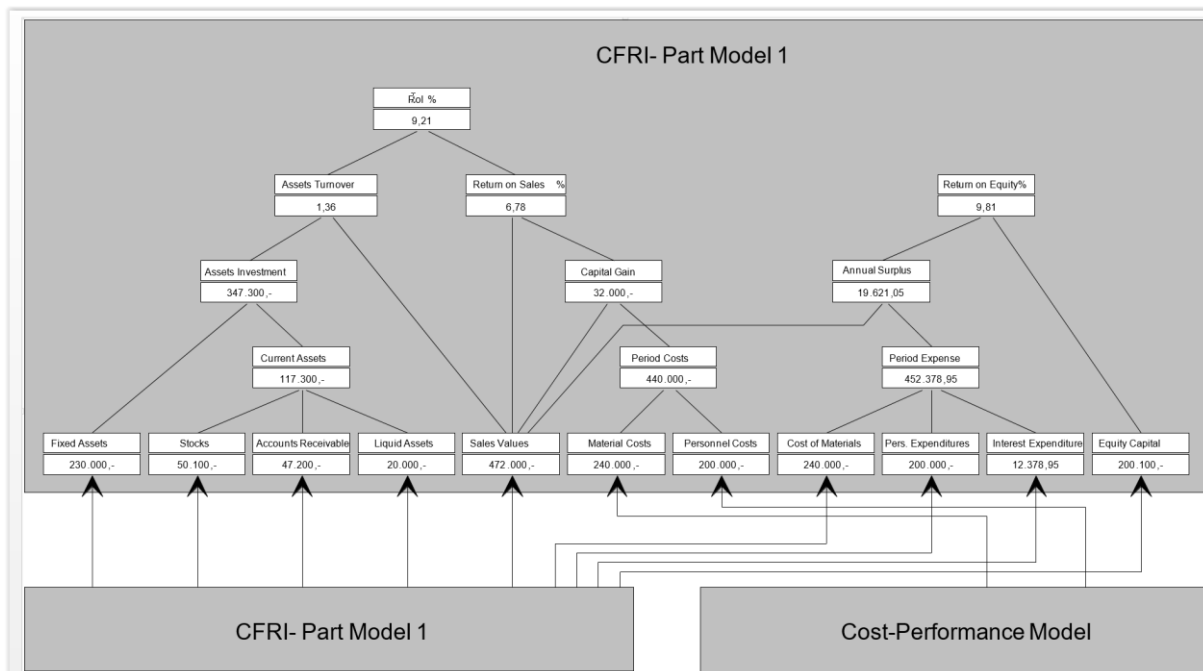


Fig. 16: Structure of company result and financial planning model 1 (CRFI sub-model 2) as part of an overall company planning model

Fig. 16 shows some ratios that may be considered as top targets in a comprehensive company planning and are not potential top targets that are already included in the plan balance sheet, the plan income statement or the financial plan (shown in Fig. 15). The most important top target is probably the return on equity. The return on investment is presented according to the Dupont definition of return on investment as the product of the return on sales with the asset turnover. These three variables are also potential top targets.

Fig. 17 shows the results of the three planning steps of an exemplarily assumed planning process with this model. Top targets are the return on equity and the liquid fund. As mentioned above, a comprehensive company planning must always have a top profitability target (here return on equity) and a top financial target (here "liquid fund"). If the top financial target would be abandoned, then maximizing the return on equity would have the effect that all

¹³⁶ See in detail: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 89, www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated)

loans would be repaid, as far as possible, in order to reduce interest rates on loans and thus increase the return on equity, with the result that the company would become illiquid. The three planning steps are described in more detail below.¹³⁷

Bottom-up planning.

At the beginning of the bottom-up planning, the responsibility areas communicate the values of the basic parameters to the controlling department. These are the voluntary target commitments, the decision parameters and the uncontrollable basic parameters, for which they are responsible in different ways. The values of these parameters are entered into the model. The variable that has afterward to be still determined is the rate of credit change. It is the model's only decision variable and is used to carry out the optimizing planning. It is intended to maximize the return on equity under the constraint that the liquid fund should not be less than € 20,000. The result of this optimization (and at the same time the target commitment planning) is shown in Fig. 17. As can be seen, a borrowing of € 7,578.95 is required.

Top-down planning.

To carry out the top-down planning, it is assumed that the corporate management requires the controller to plan a return on equity of not less than 13.7 % and not to fall below € 20,000 for the liquid fund. In this way, the corporate management formulates two requirements for maintaining a certain aspiration level of these targets.

The controller (or more precisely the top-down planner) tries to achieve these targets by using a subjectively guided iterative procedure to select certain values of the basic targets, which he considers reasonable for the areas. Once these values have been defined, the top-down planner uses the decision variable "credit change" to carry out an optimizing planning that follows this target commitment planning.

It is determined in such a way that the return on equity is to be maximised under the condition that the "liquid fund" does not fall below € 20,000. Let us assume, as is seldom the case in practice that the top-down planner has determined a planning alternative for this procedure that leads exactly to the threshold values of the two aspiration level requirements.¹³⁸ The result of this top-down planning is described by the values of the basic targets and the value of the decision variables "credit change" in the column "Top-down planning" in Fig. 17.¹³⁹

Confrontation planning.

The column "Confrontation planning" in Fig. 17 shows the results of the confrontation planning, i.e., the final plan values of the basic targets, the decision variable "Credit change" and the two top targets as a result.

¹³⁷ The model tableaus, which describe the results of the respective planning steps in the form of Excel tables, can be called up under www.Inzpla.de/GMP-BUP.XLS, www.Inzpla.de/GMP-KON.XLS and www.Inzpla.de/GMP-TOD.XLS (Designations in German)

¹³⁸ Using the GBM top-down planning procedure already mentioned (see page 60), top-down planning can also be carried out using an algorithmic procedure, which leads to a precise implementation of the required threshold values of the top targets. See in detail: Zwicker, E., *GBM Top-Down Planning, an algorithmic Procedure for Top-Down Planning in the System of the Integrated Target Commitment Planning*, op. cit., www.Inzpla.de/IN07-2000b.pdf. (Text in German, title translated)

¹³⁹ For a detailed description of this procedure using the same example, see: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 64f., www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated)

This result of the confrontation planning came about in this way: the controlling department has negotiated certain values of the basic targets with the two areas. Their values, about they have agreed with the areas, are entered into the model. With this, the final basic targets of the commitment planning are included in the model. Only one numerical parameter value is not determined. It is the value of the decision variable "Credit change".

	Unit	Bottom-Up-Planning	Top-Down-Planning	Confrontation Planning
Return on Equity	%	9,8	13,7	12,2
Liquid Fund	€	20.000,—	20.000,—	20.000,—
Basic Targets Assembly				
Proportional Cost Rate Personnel Costs	€/Unit	150,—	148,—	149,—
Fixed Personnel Costs	€	50.000,—	48.000,—	49.000,—
Basic Targets Sales				
Sales Quantity	Unit	800	820	815
Personnel Costs	€	30.000,—	29.000,—	29.400,—
Decision Variables				
Credit Change	€	7.578,95	989,47	3.757,89
Decision Parameters				
Setpoint Final Stock Quantity Raw Material	Unit	167	167	167
Setpoint Sales Price	€/Unit	590,—	590,—	590,—
Uncontrollable basic Parameters				
Production Coefficients				
Assembly	Hrs./Unit	1	1	1
Sales	Hrs./Unit	1	1	1
Single Material Cost Rate	€/Unit	300,—	300,—	300,—
Interest Rate	—	10	10	10
Sales Paid-in-Ratio old Receivables	—	1,0	1,0	1,0
Sales Paid-in-Ratio	—	0,9	0,9	0,9

Fig. 17: Results of the one-step comprehensive company planning of an example model

It is used for an optimization. As mentioned above, the corporate management requires that this optimization should lead to a maximization of the return on equity under the condition that the "liquid fund" should not fall below 20,000 €. The figures in the column "Confrontation Planning" of Fig. 17 show the results at the end of this planning step. The optimization carried out in this last step leads to a borrowing of € 3,757.89.¹⁴⁰ It is assumed that the resulting values of the two top targets (12.2 % and 20,000 €) meet the requirements of the corporate management; thus the planning is finished.

Profit Center Planning. A planning procedure has also been developed for profit center planning. It bases on the assumption that the profit centers have their own plan cost-performance models, while the central planning has its own central plan cost-performance model. The central plan cost-performance model contains a part or the whole of the structural

¹⁴⁰ Optimization is one of the three forms of an action planning that can be carried out in this planning step. For a description of these three types of an action planning in the frame of a comprehensive company planning, see: Zwicker, E., *Management Control Systems in the Light of the Integrated Target Commitment Planning*, p. 9f., Berlin 2016, www.Inzpla.de/IN52-2016.pdf. (Text in German, title translated)

equations of the plan cost-performance models of the profit centers. The central plan cost-performance model calculates the operating result of the entire company. The central plan cost performance model and the plan cost performance models of the profit centers are integrated into the planning procedure in a certain way.

The matrix in Fig. 18 shows the actual profits of a profit center, differentiated according to the article profits and the regions in which these article profits were achieved. Such profit matrices can assume considerable sizes.¹⁴¹ If the corporate management now wants to negotiate with a profit center about only eight (and no more) profit segments, it can select these segments using the (edge) hierarchies placed at the edges of the matrix. Various aspects of selection play a role here.

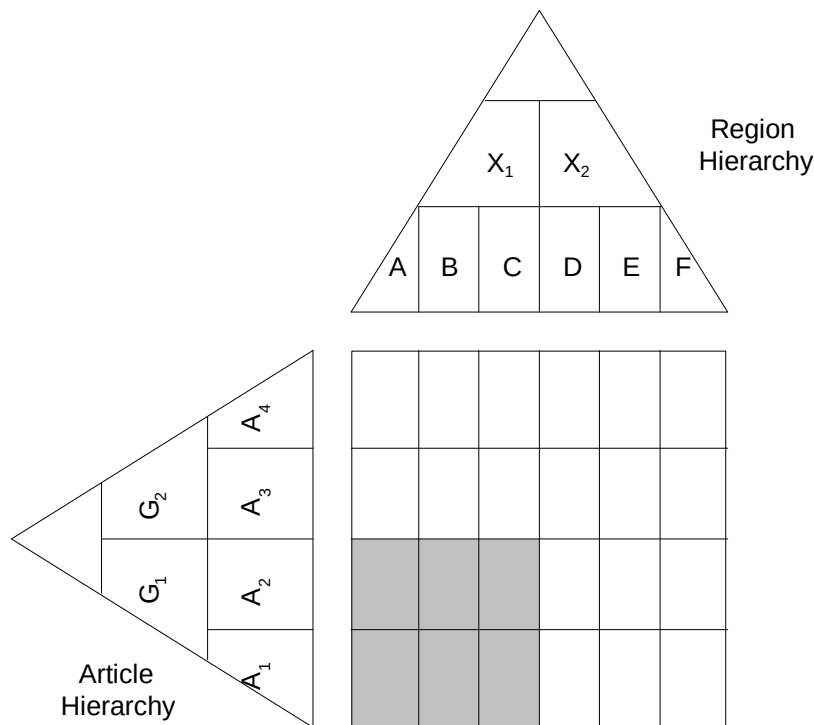


Fig. 18: Two-dimensional profit segment system of a profit center with edge hierarchies

As a result, the following eight profit segments could be selected, for example: {Region-X₁, Article-A₄}, {Region-X₁, Article-A₃}, {Region-X₁, Article Group-G₁}, {Region-X₂, Article Group-G₂}, {Region-D, Article Group-G₁}, {Region-E, Article Group-G₁}, {Region-F, Article Group-G₁} {Region-X₁, Article Group-G₂}

The conceivable case that the central plan cost-performance model contains all plan cost-performance models of the profit centers as sub-models and also describes the relationships between these profit centers using certain structural equations will probably rarely occur. Such a plan cost-performance model would just become too large for the size of many companies. If such a model were developed, the central planning would have to negotiate with all

¹⁴¹ See, for example, the regional and article hierarchies of the Schering AG on page 123.

profit centers about all the basic targets of their cost-performance models (as is the case with pure area Target Commitment Planning). This would be unreasonable and not useful for the central planning, as it would then have to negotiate thousands of basic targets with the profit centers.¹⁴²

Therefore, the central cost-performance model should generally contain only a part of the structural equations of the cost-performance models of the profit centers. Certain endogenous variables of the cost-performance models of the profit centers would thus be basic parameters of the central cost-performance model. However, which one should be chosen in order to carry out an acceptable process of target commitment planning with this "model ensemble" of profit center models and the central model?

Faced with the problem of finding an appropriate level of aggregation of the central plan cost-performance model into the plan cost-performance models of the profit centers, I had the idea that a model developer should determine the level of aggregation using a multidimensional profit segment system.

This procedure bases on the decision that a certain number of the aggregated profit sizes of a profit center should form the intersection between the central model and this profit center model. The multidimensional profit segment system of a profit center serves as the starting point for this "interface specification". In most cases, profit segment system, which forms the basis for this interface selection is a two-dimensional article-region-profit-system as shown in Fig. 18.¹⁴³ As mentioned above, it was assumed that the corporate management is willing to negotiate the profits of only eight profit segments of a profit center.

However, what the criteria for selecting these eight profit segments? That depends on the individual circumstances. However, none of the basic profit segments may be disregarded.

For the selection of these eight profit segments, an optimization procedure could be used. In this case the corporate management assumes that the alternatives of this optimization could be represented by the actual profits of all possible eight the profit segments in the previous period. The optimization should then determine these eight profit segments of the previous period, for which the differences between their actual profits are as small as possible, that is, the amounts should match each other as closely as possible. However, in individual cases, there are many selection aspects that lead to different results.

These profit parameters, such as the total profit of an article group or the profit of an article in a region, are then the parameters that act as target commitment parameters for the profit centers in the planning process.¹⁴⁴ On the basis of the central cost-performance model developed in this way and the (decentralized) cost-performance models of the profit centers, a certain type of the Integrated Target Commitment Planning can then be carried out, which has certain similarities with the pure area Target Commitment Planning already mentioned.¹⁴⁵

¹⁴² However, ThyssenKrupp Steel's plan cost-performance model, which will be described later, is just such a comprehensive model. See page 336.

¹⁴³ For information on setting up multi-dimensional profit segment systems and triggering their profit parameters via edge hierarchies, see page 114.

¹⁴⁴ Max Theodor Commes, head of the central planning at Siemens AG, told me about this topic: "With my profit centers, I have only negotiated contribution margins but never costs." (see about M. Commes p. 411)

¹⁴⁵ For an introductory description, see: Zwicker, E: *Integrated Target Commitment Planning and Control...* op. cit., p. 48f., www.Inzpla.de/IN37-2008c.pdf. A more detailed description is given in: Zwicker, E.,

8. Control and variance analysis in the system of the Integrated Target Commitment Planning

My first attempts to develop a procedure of an operational planning began with the study of comprehensive company models. Then I concentrated on planning with cost-performance models. At some point, I came up with the idea of searching in these cost-performance models for parameters for whose fulfillment one could in some way “make certain areas responsible”. The more the planning considerations became concrete to realize a planning by target commitments, the more I realized that the compliance with these target commitments also needed to be controlled. It was, therefore, essential to develop a system for controlling these target commitments. This is because a target commitment planning without the accompanying control would be a torso.

That is why I began to study the relevant literature on the subject of “control in companies” at a relatively early phase. My goal was to learn more about the model-based control procedures discussed there. However, the results of this research were not very encouraging. It turned out that this topic was hardly dealt with.¹⁴⁶

In some works, including those dealing exclusively with the topic of “control”, the contribution to a model-based control consists solely in saying that control is a “setpoint-actual comparison”. According to this assertion, the setpoint-actual comparison with a control variable (CV) is the variance between its setpoint value (CV^{SP}) and its actual value (CV^{ACT}) which is described by the following definition equation

$$\Delta CV = CV^{SP} - CV^{ACT} \quad (12)$$

There is nothing wrong with this definition. It forms the starting point of every control calculation. However, the question arises which variables are to be treated as control variables in a model-based planning system based on which control procedure and how the setpoint and actual values of these control variables are to be defined.

There are two types of setpoint-actual comparison in the flexible plan cost accounting system, which can be regarded as a model-based control procedure.

The first of these control procedures assumes that a cost element in the planning model is described by a target cost function. The setpoint value of this cost element (CO^{SP}), which is compared with the actual value (CO^{ACT}) calculated at the end of the planning period, is determined using the target cost function negotiated with the areas as a result of the planning procedure. The system determines the setpoint costs (CO^{SP}) to be the ordinate value of the target cost function whose abscissa value corresponds to the actual employment (EP^{ACT}). These setpoint costs are compared with the actual costs incurred (CO^{ACT}).

Such a procedure is described by the familiar graphical representation shown in Fig. 19 for

Structure and process of profit center planning in the system of the Integrated Target Commitment Planning, Berlin 2002, www.Inzpla.de/IN16-2002b.pdf. (Text in German, title translated)

¹⁴⁶ For a discussion of a “model-based control” in the literature, see: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, Berlin 2007, p. 214f., www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

determining a cost variance in the flexible plan cost accounting system.

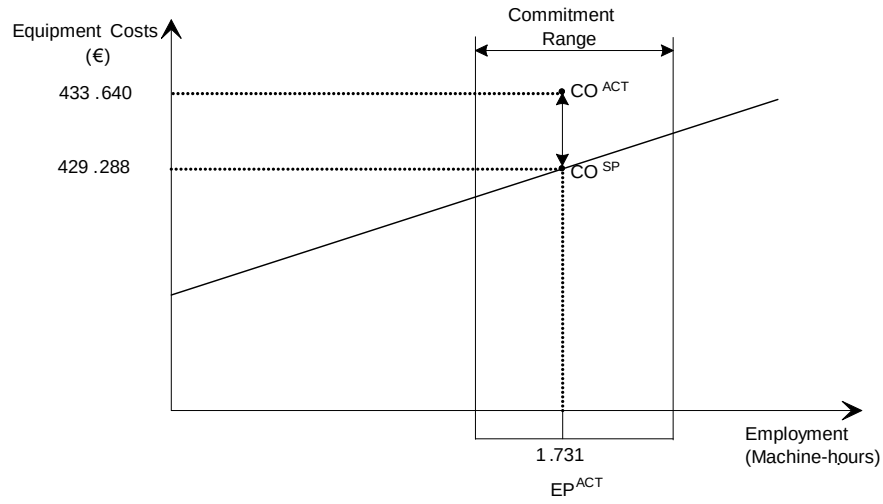


Fig. 19: Setpoint-actual control of a cost element when specifying a target cost function in the flexible plan cost accounting.

The second control procedure in the flexible plan cost accounting assumes that a cost element (CO) is defined by the product of consumption quantity (CQ) times its procurement price (PP). The setpoint value of CO, i.e., CO^{SP} , is the product of the setpoint (CQ^{SP}) with the finally planned procurement price (PP^{FP}) that is

$$CO^{SP} = CQ^{SP} \cdot PP^{FP} \quad (13)$$

The actual costs (CO^{ACT}) are defined by

$$CO^{ACT} = CQ^{ACT} \cdot PP^{FP} \quad (14)$$

However, the definition of actual costs (CO^{ACT}) as the comparison value of the setpoint-actual variance in (14) does not describe the actual costs incurred, that is, the actual values of the costs as recorded. Rather, it describes the costs that would have resulted if the actual value of the procurement price (PP^{ACT}) had corresponded to the planned value (PP^{FP}). This is, therefore, an irreal condition forecast of the costs.

The two control procedures are based on the principle that in the two definition equations of the setpoint and actual values of the cost variable to be influenced (CO), the values in the definition equation, which the cost center managers as the persons responsible cannot influence, are set equal. This “*principle of eliminating all uninfluenceable variances of a responsibility-related setpoint-actual control*” from the setpoint-actual variance of the costs, on which these regulations are based, was extended by me to all types of control variables in all responsibility categories. It turns out to be a model-based specification of the principle of controllability, which has so far only been verbally formulated in the literature, which demands that nobody should be held responsible for something he cannot influence. (s.p.601)

In the context of the Integrated Target Commitment Planning and Control, this hitherto verbally formulated principle of controllability is intensified on the level of an equation model of the Integrated Target Commitment Planning by following the described “*principle of elimina-*

tion of all uninfluenceable variances of a responsible setpoint-actual-control". In this case, the principle of controllability should be described as the model-based principle of controllability. As explained elsewhere, this principle is regarded as one of the two paradigms of the Integrated Target Commitment Planning and Control (s.p.597).

However, the control procedure based on the model-based principle of controllability is only applicable if the model used is a model of the Integrated Target Commitment Planning and such a planning was carried out with it. This is because the basic variables in the actual and setpoint equations of the control variables for which a responsible person is responsible only result from the semantics of a model of the Integrated Target Commitment Planning, which states that all parameters of the model are assigned to a person who is made "responsible" in a certain way for the variance of these parameters.

The basic structure of this control system is briefly described below. As discussed, the top targets are "planned" within the framework of an Integrated Target Commitment Planning by making someone "responsible" for the values of the basic parameters influencing these top targets in one of the three possible types of responsibility. As mentioned above, these are the three types of responsibility

1. A fulfillment responsibility with regard to the basic targets
2. A realization responsibility with regard to the decision parameters
3. A forecasting responsibility with regard to the uncontrollable basic parameters.

The control now consists of determining the setpoint-actual variance or the actual-forecast variance of a control variable that originates from one of the three variance types.

These are

1. The setpoint-actual (or actual-setpoint) variance of a fulfillment responsibility.
2. The setpoint-actual (or actual-setpoint) variance of a realization responsibility.
3. The actual-forecast (or actual-forecast) variance of a forecasting responsibility.

In the latter case of a forecast variance, we do not speak of a "setpoint-actual variance" or "actual-setpoint variance", because term "setpoint" is connected with the idea that the person responsible can and should achieve this "setpoint".¹⁴⁷ However, the forecaster of an uncontrollable (pure) forecast (like an exchange rate forecast) cannot bring about its occurrence. Certain persons always bear responsibility for the variances of this three types of model parameters to be controlled. A "zero variance" is required for the realization and forecasting responsibility, while the fulfillment responsibility requires that a threshold value is adhered whose threshold value is described by the setpoint value.

Such a distinction between three types of control, which are used as a result of planning, has not yet been described in the literature. Küpper speaks of the fact that there are different types of control and mentions the "*will-be-will-be control*" and the "*will be-actual-control*" as fur-

¹⁴⁷ The literature often refers to a "setpoint-actual comparison". As part of the control system of the Integrated Target Commitment Planning, the standard form is based on a setpoint-actual comparison for costs and an actual-setpoint comparison for profit sizes. A setpoint-actual variance differs from an actual-setpoint variance only by its sign.

ther forms of control in addition to the setpoint-actual-control.¹⁴⁸ However, Küpper does not define these terms further and does not provide any instructions on how such a check should be carried out. In the light of the planning procedure of the Integrated Target Commitment Planning, however, such "controls" are not a trivial matter about which one no longer needs to say a word.

One could think that the control of these three types of responsibility consists in the determination of the setpoint-actual-variance of the basic targets and decision parameters as well as the actual-forecast variance of the uncontrollable basic parameters. However, this is not always the case, because different aggregation levels can be chosen for the control variables used to measure the variances between the three types of responsibility.¹⁴⁹

Aggregation level of the control variables

The lowest aggregation level exists if the basic parameters are identic with the control variables. In this case, the values of their setpoint-actual variance and their forecast-actual variance is a responsibility measure of the person responsible for the respective type of responsibility. However, if the basic parameters are, which is often the case, parameters of a target commitment function (as basic targets), an uncontrollable hypothesis equation (as uncontrollable basic parameters) or a decision rule (as decision parameters), then it makes sense to use control variables of a higher aggregation level.¹⁵⁰ The explained variables of these hypothesis equations can be used here as control variables.

In the case of the cost function as the most important type of a target commitment function

$$CO = FC + VUC \cdot EP \quad (15)$$

(CO - costs, FC - fixed costs, VUC - variable unit costs, EP - employment)

the variance of the fulfillment responsibility is, therefore, no longer measured using the setpoint-actual variance of the basic targets $FC^{SP} - FC^{ACT}$ and $VUC^{SP} - VUC^{ACT}$, but rather using the setpoint-actual variance of costs, i.e., $CO^{SP} - CO^{ACT}$.

If an aggregated control variable (by means of a hypothesis equation) is used to measure the setpoint-actual variance of the fulfillment responsibility, then it becomes apparent that the hypothesis equation, which explains this control variable (here CO), also contains other explanatory variables (here EP) in addition to the basic targets (here FC and VUC), which are not basic targets.

If, however, the setpoint-actual variance of the aggregated control variable is only to show the variance caused by the variance of the basic targets, then the question arises of how this requirement is to be taken into account in the setpoint-actual comparison.

¹⁴⁸ Küpper, H.U., *Controlling, Konzeption, Aufgaben, Instrumente*, Stuttgart, 5th Ed. Stuttgart, 2011, p. 223. "Wird-Wird-Kontrolle" and "Wird-Ist-Kontrolle."

¹⁴⁹ See the more detailed consideration of the selectable aggregation levels of the control variables in: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*. Berlin 2007, p. 46f, www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

¹⁵⁰ See page 31 on this classification of the hypothesis equations in models of the Integrated Target Commitment Planning.

In the example of the cost element (CO) of a cost center, the actual costs (CO^{ACT}) and the costs in the final plan (CO^{FP}) are defined as follows¹⁵¹

$$CO^{ACT} = FC^{ACT} + VUC^{ACT} \cdot EP^{ACT} \quad (16)$$

$$CO^{FP} = FC^{SP} + VUC^{SP} \cdot EP^{FP} \quad (17)$$

If you compare these plan costs (CO^{FP}) with their actual costs (CO^{ACT}), this would not be a meaningful comparison. This is because the $CO^{SP} - CO^{ACT}$ variance would also depend on the variance between the actual and plan employment ($EP^{FP} - EP^{ACT}$), which cannot be influenced by the cost center.

Therefore, it must be decided that in the hypothesis equations of the setpoint and actual cost (CO) values, the same values are assigned to the explanatory variables that are no basic targets. Only the planned final values or the actual values of the explaining variables can be considered as possible values for "equalization". It makes sense to use the actual value as an "equalization figure", because in this case the actual costs (CO^{ACT}) correspond to the actual values determined and do not form a fictitious figure.

The setpoint-actual variance to control costs, i.e., $CO^{SP} - CO^{ACT}$, is, therefore, based on a certain specification of its two definition components CO^{ACT} and CO^{SP} , which fulfills this "equalization". These two variables are determined using the following hypothesis equations

$$CO^{ACT} = FC^{ACT} + VUC^{ACT} \cdot EP^{ACT} \quad (18)$$

$$CO^{SP} = FC^{SP} + VUC^{SP} \cdot EP^{ACT} \quad (19)$$

It can be seen that the hypothesis equation (19) for CO^{SP} does not coincide with the hypothesis of the final plan value CO^{FP} in (17), for it assumes that the actual value of the employment EP^{ACT} and not the final plan value EP^{FP} was realized. This results in exactly the procedure described in Fig. 19 for the controlling of the setpoint costs in the case of a flexible plan cost accounting.

Principle of elimination of all uncontrollable variances of a responsibility-based setpoint-actual control

In view of the requirement that only the basic target variances should influence the setpoint-actual target variances of aggregated control variables, the principle of eliminating all uncontrollable variances for calculating the actual and setpoint values of such aggregated control variables can be specified as follows. It reads:

Choose for all explanatory variables in the plan and actual explanatory equation of an aggregated control variable, which are not basic targets, their actual values.

However, this principle for determining the setpoint and actual values of an aggregated control variable should not apply if one of the explanatory variables in the definition equations forms a basis business variable (precondition) of the basic target commitments. In this case, the final planned value for this explanatory variable must be selected, as it formed the busi-

¹⁵¹ Equation (16) is an ex-post hypothesis of the costs leading to an explanation of the actual value. See also: Zwickler, E., *Actual Cost-Performance Models: Structure, Semantics and Application*, Berlin 2008, p. 8f., www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated)

ness basis for the basic target commitment. An example is the cost hypothesis (or cost function)^{152, 153}

$$CO = CQR \cdot PP \cdot EP \quad (20)$$

(CO - costs, CQR - consumption quantity rate, PP - procurement price, EP - employment)

The consumption quantity rate (CQR) is a basic target; the employment (EP) and the procurement price (PP) are explanatory variables of the costs (CO), but not basic targets. In accordance with the elimination principle, the actual value of PP and EP should be selected for the definition of setpoint and actual costs CO^{SE} and CO^A .

However, if the final plan value of the procurement price (PP^{FP}) formed the prerequisite (business basis) for the consumption quantity rate (CQR^{FP}) being agreed, then this plan value (and not the actual value) must be used in the actual and setpoint definition equation.¹⁵⁴

This gives you the actual and target costs of the setpoint-actual control with

$$CO^{ACT} = CQR^{ACT} \cdot PP^{FP} \cdot EP^{ACT} \quad (21)$$

and

$$CO^{SP} = CQR^{SP} \cdot PP^{FP} \cdot EP^{ACT} \quad (22)$$

The actual costs (CO^{ACT}) are, therefore, not the observed actual costs, but the actual costs that would have resulted if the planned price PP^{FP} had realized as the actual value. The control variance of the costs (CO), i.e., $CO^{SP} - CO^{ACT}$, therefore, results from

$$CO^{SP} - CO^{ACT} = CQR^{SP} \cdot PP^{FP} \cdot EP^{ACT} - CQR^{ACT} \cdot PP^{FP} \cdot EP^{ACT} \quad (23)$$

These principles for specifying the actual and setpoint values of the control variables of a fulfillment responsibility apply in a similar manner for determining the actual and setpoint values of a realization responsibility and the determination of the actual and forecast values of a forecasting responsibility.

The elimination of the influence of variables for which a person is not responsible on the actual-setpoint variance of a commitment and realization responsibility can, as mentioned above, be seen as a concretization of the principle of controllability within the framework of model-based control of the Integrated Target Commitment Planning. It has been described (s.p.77) as the model-based principle of controllability. The criterion of whether a variable in the model is “*influenceable*” by a person is fulfilled in the light of the Integrated Target Commitment Planning if this person has undertaken to adhere to it (as a basic target) with a

¹⁵² The term “cost function” is used throughout the literature. In the present context, such cost functions are always “cost hypotheses”. With the word “cost hypothesis” the character of such a function, to be a falsifiable hypothesis is emphasized more strongly. Both words are therefore used meaning-equivalently in this text.

¹⁵³ This equation for determining the costs corresponds to the hypothesis equation of the costs in the fourth line of the cost element tableau in Fig. 2.

¹⁵⁴ For the reason why it is necessary to choose the final planned values of the procurement price for a target commitment for the consumption quantity rate (CQR), see: Zwicker, E., *Control and variance analysis...*, op. cit., p. 69f. www.lnzpla.de/IN34-2007.pdf. (Text in German, title translated)

setpoint value.¹⁵⁵

With the formulation of these regulations for the actual and setpoint values (or forecast values) of the control variables of individual types of responsibility, the control procedure of the Integrated Target Commitment Planning was developed. It was characterized by two types of regulations:

1. Regulations for determining the variables that are to act as (aggregated) control variables of the control procedure.
2. Regulations for determining the actual and setpoint values (or forecast values) of these control variables, with which a setpoint-actual (or actual-setpoint) comparison is to be carried out.

Control of pure area Target Commitment Planning¹⁵⁶

The preceding text describes the control of the pure basic Target Commitment Planning, that is, the planning procedure of the Integrated Target Commitment Planning, which still has the greatest chance of being used in practice due to its close connection to the flexible plan cost accounting. In the following, as already announced (s.p.50) the control procedure of the area Target Commitment Planning will be dealt with. As described, you can differentiate between a single-level and a multi-level area Target Commitment Planning. First, we discuss the control of the single-level area Target Commitment Planning. This is followed by the multi-level area Target Commitment Planning, which always includes the control of the single-level area Target Commitment Planning.

Point-exact fulfillment of area targets. The first step is to clarify what is to be understood by a point-exact fulfillment of the area's targets. In such a case, the actual and the setpoint targets of an area agree with each other (however, if the setpoint target is "overachieved" in a favorable sense, it is even better). An area Target Commitment Planning is characterized by the fact that this is not only the case if the actual values of the basic targets exactly correspond to their final plan values. Other actual values of the basic targets can also lead to such point-exact fulfillment of area targets. Since these can be achieved not only with the setpoint values of the basic targets originally agreed for a point-exact fulfillment of the setpoint area targets an area manager has more actions available for the realization of a point-exact fulfillment of his area targets in the case of a pure area Target Commitment Planning than in the case of a pure basic Target Commitment Planning. As already mentioned, this is an important advantage of this planning procedure in comparison to the pure basic Target Commitment Planning.

Control of a single-level area Target Commitment Planning

The reduced area target equation of an area target (AT) is realized if the reduced equation is a function of the basic parameters of the area model. Such a reduced equation has the form

$$AT = F(BT_1, \dots, BT_n, IV_1, \dots, IV_z, OBP_1, \dots, OBP_v) \quad (24)$$

¹⁵⁵ See further details 597.

¹⁵⁶ The following text on the control of a single and multi-level area Target Commitment Planning is quite long with nine pages. However, with a shorter presentation, it would not be possible to present the basic idea of this control procedure on a model-based level.

AT - area target, BT - basic target, IV - input variable of the central model, OBP - other basic parameters

The input variables (IV) are, according to the modeling concept of the Integrated Target Commitment Planning, only order quantities of other areas to the area X in question or the prices that other areas "charge" for a service supplied to this area X.¹⁵⁷

In the case of the furniture model, the area target definition of the area costs of the assembly was defined by

$$ACO_{AS} = PCR_{AS} \cdot EP_{AS} + FC_{AS} \quad (25)$$

ACO_{AS} - Area costs of the assembly

PCR_{AS} - Proportional cost rate of the assembly

FC_{AS} - Fixed costs of the assembly

EP_{AS} - Employment of the assembly

However, this is not a reduced equation of the area costs, because the input variables of the area model of the assembly area (s.p.51) are the sales quantities of the beds and sofas (SQ_{BD} and SQ_{SO}). By reducing the employment (EP_{AS}) in (25) to these input variables, the reduced equation of the area costs of assembly follows with

$$ACO_{AS} = PCR_{AS} \cdot PCO_{AS-SO} \cdot SQ_{SO} + PCR_{AS} \cdot PCO_{AS-BD} \cdot SQ_{BD} + FC_{AS} \quad (26)$$

PCO_{AS-SO} - Production coefficient sofas in the assembly (*uncontrollable basic parameter*)

PCO_{AS-BD} - Production coefficient beds in the assembly (*uncontrollable basic parameter*)

SQ_{SO} - Sales quantity sofas (*input variable from the sales area*)

SQ_{BD} - Sales quantity beds (*input variable from the sales area*)

PCR_{AS} - Proportional cost rate (*basic target*)

FC_{AS} - Fixed costs in the assembly (*basic target*)

With the determination of the reduced equation of the area costs, the prerequisites are met to show using this example which combinations of basic targets lead to a point-exact fulfillment of area targets.

Setpoint-actual target comparison of area contribution margins.

In case of the furniture model, the final planned value of the area target "area contribution margin" (ACM^{FP}) of the sales area of 627,500 € was determined as follows:¹⁵⁸

$$ACM^{FP} = SQ_{SO}^{FP} \cdot (SP_{SO}^{FP} - VUC_{SO}^{FP}) + SQ_{BD}^{FP} \cdot (SP_{BD}^{FP} - VUC_{BD}^{FP}) \quad (27)$$

$$627.500 = 240 \cdot (3.000 - 2.500) + 1.450 \cdot (1.050 - 700)$$

SP_{SO} - Sales price sofas

SP_{BD} - Sales price beds

VUC_{BD} - Variable unit costs beds

VUC_{SO} - Variable unit costs sofas

¹⁵⁷ For the order quantity-price relationships between the areas, see page 24. It always applies to standard cost-performance models.

¹⁵⁸ Fig. 5 shows the bottom-up values of the furniture model. Since these are so easily comprehensible there, it is assumed here that planning is completed with the bottom-up planning because management agrees with the bottom-up value of the operating result. This means that the bottom-up values are identical to the final plan values.

X^{FP} - X with final plan value (FP)

The setpoint target of the area contribution margin (ACM^{SP}) is point-exact fulfilled if the actual values of all definition components, i.e., SQ_{SO} , SP_{SO} , VUC_{SO} , SQ_{BD} , SP_{BD} , and VUC_{BD} , coincide with their final plan values. In this case, the actual value of the area contribution margin is € 627,500 and thus corresponds to his setpoint value. However, we should also speak of a point-exact fulfillment if a combination of the two actual sales quantities for beds and sofas (SQ_{SO}^{ACT} and SQ_{BD}^{ACT}) is available, which also leads to the final planned value of the area target of € 627,500. When this criterion is applied, it is assumed that the actual values of the definition components in (27), which are not basic targets of the sales area, i.e., SP_{SO} , VUC_{SO} , SP_{BD} , and VUC_{BD} , match their plan end values.

Under these conditions, you can determine which combinations of the actual values of the sales quantities, that is, SQ_{SO}^{ACT} and SQ_{BD}^{ACT} , also realize the target “contribution margin” of € 627,500 and, therefore, lead to a point-exact fulfillment of the setpoint contribution margin of the sales area.

This will be demonstrated by means of an example. According to what has been said the final plan value (ACM^{FP}) will be equated with the setpoint of area contribution margin (ACM^{SP}), that is, the following applies

$$ACM^{SP} = ACM^{FP} = 627,500 \quad (28)$$

The numerical specification of the basic parameters in (27), which are not basic targets, results in

$$SP_{SO}^{FP} - VUC_{SO}^{FP} = 500 \quad (29)$$

and

$$SP_{BD}^{FP} - VUC_{BD}^{FP} = 350 \quad (30)$$

With (28) and as well as (29) and (30) results from (27) the relationship

$$SQ_{SO} = -0,7 \cdot SQ_{BD} + 1.255 \quad (31)$$

The area manager can use such an “iso-profit relationship” to see which values of the sales quantities can be realized by him (in addition to the setpoint sales quantities) in order to point-exact fulfill his setpoint area target “area contribution margin” $ACM^{SP} = 627.000$ €.

This only describes how the setpoint value of the contribution margin for the area is determined in accordance with (25) and under which conditions, i.e., condition (31), a point-exact target fulfillment exists.

However, in the normal case of a planning, at the end of the planning period, it is unlikely that the targets will be met with a point-exact fulfillment. Rather, it can be expected that almost only (favorable or unfavorable) setpoint-actual variances of the contribution margin will occur. Therefore, it should also be shown how the “actual value” of the area contribution margin, which should be used for the setpoint-actual comparison, is to be defined.

This “actual value” is called comparative actual value (ACM^{CO-ACT}) because it is not always (as in this case) an observable actual value, but a fictitious quantity. In this example, it is defined by

$$ACM^{CO-ACT} = SQ_{SO}^{ACT} \cdot (SP_{SO}^{FP} - VUC_{SO}^{FP}) + SQ_{BD}^{ACT} \cdot (SP_{BD}^{FP} - VUC_{BD}^{FP}) \quad (32)$$

With (29) and (30) follows from (32)

$$ACM^{CO-ACT} = SQ^{ACT}_{SO} \cdot 500 + SQ^{ACT}_{BD} \cdot 350 \quad (33)$$

ACT - actual (observable) value, CO-ACT - comparative actual value

In the block of equations listed below, the definition equation of the comparative actual value (33) is again given in the first line. The following line shows the comparative actual value (ACM^{CO-ACT}) in the case of a point-exact target fulfillment, which is achieved by realizing the actual sales quantities that exactly match the setpoint values of the sales quantities. The last two lines show the cases of over- and underfulfillment of the setpoint contribution margin of 627,500 €

$$\begin{aligned} ACM^{CO-ACT} &= SQ^{ACT}_{SO} \cdot 500 + SQ^{ACT}_{BD} \cdot 350 \\ ACM^{CO-ACT} &= 240 \cdot 500 + 1.450 \cdot 350 = 627.500 \text{ €} = ACM^{FP} \text{ (final plan setpoint value)} \\ ACM^{CO-ACT} &= 226 \cdot 500 + 1.470 \cdot 350 = 627.500 \text{ €} = ACM^{SP} \text{ (point-exact target fulfillment)} \\ ACM^{CO-ACT} &= 254 \cdot 500 + 1.440 \cdot 350 = 731.000 \text{ €} > ACM^{SP} \text{ (target overfulfillment)} \\ ACM^{CO-ACT} &= 242 \cdot 500 + 1.430 \cdot 350 = 621.500 \text{ €} < ACM^{SP} \text{ (target underfulfillment)} \end{aligned}$$

The procedure demonstrated using the furniture model can now be generalized. If a sales area sells the sales quantities SQ_1 to SQ_n , the setpoint value is determined in the same way in accordance with $ACM^{SP} = ACM^{FP}$. In this case, too, any combination of the actual sales quantities SQ_1^{ACT} , ..., SQ_n^{ACT} that fulfills the condition

$$ACM^{SP} = SQ_1^{ACT} \cdot (SP_1^{FP} - VUC_1^{FP}) + \dots + SQ_n^{ACT} \cdot (SP_n^{FP} - VUC_n^{FP}) \quad (34)$$

is a point-exact fulfillment of the area's setpoint commitment.

Setpoint-actual target comparison of area costs.

With this we turn to the further question of how the setpoint of an area target and the actual-comparative area target are to be defined in the case of the "area costs" (ACO) and under which circumstances in this case of a point-exact target fulfillment exists.

The final plan value equation of the reduced equation of the area costs in the assembly is

$$\begin{aligned} ACO^{FP}_{AS} &= PCR^{FP}_{AS} \cdot PCO^{FP}_{AS-SO} \cdot SQ^{FP}_{SO} + PCR^{FP}_{AS} \cdot PCO^{FP}_{AS-BD} \cdot SQ^{FP}_{BD} + FC^{SP}_{AS} \\ 482.500 &= 250 \cdot 1 \cdot 240 + 250 \cdot 1 \cdot 1.450 + 60.000 \end{aligned} \quad (35)$$

Determination of the setpoint value. The first step is to show how in this case the setpoint value of the area costs of the assembly, i.e., ACO^{SP}_{AS} , is to be defined. It is determined by

$$ACO^{SP}_{AS} = PCR^{SP}_{AS} \cdot PCO^{ACT}_{AS-SO} \cdot SQ^{ACT}_{SO} + PCR^{SP}_{AS} \cdot PCO^{ACT}_{AS-BD} \cdot SQ^{ACT}_{BD} + FC^{FP}_{AS} \quad (36)$$

The definition equation contains four definition components (SQ_{SO} , SQ_{BD} , PCO_{AS-SO} , and PCO_{AS-BD}) which are no basic targets. They are subject to the already mentioned "principle of eliminating all uncontrollable variances of a responsibility-related setpoint-actual control".

Accordingly, the same value must be selected in the setpoint and actual definition equations. And, since they are no basic business parameters in respect to the target commitment of the assembly manager, their actual value must be selected. It can be recognized that the setpoint area costs of the assembly (ACO^{SP}_{AS}) change according to the actual values of these four parameters. If the final plan values of the basic targets PCR and FC are entered in (36), the tar-

get cost function of the area costs of the assembly is obtained

$$ACO^{SP}_{AS} = 250 \cdot SQ^{ACT}_{SO} \cdot PCO^{ACT}_{AS-SO} + 250 \cdot SQ^{ACT}_{BD} \cdot PCO^{ACT}_{AS-BD} + 60.000 \quad (37)$$

In contrast to the fixed setpoint area contribution margin of the sales area of € 627,500, the setpoint area costs to be calculated at the end of the planning period depend on the actual values of the four parameters (SQ_{SO} , SQ_{BD} , PCO_{AS-SO} , PCO_{AS-BD}) which are variables that cannot be influenced by the assembly manager (non-basic targets). In this case, too, there are several alternatives with which a point-exact fulfillment of the setpoint area costs ACO^{SP}_{AS} can be realized. However, it depends on the actual values achieved for the non-basic targets in (37). For example, if the

$$\begin{aligned} SQ^{ACT}_{SO} \cdot PCO^{ACT}_{AS-SO} &= 250 \cdot 1,2 = 300 \\ SQ^{ACT}_{BD} \cdot PCO^{ACT}_{AS-BD} &= 1.500 \cdot 1,1 = 1,650 \end{aligned}$$

then the setpoint value (ACO^{SP}_{AS}) of the area costs is

$$\begin{aligned} ACO^{SP}_{AS} &= PCR^{FP}_{AS} \cdot PCO^{ACT}_{AS-SO} \cdot SQ^{ACT}_{SO} + PCR^{FP}_{AS} \cdot PCO^{ACT}_{AS-BD} \cdot SQ^{ACT}_{BD} + FC^{FP}_{AS} \\ 547,500 &= 250 \cdot 1,2 \cdot 250 + 250 \cdot 1,1 \cdot 1,500 + 60,000 \end{aligned}$$

All combinations of the actual basic targets PCR^{ACT}_{AS} and FC^{ACT}_{AS} , which satisfy equation (38), form a point-exact target fulfillment.¹⁵⁹

$$547,500 = 1,950 \cdot PCR^{ACT}_{AS} + FC^{ACT}_{AS} \quad (38)$$

Determination of the comparative actual value. As in the case of the setpoint-actual comparison of the area contribution margin, the comparative actual value of the total area costs of the assembly (ACO^{CO-ACT}_{AS}) to be compared with the setpoint value must be determined. Its variance with the setpoint value (ACO^{SP}_{AS}) leads to the determination of a point-exact fulfillment but above all also to the determination of an overfulfillment and underfulfillment. It is in accordance defined with

$$ACO^{CO-ACT}_{AS} = PCR^{ACT}_{AS} \cdot PCO^{ACT}_{AS-SO} \cdot SQ^{ACT}_{SO} + PCR^{ACT}_{AS} \cdot PCO^{ACT}_{AS-BD} \cdot SQ^{ACT}_{BD} + FC^{ACT}_{AS}$$

A point-exact fulfillment of targets exists if

$$ACO^{SP}_{AS} - ACO^{CO-ACT}_{AS} = 0 \quad (39)$$

Overfulfillment occurs if the variance amount is positive while a negative variance leads to underfulfillment.

It is claimed that an area Target Commitment Planning is characterized by the fact that the area managers do not have to adhere to the initially agreed values of the setpoint basic targets but also have the possibility to realize a point-exact fulfillment of the values of their setpoint area targets by using other actual values of the basic targets. That this is possible was demonstrated by describing the target area contribution margins of the sales area and the target area costs of the assembly area of the furniture model.

¹⁵⁹ The plan fixed costs FC^{FP}_{AS} are observable costs because they are a cost element that does not also have variable costs. If they would occur in a cost hypothesis $CO = PCR \cdot EP + FC$, their final plan value would be selected as the actual value. An interchangeability would then not be possible as assumed here. See also: Zwicker, E. *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 211, www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

Control of multi-level area Target Commitment Planning

Multi-level area Target Commitment Planning has already been dealt as one of the planning procedures of an Integrated Target Commitment Planning (s.p.54). There it was also described how the two area targets of such a planning are to be defined. The task now is to describe the setpoint and actual definitions of one or two area targets, which must be required to make a secondary responsibility area in question responsible for its setpoint-actual variance. This is demonstrated using the example of the furniture model. A number of questions will also be discussed in connection with the control procedure for secondary responsibility areas. One example of this is the question of why you can not only use one area target for sales areas as in the case of a pure cost center.

Setpoint-actual target comparison of the area contribution margin of secondary responsibility areas

If a secondary area manager is assigned a primary responsibility area or usually several primary responsibility areas with a sales quantity responsibility (sales areas), then his area contribution margin (ACM) is determined as the sum of the contribution margins of these primary sales areas. This results in a definition equation of the form

$$ACM = SQ_1 \cdot (SP_1 - VUC_1) + \dots + SQ_s \cdot (SP_s - VUC_s) \quad (40)$$

(ACM -Area contribution margin, SP_i -Sales price article i, VUC_i -Variable unit cost article i, SQ_i - Sales quantity article i)

in which s describes the number of articles for whose sales an area sales manager has made a sales quantity commitment in one of the subordinate primary sales areas.

After planning has been completed with the primary responsibility areas, the setpoint value of the secondary responsibility area in question can also be calculated according to

$$ACM^{SP} = SQ^{SP}_1 \cdot (SP^{FP}_1 - VUC^{FP}_2) + \dots + SQ^{SP}_s \cdot (SP^{FP}_s - VUC^{FP}_s) \quad (41)$$

The final plan values of the s contribution margins $SP^{FP} - VUC^{FP}$ have after completion of the planning a numerical value. If these numerical values are used in (41), the following relationship is obtained

$$ACM^{SP} = SQ^{ACT}_1 \cdot \{\text{numValue}_1\} + \dots + SQ^{ACT}_s \cdot \{\text{numValue}_s\} \cdot SQ^{ACT}_s \quad (42)$$

All combinations of actual sales quantities (SQ^{ACT}) that satisfy the (iso-profit) relationship (42) represent a point-exact target fulfillment by the head of the secondary management unit in the management hierarchy.

However, why is a manager in the management hierarchy held responsible for reaching the setpoint value ACM^{SP} (with $ACM^{FP} = ACM^{SP}$)? He is not even directly involved in the negotiation of the setpoint values of the basic sales quantity targets. This takes place between the central planning and the primary sales areas.

Such assignment of responsibility can be justified because the secondary area manager can have a direct or indirect influence on the primary responsibility areas subordinate to him, to ensure that the setpoint of his area contribution margin is maintained.

The relationship between the setpoint targets of the primary sales areas and the setpoint targets of the secondary responsibility areas in the management hierarchy can be described as follows: If all subordinate primary responsibility areas exactly meet their setpoint area contribution margin (setpoint area costs), then the setpoint area contribution margin of the superior secondary responsibility area is also point-exactly met. If all subordinate areas fall below (exceed) their setpoint area contribution margin (their setpoint area costs), then the setpoint area contribution margin of the superior secondary responsibility area is also fallen below (exceeded).

If, however, not all subordinate areas fall below or exceed their setpoint area contribution margin or adhere them precisely, then it depends on the individual case whether the setpoint area contribution margin (the setpoint area costs) of the superordinate secondary responsibility area is fallen short of, exceeded, or exactly adhered.

The objective of achieving a responsibility for compliance with target commitments not only for the primary responsibility areas but also for the positions within the management hierarchy is decisive for this procedure of a multi-level area Target Commitment Planning and Control. In the case of the single-level area Target Commitment Planning and Control described above, the corporate management makes the primary responsibility areas responsible for compliance with their area targets without taking into account the management positions in the hierarchy between. However, it is not inappropriate to involve the management positions located in the hierarchy between them in the responsibility, because they have the possibility of influencing the areas under their control to meet their setpoint area targets.

Setpoint-actual target control of the area costs of the secondary responsibility areas

We turn now towards the question of how the setpoint area costs and actual area costs of a secondary responsibility area are to be defined, i.e., the quantities for whose variance this area can be held responsible.

As described (s.p.55), the area costs of a secondary responsibility area correspond to the total of all its external delivery costs. The definition equation of the area costs is, as already mentioned, particularly informative if it is determined in the form of a reduced equation of the area model for the area in question. For example, if you look at the area costs of the head of the entire production, and there is a multi-stage production described by the cost-performance model between the subordinate production areas, then the reduced area equation of the area costs of the secondary responsibility area "entire production" has as mentioned (s.p.55) n cost components (CC) in the form of so-called cost chains.¹⁶⁰

$$CC = PP \cdot M_1 \cdot M_2 \cdot \dots \cdot M_v \cdot SQ \quad (43)$$

PP is the procurement price from an external cost center or an external supplier, which cannot be influenced by the head of the production and its primary production areas. SQ describes the sales quantity, which is for the production manager (but not for the sales manager) an un-

¹⁶⁰ See also page 104 for these cost chains. In addition to the chain (43), there are other chains to which the analog argument applies. See: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 90f., www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

controllable quantity. The sizes M_1 to M_v are quantity multipliers. These can as mentioned be consumption rates, production coefficients, and scrap rates. They can be the basic targets of the individual primary production areas, but they can also be uncontrollable basic parameters. When determining the setpoint value of this cost chain as a component of the definition of the setpoint value of the area costs of the “entire production area”, the question arises; Should in accordance with the already formulated “*principle of eliminating all uncontrollable variances of a responsibility related setpoint-actual control*”, the uncontrollable basic parameters in the cost chain are specified with their actual or planned end values?

Here the procurement price (PP) is to be set with its final plan value because it functions as business basis parameter of the target commitment of the production manager of the primary responsibility area (s.p.80). However, for the quantity multipliers (M) and sales quantities (SQ) that cannot be influenced by the production manager, their actual values (in the setpoint and actual case) must be selected.

The setpoint-actual variance of the area costs of a secondary responsibility area (ACO) is calculated with

$$ACO^{SP} - ACO^{CO-ACT} = (CC_1^{SP} - CC_1^{CO-ACT}) + \dots + (CC_n^{SP} - CC_n^{CO-ACT}) \quad (44)$$

A point-exact area target fulfillment is achieved if $ACO^{CO-ACT} = ACO^{SP}$. In this context, it is irrelevant which setpoint-actual variances $(CC^{SP} - CC^{CO-ACT})$ of the cost components (CC) in (44) brought about the point-exact fulfillment of the target.

Setpoint-actual target control of the corporate management. The variance between the setpoint and the comparative actual value of a secondary responsibility area target can also be determined for the corporate management level. The comparison between the actual and the setpoint operating result is characterized by the fact that in their reduced equations some non-basic targets such as procurement prices are to be assigned their final plan value and not their actual value. This means that the primary responsibility areas and all managers in the management hierarchy above them, and thus also the corporate management, are only held responsible for the variance between the actual comparative value and the setpoint value of their area target. This means that the corporate management (by itself) is only “held responsible” for the variance of all actual basic targets from their setpoint values. The demand, “*Make people responsible for numbers for which they can be made responsible*” applies in such planning and control not only to the primary responsibility areas but also to all heads in the management hierarchy.

However, it is questionable whether a multi-level area Target Commitment Planning and Control should be “pulled up” to the corporate management. After all, it has just been introduced by the corporate management in order to delegate the responsibility for a fulfillment of performance targets “downwards”.

Real actual value vs. comparison actual value in the operating result.

The actual comparison operating result of the control of the area Target Commitment Plan-

ning (OR^{CO-AC}) differs from the "real actual value" of the operating result (OR^{ACT}).¹⁶¹ In the reduced definition equation of the "real actual value" of the operating result, all parameters which are non-basic targets are assigned their actual values determined at the end of the planning period. However, this is not always the case in the corresponding definition equation of the actual comparison operating result (OR^{CO-ACT}) of a multi-level area Target Commitment Planning. The relationships between the real actual value of the operating result (OR^{ACT}) and its final planning value (OR^{FP}) can be described by taking into account the actual comparison operating result (OR^{CO-ACT}) as follows

$$OR^{FP} - OR^{ACT} = OR^{FP} - OR^{CO-ACT} - \Delta NRV$$

with

$$\Delta NRV = OR^{ACT} + OR^{CO-ACT}$$

Here ΔNRV is the variance between the real actual value and the actual comparison value of the operating result that cannot be attributed to any of the three categories of responsibility.

In the control procedure of an Integrated Target Commitment Planning for each variance between the final plan value and the actual value of a basic parameter, someone is made "responsible". It would be desirable to break down the variance between the plan value and the real actual value of the operating result, i.e. $OR^{FP} - OR^{ACT}$, into components that can be completely assigned to one of these responsible persons in their type of responsibility. However this is not possible with the procedure described for a multi-level area Target Commitment Planning and Control. Why such a procedure is not realizable is answered by the RR-Min variance analysis of the operating result still to be discussed (s.p.103).

Restriction of the exchange possibilities. The previous considerations may lead to the conclusion that an area manager may achieve any combination of actual basic targets that would result in the setpoint-actual target variance of area costs being zero or less than zero. However, such a general exchange option is not acceptable. The exchange possibility between certain cost types is rather to be limited by certain general regulations.

For example, an area manager may not be allowed to reduce the fixed travel expenses by € 10,000 compared to the original commitment and then increases the salaries of his ante-chambers by this amount of € 10,000 in return. However, the restrictions on exchange opportunities to be imposed by management should not be too extensive either, because an increasing restriction on possible exchanges will further restrict the primary responsibility area managers in terms of the actions available to them to meet their cost area targets. In extreme cases, the exchange possibilities are so restricted that only the original basic planning target commitments have to be met and then one has returned to a pure basic Target Commitment Planning.

Why two area targets? For sales areas, the use of two area targets was required, namely the use of area costs and area contribution margin. The question arises as to whether it is not pos-

¹⁶¹ In the definition equation of a "real actual value" of the operating result, however, further final plan values may also occur. These are the non-basic targets that are not measurable, but which, for example, as a depreciation amount are required as a definition component in the definition equation of the actual operating result. See for a detailed discussion of the epistemological status of the basic parameters in actual models: Zwicker, E., *Actual Cost-Performance Models: Structure, Semantics and Application*, Berlin 2008, www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated)

sible to work with just one area target for a sales area, as is the case for pure cost areas. In such a case, a clear judgment can be made as to whether or not an area has achieved its (only) target.

Unfortunately, however, this is probably not possible. One could define a quantity that is influenced by all basic targets of the sales area. It could also be defined in such a way that the change of a basic target in its direction of burden increase always leads to the intended area target being changed in the same direction (one that increases the operating result). However, these characteristics are not sufficient to define only one "reasonable target" for the sales area. For example, one could come up with the idea of simply deducting the *area costs* (ACO) of the sales area from the *area contribution margin* (ACM). In the case of the furniture model, there would be an area target of the form

$$AT = ACM - ACO \quad (45)$$

which contains both basic targets as definition components. Let us assume that such an area target should apply to a sales area that sells two articles and whose area costs consist of two cost value commitments in the form of material costs (CM) and personnel costs (CP). The definition equation of the single area target of the sales area according to (45) is then specified in the top line¹⁶²

$$\begin{aligned} AT &= (SP_1 - VUC_1) \cdot SQ_1 + (SP_2 - VUC_2) \cdot SQ_2 - CO_{CM} - CO_{PC} \\ AT^{SP} &= (SP_1^{FP} - VUC_1^{FP}) \cdot SQ_1^{SP} + (SP_2^{FP} - VUC_2^{FP}) \cdot SQ_2^{FP} - CO_{CM}^{SP} - CO_{PC}^{SP} \\ 1,900 &= (10 - 8) \cdot 10,000 + (6 - 4) \cdot 20,000 - 20,000 - 30,000 \end{aligned}$$

The following line shows the definition equation of the setpoint value (AT^{SP}) and a numerical example for the calculation of this setpoint is given below. Here the setpoint values are used for the basic cost targets CO_{CM} , CO_{PC} , SQ_1^{SP} and SQ_2^{FP} . For the uncontrollable definition components, that is, here the variable unit costs VUC_1 and VUC_2 and the *sales prices* SP_1 and P_2 , their final plan values are used both in the setpoint and in the actual definition equation.

If AT^{SP} were declared as the only area target of the sales area, any combination of the actual values of the four basic targets SQ_1 , SQ_2 , CO_{CM} and CO_{PC} leading to the setpoint value of the target of 1,900 would be permissible for its point-exact area target fulfillment.

If in the example, the sales area for the first article would realize an actual sales quantity of $SQ_1^{ACT} = 11,000$ pieces, then the contribution margin of this article would be € 2,000 higher than the contribution margin of its setpoint value $(SP_1^{FP} - VUC_1^{FP}) \cdot SQ_1^{SP}$. The sales area manager could use this amount, if it were completely interchangeable, to exceed the planned commitment amount of his fixed travel expenses by the amount of € 2,000 without changing the setpoint value of the area target of € 1,900 in question. However, such an exchange is unacceptable.

And this applies to any change of an *article contribution margin* ($\Delta ARCM$) if its amount is compensated with a corresponding change of the costs in the sales area (ΔCO). Such an exchange is to be rejected since the increase (or decrease) of the burden of the sales area manager connected with the realization a change of an article contribution margin ($\Delta ARCM$) is considerably lower than the corresponding reduction (or increase) of his burden resulting from the realization of ΔCO (with $\Delta CO = \Delta ARCM$).

If this claim is accepted, it does not make sense to define only one area target of a sales area,

¹⁶² The variable unit costs VUC_1 and VUC_2 are assumed to be uncontrollable basic parameters.

as was attempted with (45). The two area targets should be defined in such a way that they allow only an exchange between the cost and sales quantity commitments of the basic targets. The requirement to use a single obligatory control variable even in the case of sales areas cannot, therefore, be met.

In the case of using the total contribution margin as an area target (ACM), there are probably no objections in allowing a large number of different combinations of actual sales quantities as a point-exact area target fulfillment. This applies accordingly to the over- and underachievement of the target value of the area contribution margin. In the case of the area costs as a whole, however, as already mentioned, the interchangeability between certain cost elements of an area should be checked and possibly prohibited.

Variance analysis and control.

The control procedure of the Integrated Target Commitment Planning had taken an acceptable form in developing these rules, but I was not yet satisfied with it.

Although the literature on controls, as reported, did not contain any regulations on the implementation of a model-based control, two areas close to the concept of control were often mentioned and also discussed in more or less detail. This involved the variance analysis and the so-called “control loop planning” or “cybernetic planning and control” of companies.

During the first review of the relevant literature, I did not find any useful regulations for designing a model-based control system. But the subjects “variance analysis” and “control loop planning” or “cybernetic planning and control” are treated in the literature in such a close connection with the concept of control that one thing was clear to me: Only if I neatly work out the relationships of these two areas to the Integrated Target Commitment Planning and Control did I have any chance of being noticed by the relevant experts.

There are many authors who have dealt with these areas in more or less detail. It, therefore, seemed to me to be important, building on their knowledge, to work out the differences and similarities between these two areas and the Integrated Target Commitment Planning and Control.

First, I turned to variance analysis. (The control loop planning later followed this). However, this consideration did not happen in a way, as one would perhaps believe. I immediately began to develop my own variance analysis without studying the literature on variance analysis in depth.

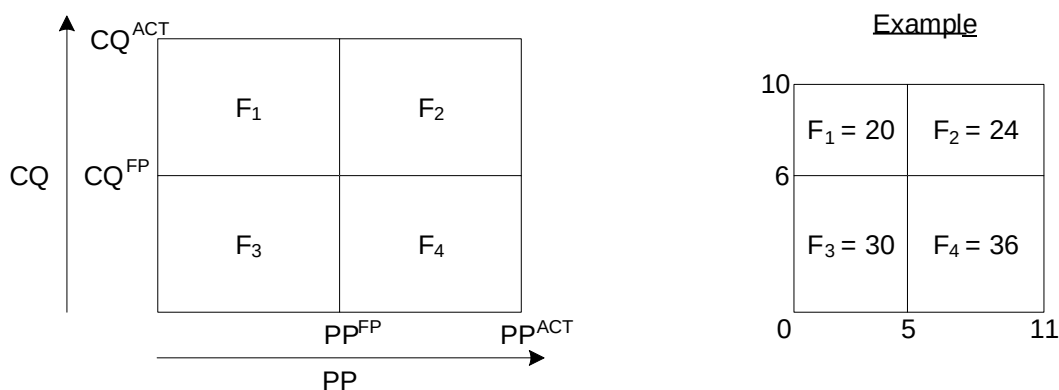


Fig. 20: Variance diagram of a procurement price consumption quantity variance

From the various textbooks of general business administration and also cost and performance accounting I knew that the variances of the cost equation

$$CO = CQ \cdot PP \quad (46)$$

(CO - costs, CQ - consumption quantity, PP - procurement price)

could be described with regard to the variance between their actual and planned values of the consumption quantity (CQ) and the procurement price (PP) by variance diagrams. Fig. 20 provides an example of this.

Using such a diagram, many authors demonstrate the result of a variance analysis between the planned and actual costs described by equation (46).

I also used this variance diagram as a starting point for my considerations. However, I assumed from the beginning that a variance analysis based on such a diagram should always work with the plan values that are the result of an Integrated Target Commitment Planning. Thus, I assumed that equation (46) could be interpreted as "one equation model" of an Integrated Target Commitment Planning.

The top target of this simple equation model is the cost (CO). The consumption quantity (CQ) serves as the basic target (to be met) and the procurement price (PP) as the basic parameter that cannot be influenced and is, therefore, to be forecast.

Assume that the planned values shown in Fig. 20 correspond to the final planned values of a planning procedure in which an area 1 has committed itself to maintain a setpoint value of the consumption quantity CQ^{SP} and area 2 has assumed the forecasting responsibility for the procurement price of the final plan PP^{FP} . The numerical values assumed for this case can be seen in Fig. 20.

The actual-plan variance between CO^{ACT} and CO^{FP} is 80 value units. From the point of view of the Integrated Target Commitment Planning, the question now arises, who is responsible for this variance?

It makes sense to divide this actual-plan variance of 80 value units into certain partial variances, which have to meet the following two requirements.¹⁶³

1. The partial variances to be determined should contain expressions of model parameters (PR) in the form $(PR^{ACT} - PR^{FP})$ whose equalization $(PR^{ACT} = PR^{FP})$ causes these partial variances to become zero. This is because the partial variance of this basic parameter or these basic parameters could then be related to a responsible person. (Structure claim 1)
2. If the partial variances determined contain several expressions of the form $(PR^{ACT} - PR^{FP})$, then it should not be possible to divide them into further components which satisfy the structure claim 1. In this case, these not further decomposable partial variances could be related to one person or several persons, who are responsible for their amount. (Structure claim 2)

¹⁶³ The model parameters PR that are used in the following variance analysis assumed to originate from the final plan model of an Integrated Target Commitment Planning are marked with the superscript index "FP" (final plan value). Depending on the circumstances, this can be in individual cases a setpoint parameter with the superscript index "SP" or a pure forecast parameter with the superscript index "FV" (forecasting value).

If these two structural requirements are met, then such a partial variance should be referred to as an elementary actual-plan variance.

How can these requirements be applied to the variance diagram in Fig. 20? Using the area sections in Fig. 20, the actual and plan costs can be described as follows.

$$CO^{ACT} = F_1 + F_2 + F_3 + F_4 \quad 20 + 24 + 30 + 36 = 110$$

$$CO^{FP} = F_3 = 30.$$

This means that the actual-plan variance of the costs of 30 value units is determined by

$$CO^{ACT} - CO^{FP} = F_1 + F_2 + F_4 \quad 20 + 24 + 36 = 80$$

If you leave in the algebraic expressions for F_1 , F_3 and F_4 , only the actual-plan variances of the basic parameters in symbolic form, then you get the expressions

$$F_1 = (CQ^{ACT} - CQ^{FP}) \cdot 5 \quad (47)$$

$$F_2 = (CQ^{ACT} - CQ^{FP}) \cdot (PP^{FP} - PP^{ACT}) \quad (48)$$

and

$$F_4 = (PP^{ACT} - PP^{FP}) \cdot 6. \quad (49)$$

On the basis of the symbolically left actual-plan variances of the basic parameters in (47) to (49), it is possible to judge whether the two structural requirements are being met. This, as can be seen, is the case. These expressions are, therefore, elementary actual-plan variances.

In order to function as "responsibility variance variables" of an Integrated Target Commitment Planning, however, in addition to the property of being an elementary actual-plan variance, a "responsibility assignment" is also required. In other words, the determined elementary actual-plan variances must be assigned to one of the persons involved in the planning as variances for which they are responsible.

With the expressions (47) and (49), i.e., expressions in the form "'numValue' • (PR^{ACT} - PR^{FP})", the assignment did not seem problematic to me. The person responsible for the variance of the basic parameter PR^{ACT} - PR^{FP} is fully responsible for the variance of "numValue" • (PR^{ACT} - PR^{FP}).

In the event of a variance of the type (48), both are co-responsible for forecasting PR^P and compliance with CQ^P. Actual-plan variances, which could be interpreted in such a way, are to be referred to as variances of a full or co-responsibility. The following overview shows that the actual plan-cost variance of 80 value units can be divided into two full responsibility variance and one co-responsibility variance.

Actual costs	$F_1 + F_2 + F_3 + F_4 = 110$
- Full responsibility for a target commitment by area 1	- $F_1 = -20$
- Full responsibility for a forecast accuracy by area 2	- $F_4 = -36$
- Co-responsibility for area 1 and area 2	- $F_2 = -24$
= Plan costs	$F_3 = 30$

However, costs are not only defined as in case (46) by an equation with two explanatory basic parameters but can contain several multiplicatively linked basic parameters. The following hypothesis equation

$$CO = CQR \cdot SQ \cdot PP \quad (50)$$

(CO- cost, CQR - consumption quantity rate, SQ - sales quantity, PP - procurement price) for example, do not contain two, but three model parameters as explanatory variables, which are interpreted as basic parameters of an Integrated Target Commitment Planning.

This hypothesis equation of costs should, in turn, be regarded as a one-equation model of an Integrated Target Commitment Planning with costs (CO) as the top target.

The actual-plan variance of the top target costs (CO), that is, $CO^{ACT} - CO^{FP}$ is represented in this case by

$$CO^{ACT} - CO^{FP} = CQR^{ACT} \cdot SQ^{ACT} \cdot PP^{ACT} - CQR^{FP} \cdot SQ^{FP} \cdot PP^{FP} \quad (51)$$

Can this actual-plan variance, in turn, be split into (non-decomposable) elementary actual-plan variances, as in the two basic parameters case (46)?

Fig. 21 shows how the elementary actual-plan variances to be determined in such a "three-parameter case" can be visually described by certain cuboids.

The actual costs are described by the volumes of the following cuboids

$$CO^{ACT} = I + II + IV + VIII$$

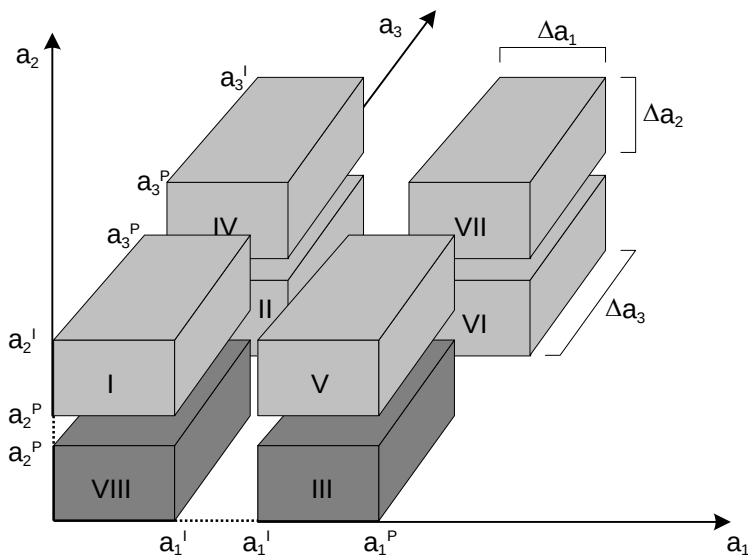


Fig. 21: Elementary actual-plan variances I, II, III, IV, and V of a one-equation model of the Integrated Target Commitment Planning with three basic parameters (a_1 , a_2 , and a_3)

and the plan costs accordingly by means of

$$CO^P = III + VIII$$

The actual-plan variance of the costs $CO^{ACT} - CO^{FP}$ is therefore

$$CO^{ACT} - CO^{FP} = I + II + IV - III$$

It can be seen that the algebraic expressions describing the four cuboids I, II, III, and IV satisfy the structural requirements 1 and 2. They are thus elementary actual-plan variances that allow you to assign responsibilities.

Based on this geometric example, it became clear to me how to proceed in case of a cost chain of the form

$$CO = a_1 \cdot a_2 \cdot \dots \cdot a_n \cdot PP \quad (52)$$

in which all explanatory variables are basic parameters of a one-equation INZPLA-model with the top target (CO). The variance between actual and final plan costs

$$CO^{ACT} - CO^{FP} = a_1^{ACT} \cdot a_2^{ACT} \cdot \dots \cdot a_n^{ACT} \cdot PP^{ACT} - a_1^{FP} \cdot a_2^{FP} \cdot \dots \cdot a_n^{FP} \cdot PP^{FP} \quad (53)$$

can be "visualized" in an analog procedure using an n-dimensional hyperquader.

Using the two examples in Figures 20 and 21, it was shown that the actual-plan variances of the two and three-linked cost chains can be divided into such elementary actual-plan variances. If one wants to develop however a general computer-supported procedure for the execution of a responsibly-related variance analysis, then one must develop for this a procedure, with which it is possible to decompose each actual-plan variance of the form (53) into its elementary actual-plan variance. Thus the variance $CO^{ACT} - CO^{FP}$ in (53) is divided by a sum of elementary variance components of the form

$$\text{"numValue"} \cdot (a_{v1}^I - a_{v1}^P) \cdot (a_{v1}^I - a_{v1}^P) \cdot \dots \cdot (a_{vz}^I - a_{vz}^P)$$

The parameters a_{v1} to a_{vz} are certain basic parameters from the set of the basic parameters a_1 to a_n of the cost-performance model listed in (54). I developed such an actual-plan chain decomposition procedure. The variance components determined with this procedure can be differentiated with regard to the number of their chain elements. In order to be able to assign them however to a person in a certain type of responsibility, an assignment rule is to be developed. Here, the corresponding assignment rules can be used to determine full and co-responsibility, as in the case of a chain of two and three links discussed above.

Elementary actual-plan variances with $n = 1$, that is the form

$$\text{"numValue"} \cdot (a^{ACT} - a^{FP}) \quad (54)$$

are fully assigned to the person who is responsible for the basic parameter a in one of the responsibility types.

Elementary actual-plan variances of the form

$$\text{"numValue"} \cdot (a^{ACT}_1 - a^{FP}_1) \cdot \dots \cdot (a^{ACT}_n - a^{FP}_n) \quad (55)$$

with $n > 1$ require a distinction.

In this case, one person alone can also be fully responsible for the variance of this component in one particular responsibility type. This is the case if all basic parameters in (55) can be assigned to a person in a responsibility type. It is also possible that a person is responsible for the variance in different responsibility types. Most likely, however, is that several persons

with the same or different responsibility types are jointly responsible for the variance. Then there is a co-responsibility

Variance analysis of the operating result. Up to now, a one-equation model was assumed, whose top target are certain costs. However, if one assumes a "normal" cost-performance model with the operating result as the top target, then one is primarily interested in whether the actual-plan variance of the operating result can be attributed to certain actual-plan variances of a full or co-responsibility.

In order to pursue this question, we want to start from the definition of the operating result in the case of the total cost version of a cost-performance model. It is defined as the difference between total sales (TSA) and total costs (TCO).¹⁶⁴

The following thus applies

$$OR^{ACT} - OR^{FP} = TCO^{ACT} - TCO^{FP} + TSA^{ACT} - TSA^{FP} \quad (56)$$

As described, the total costs (TCO) can be traced back to cost chains of the form (52), whose actual-plan variances can, in turn, be traced back to responsible elementary actual-plan variances. In order to reduce the actual-plan variance of the operating result to the elementary actual-plan variances that cause it, the actual-plan variance of the sales ($TSA^{ACT} - TSA^{FP}$) in (56) is also to be traced back to their elementary actual-plan variances, which must allow an attribution of responsibility.

Full Responsibility			Variance Amount	Percent
	Fulfillment Responsibility	Area 1	...	...
		...	...	...
	Forecasting Responsibility	Area 1	...	...
		...	...	...
	Realization Responsibility	Area 1	...	...
		...	...	...
Co-Responsibility			...	...
		?	...	100

...

...

...

Actual Operating Result

- Plan Operating Result

Actual-Plan Operating Result

Fig. 22: Actual-plan variance tableau of the operating result

Fig. 22 shows the structure of a so called actual-plan variance tableau of the operating result,

¹⁶⁴ This definition assumes that the inventory changes are zero.

which traces both the cost and the sales variances back to their responsibility-related elementary variances. In other words, the actual-plan variance of the operating result is completely traced back to variances for which a certain area in a certain type of responsibility is fully responsible or for which certain responsibility areas in certain types of responsibility are co-responsible.

Two steps were necessary to determine the full and co-responsibility variances of the total costs of this variance tableau.

First, a procedure had to be developed to determine all cost chains of the form (52).

Secondly, a further procedure had to be developed to determine the described elementary actual-plan variances by presetting the actual and plan values of the basic parameters from the expressions of the form (53). As already mentioned, it was referred to as the actual-plan chain decomposition procedure.

If the elementary actual-plan variances of the form (54) and (55) have been determined, they must be assigned to certain areas in a responsibility type either fully or jointly. After that, however, their amounts must still be calculated, since the actual-plan variances ($a^{\text{ACT}}_i - a^{\text{FP}}_i$) in the expressions (54) and (55) are currently only available in symbolic form. Once this has been done, the actual-plan variance tableau can be created.

	Number	Amount in €	
Number Parameters	1.718		
Number Basic Parameters with Variances	1.693		
Variance Component with Chain Length			
Chain Length1	249	27.917,13	
Chain Length2	410	-109.694,69	
Chain Length3	2.140	93.472,77	
Chain Length4	5.110	106.506,12	
Chain Length 5	11.245	126.240,07	
Chain Length 6	15.355	6.987,98	
Chain Length 7	12.365	89,52	
Chain Length8	5.780	0,47	
Sum Variance Components	52.654	251.519,37	
Type of Variance Contributions			
Full Responsibility Type 1 (1. Grade)	211	27.922,39	93,6%
Full Responsibility Type 2 (1. Grade)	257.201	207.546,90	
Full Responsibility Type 2 (2. Grade)	354	0,11	
Co-Responsibility (2. Grade)	532.432	15.692,55	6,4%
Co-Responsibility (3. Grade)	599.349	353,97	
Co-Responsibility (4. Grade)	392.114	3,44	
Co-Responsibility (5. Grade)	148.031	0,01	
Co-Responsibility (6. Grade)	29.912	0,00	
Co-Responsibility (7. Grade)	2.720	0,00	
Co-Responsibility (8. Grade)	88	0,00	
Sum Variance Contributions	1.962.412	251.519,37	

Fig. 23: Results of the explorative RR-Min variance analysis of the Kilger model assuming certain actual and plan values of the basic parameters.

Determination of cost chains. The first task, the identification of the cost chains of form (52) is not as simple as it may appear. They shall be determined by means of a structure analysis. In principle, you can determine these chains by tracing all chains back to the procurement prices (PP) starting from the sales quantities and also fixed order quantities in the existing cost-

performance model. The product of the chain elements, apart from the procurement price, then describes the purchase quantity. However, if quantity loops occur in the quantity structure, you can also find chains with which you can get out of the loop and reach the procurement price, but in the loops themselves, there are chains that are basically infinitely long, because you can run through the loops as long as you like.

The same applies to the much more frequently occurring price loops for interdependent settlement between cost centers. If you come across the case when tracing a transfer price that the transfer price depends on itself, you are entering a price loop. Such price loops, which are often embedded in large loop systems, can be run through as long as desired, like the quantity loops, and the number of coefficients determined becomes longer and longer and, more and more chains are added. Some chains naturally leave the loop again and "land" at the procurement price. To solve this "grinding problem", I developed a chain structure analysis in the form of a "chain back tracking procedure", which tracks the chains in all directions back to the procurement prices, but also always goes through the price and quantity loops as before.

As already described, this generates more and more chains in addition to the chains that have "arrived" at a procurement price. Such a procedure, however, requires the development of a termination criterion. This one looked like this: The variance between the actual and plan values of chains that have not yet arrived at a procurement price (in the form of a basic parameter) is determined at intervals. If this variance falls below a certain amount, e.g., € 0.1, the further chain tracking and thus the division of this chain into further chains with additional elements is terminated.

As another criterion of termination, you can also specify that a termination is not to take place until the actual-plan variance of the operating result up to a certain percentage, for example, 99 percent, has been explained by the elementary actual-plan variances. However, under certain circumstances, this can generate considerably long chains, because some basic parameters in the loops are touched several times and thus occur several times in the chains.

It turned out that the determination of the actual and plan chains and their dismantling with the aid of the dismantling method developed led to a considerably high number of such chains even in small models. As Fig. 23 shows, the chain analysis led to a total of 52,654 chains with up to 8 chain elements in the case of the not particularly large Kilger model.

After the chains have been determined, the actual plan chain decomposition procedure already mentioned has to be carried out. As Fig. 23 shows, this led to 1,962,412 elementary actual-plan variations in the case of the Kilger model.

After determining the elementary actual-plan variances, the table of actual-plan variances of the operating result described in Fig. 22 can then be created in a third step, disregarding the regulations for assigning responsibilities.¹⁶⁵

Only after this procedure had been developed and tested using examples such as the Kilger model given here, did I turn to a more in-depth study of the existing procedures for a variance

¹⁶⁵ For more information on this analysis and the actual-plan variance table created for the operating result, see: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 128f., www.lnzpla.de/IN34-2007.pdf. (Text in German, title translated)

analysis and try to find out how the actual and plan cost chains are broken down there. The determination of the cost chains did not seem to be a problem for any of the authors. The different methods of "cost chain splitting" and thus the variance analysis were studied by me compared with the variance analysis method I developed. I can only report on the result here.¹⁶⁶

If you want to familiarize yourself with the methods of variance analysis, you have to deal with the work of Josef Kloock. If Wolfgang Kilger is regarded as the father the flexible plan cost accounting, Josef Kloock is the father of variance analysis. He has analyzed and structured this area from a wide variety of perspectives. In 1982, Kloock developed two methods, differentiated cumulative variance analysis on an actual and plan basis. These two methods, called Kloock's variance analysis (B.1 in Fig. 25 on page 109) meet certain requirements, which Kloock deems necessary for a variance analysis method.

Using these two methods, Kloock calculates certain partial variances that lead from the actual to the plan costs of a cost element and from the planned to the actual costs of the same cost element. However, it became apparent during the study of his procedure that the partial variances determined by him need not necessarily be elementary actual-plan variances.¹⁶⁷ So I couldn't use his decomposition procedures. In my variance analysis procedures (see structure requirement 2 on page 93), you must ensure that an actual-plan partial variance is always an elementary actual-plan variance. This is because you can only make the described responsibility assignment based on an elementary actual-plan variance.

For a short time I had the impression that with the elementary actual-plan variances, I had identified a form of variance components that had not yet been described in the literature.

However, it soon became clear that Wilms a scholar of Kloock already described such a decomposition procedure, in his dissertation in 1988.¹⁶⁸ This method was called the Min-method because it determines the smallest possible variance components. Since these elementary actual-plan variances undergo a special interpretation of responsibility within the framework of the variance analysis developed by me, I referred to this procedure as (responsibility-related) RR-Min variance analysis.

For Josef Kloock, who was sovereign in the analysis of variances, it would have been easy to propagate the Min-method. The reason why he ignored this can probably only be explained by the fact that in 1982, in connection with the development of his procedures, he drew up certain requirements for a variance analysis, which was to comply with a "good" variance analysis.¹⁶⁹ These requirements are best met by its procedures of differentiated cumulative variance analysis on an actual and plan basis. Therefore, the Min-method that is splitting the

¹⁶⁶ For an analysis of these procedures, see: Zwicker, E., *Control and Variance Analysis...*, op. cit., p. 193f.

¹⁶⁷ For this see: Zwicker, E., Zwicker, E., *Control and variance analysis ...*, op. cit., p. 212f.

¹⁶⁸ See: Zwicker, E., *Control and Variance Analysis ...*, op. cit., p. 202f.

The Wilms method has received little attention in the literature. In the comprehensive monograph on "*Interne Unternehmensrechnung*" by Ewert and Wagenhofer, for example, the methods of variance analysis are dealt with in detail. However, the Wilms procedure is only mentioned briefly from the 3rd Ed. 1997 and assessed negatively there. See: Zwicker, E., *Control and Variance Analysis...*, op. cit., p. 199.

¹⁶⁹ For this see: Zwicker, E., *Control and variance analysis ...*, op. cit., p.215f.

actual-plan variance of the costs into minimum variance components, was consequently of no importance for him. Therefore it was described relatively late by his research associate Wilms in 1988.¹⁷⁰

The variance analysis of an Integrated Target Commitment Planning only assumes one requirement that is not included in Kloock's list of requirements. This is the requirement for an assignment of the actual-plan partial variances of the reference variable (for example, the operating result) to certain persons responsible in one of three types of responsibility. This requirement is met solely by the Min-method.

In his monograph Wilms does not describe any method for the systematic determination of cost chains. Such a procedure is required to determine the elementary actual-plan variances under specification of the actual and plan values of a cost chain (52) with any number of links. Therefore, the problem that the chains are not readily available in a structure with quantity and price loops is not addressed by him. Furthermore, Wilms does not describe any general procedure how to arrive at the minimum variance components from the actual plan partial variances of the form (53). Although he speaks of the "Min-method", he does not describe the two necessary steps of this "method", i.e. the procedure for a chain determination and for an actual-plan chain decomposition. Instead, he demonstrates the min-procedure using a simple example. Other authors, who described the Min-method after the contribution of Wilms, did also not treat these topics.

The Min-method has an advantageous property that other methods of a differentiated cumulative variance analysis do not possess. This property is to be referred to as the directional consistency of the parameter variances. It is briefly demonstrated by an example. Assuming the full responsibility variances of two basic parameters a_1 and a_2 lead to a cost reduction, for example

$$\text{"numValue"} \cdot (a_1^{\text{ACT}} - a_1^{\text{FP}}) = -16 \quad (57)$$

and

$$\text{"numValue"} \cdot (a_2^{\text{ACT}} - a_2^{\text{FP}}) = -10 \quad (58)$$

then a co-responsibility variance of the form.

$$\text{"numValue"} \cdot (a_1^{\text{ACT}} - a_2^{\text{FP}}) \cdot (a_2^{\text{ACT}} - a_2^{\text{FP}}) \quad (59)$$

can also occur as an actual-plan variance. In this case, the question arises, can a binding statement be made as to whether this co-responsibility variance has a positive or negative value?

It would contradict any interpretation of the actual-plan variances (57) and (54) as causal elements of a_1 and a_2 if the co-responsibility variance (59), which is jointly caused by the cost-reducing variances of a_1 and a_2 , would not also have a negative value, but would increase costs with regard to the operating result. Therefore, it is indispensable for the here propagated

¹⁷⁰ After the publication of Wilms, Kloock (1999) also commented on the assessment of this procedure. See: Zwicker, E., *Control and Variance Analysis ...*, op. cit., p.201f

procedure of a variance analysis that all co-responsibility variances of the full responsibility variances, which have the same sign (cost reduction or cost increase), must also have the same sign. In this case, there exists a directional consistency of the parameter variances. Such proof was provided by me for any full-responsibility variances a_1 up to a_n including all co-responsibility variances, which contain the actual-plan variances of parameters a_1 up to a_n including as partial quantities and also as a total quantity.¹⁷¹

After I had studied the procedures of Kloock and Wilms and also those of other authors more intensively, my interest in variance analysis had awakened. The result was (in my view) the development of a comprehensive system of variance analysis, which also includes the procedures of Kloock and Wilms as specific variants. I described this system in detail.¹⁷² Fig. 25 on page 109 shows a classification tree that includes all variants.

A distinction is made between a responsibility-related and a non-responsibility-related variance analysis (A vs. B in Fig. 25).

In the case of a responsibility-related (RR) variance analysis, all model parameters of the model in question must be interpreted as basic parameters of an INZPLA-model.

All methods of model-based variance analysis developed so far, such as the methods of Kloock and Wilms, can be assigned to one of the non-responsibility-related (NRR) variance analysis. These procedures are not based on an interpretation of the model parameters in the sense of a responsibility assignment.

Branch A of a responsibility-related variance analysis in Fig. 25 is, therefore, only relevant if an Integrated Target Commitment Planning model is available. In this branch, a distinction is first made between different model types with which a variance analysis can be carried out. Only the case of a variance analysis with a standard cost-performance model on an annual basis with an annual interval is covered in the overview, that is, the branch AAB. A distinction is made there (1 vs. 2) between a normative and explorative variance analysis.¹⁷³

The normative variance analysis is the control procedure of the Integrated Target Commitment Planning. Therefore the control procedure of an Integrated Target Commitment Planning is systemized as an area of the normative variance analysis, which is to be distinguished from all other procedures of an explorative variance analysis. In the light of the systematization developed here, the procedures of an explorative variance analysis are not control procedures. This also applies to the RR-Min variance analysis (2 in Fig. 25).

The control (1 in Fig. 25) of an Integrated Target Commitment Planning includes the definition of the actual and setpoint values of the control variables described and the determination of the setpoint-actual variance. This procedure does not require an explorative variance analysis, i.e., neither the NRR variance analysis procedures nor the RR-Min variance analysis.

Analysis of variance as a current topic. Many areas of the Integrated Target Commitment Planning are only briefly discussed in this "History...". The pure area Target Commitment

¹⁷¹ See: Zwicker, E., *Control and Variance Analysis...*, op. cit., p. 282f. Wilms did not provide that kind of proof. See, op. cit., p. 197f.

¹⁷² See: Zwicker, E., *Control and Variance Analysis...*, op. cit.

¹⁷³ The corresponding distinction also applies to the models under AAA and AAC, which have not been further explicated.

Planning is a planning procedure that is hardly covered in the literature. It, therefore, does not tie in with existing concepts and is unlikely to lead to objections based on already existing competing concepts. The situation is completely different regarding the term "variance analysis". Almost every reader interested in the field of controlling will associate more or less detailed ideas with this term.

For example, some authors regard Kloock's variance analysis procedures as control procedures or as part of a control procedure. In this sense, Küpper notes that "*variance analyses*"... *form a core of control processes*".¹⁷⁴ Since many readers already assume certain more or less detailed concepts for variance analysis, in the following, it should be explained in relative detail why a differentiation must be made between an explorative variance analysis and a normative variance analysis, i.e., the control of the Integrated Target Commitment Planning.

The result of an explorative RR-Min variance analysis with respect to an endogenous model variable (here the operating result) is shown in the actual-plan variance tableau in Fig. 22. The explorative RR-Min variance analysis practiced here attributes the actual-plan variance of the operating result to certain components for whom area managers are fully or jointly responsible. However, it does not serve to control the areas target and fulfillment commitments of the area managers. This assertion is to be substantiated as follows.

The normative variance analysis or the control of the Integrated Target Commitment Planning leads for each responsibility area ($i = 1$ to n), to three types ($j = 1$ to 3) of a control variance $CV_{i,j}$, which can also be zero. The results of this (explorative) RR-Min variance analysis would correspond to the results of the (normative) control if the actual-plan variance of the operating result $OR^{ACT} - OR^{FP}$ corresponded to the sum of all control variances, i.e.,

$$OR^{ACT} - OR^{FP} = \sum_{i=1}^n \sum_{j=1}^3 CV_{i,j}. \quad (60)$$

The sum of the control variances of an area could then be inserted in the lines of Fig. 22 according to the respective type of responsibility (responsibility for fulfillment, forecasting, and realization). The line "co-responsibility" should be deleted because it would no longer be necessary.

However, this case of an RR-Min variance analysis only exists if the total costs (and not the operating result) are used as the top target and all cost elements are cost values. This means that it represents in a cost element tableau of a cost center in Fig. 2 on page 33, the cost category assigned in the first line.

If a setpoint value of $CO^{SP} = 100,000$ € was agreed for the travel expenses of an area and the actual travel expenses are $CO^{ACT} = 120,000$ €, then the actual-setpoint variance as a measure of control is 20,000 €. This actual-setpoint variance that is $CO^{ACT} - CO^{SP} = 20,000$ €, is also an elementary actual-plan variance of the RR-Min variance analysis. Therefore, if the total costs (TCO) are used as the reference variable for an RR-Min variance analysis and these are composed only of cost values then the total equation is

$$TCO = CV_1 + CV_2 + \dots + CV_n \quad (61)$$

In this case, the $CV_i^{ACT} - CV_i^{SP}$ variance contributions are assigned to the area that has a full

¹⁷⁴ Küpper. H.U., *Controlling. Konzeption, Aufgaben, Instrumente*, 4th Ed., Stuttgart 2005, p. 198.

fulfillment or forecast responsibility for them and are entered in the corresponding lines of the actual-plan variance tableau. In this example, the actual-plan variance tableau would only be a compilation of all cost variance amounts ($CV^{ACT} - CV^{SP}$), the sum of which gives the plan-actual variance of the total costs (TCO).

However, it can be shown a case that the plan-actual variance (or actual-plan-variance) of a cost element for which in regard of the RR-Min variance analysis an cost center is fully responsible almost never coincides with the setpoint-actual variance (or actual-setpoint variance) of the cost control of this cost element. This is the case if a secondary cost element exists that is determined by a series of cost chains. An example is the secondary cost element (CO), which is defined by the equation

$$CO = TP \cdot CQR \cdot TP \quad (62)$$

(CO - costs, TP - transfer price, CQR - consumption quantity rate, EP - employment)

In accordance with the principle formulated for calculating the actual and setpoint values of aggregated control variables, the setpoint-actual variance of cost control amounts to

$$CO^{ACT} - CO^{SP} = TP^{SP} \cdot CQR^{ACT} \cdot EP^{ACT} - TP^{SP} \cdot CQR^{SP} \cdot EP^{ACT} \quad (63)$$

It is assumed that the transfer price (TP) in the cost-performance model is an endogenous variable that is determined by the addition of certain components of the form

$$M_1 \cdot M_2 \cdot \dots \cdot M_n \cdot PP \quad (64)$$

The sizes $M_1, M_2, \dots$ are basic parameters of the model in the form of quantity multipliers as described (s.p.31). They are rates of consumption, production coefficients, and scrap rates. PP is the procurement price of the activity created over several production levels, the costs of which are determined by the cost chain. As already mentioned, employment (EP) in (63) consists of corresponding components of the form

$$M_1 \cdot M_2 \cdot \dots \cdot M_v \cdot IQD \quad (65)$$

IQD is an initial quantity driver (s.p.31). This is usually a sales quantity, but a fixed order quantity (for example, a fixed consumption of kWh in a cost center) can also be an initial quantity driver.

Fig. 24 shows such a case. The employment (EP) of the cost center in question is determined by five chains whose initial quantity drivers are the sales quantities SQ_1 to SQ_4 . The chain triggered by SQ_1 , for example, makes a contribution ΔEP to the employment (EP) described by " $M_6 \cdot M_8 \cdot SQ_1$ ". The transfer price (TP) is determined by six chains whose "chain drivers" are procurement prices PP_1 to PP_4 .

Therefore, thirty cost chains "run" over the CQR consumption rate in (62). In other words, the CQR consumption rate in the cost center under consideration is contained in thirty cost chains. The elementary actual-plan variances must be calculated for each of these cost chains, specifying the actual and plan values. Each of the thirty cost chains leads to a full responsibility component in the form " $numValue \cdot (CQR^{ACT} - CQR^{SP})$ ".

However, the setpoint-actual variance of the control, which is used to assess the extent to which the target commitment CQR^{SP} has been met, is described by the $CO^{ACT} - CO^{SP}$ cost

variance in (63) and, therefore, does not correspond to the sum of these thirty full responsibility variance of a fulfillment responsibility.

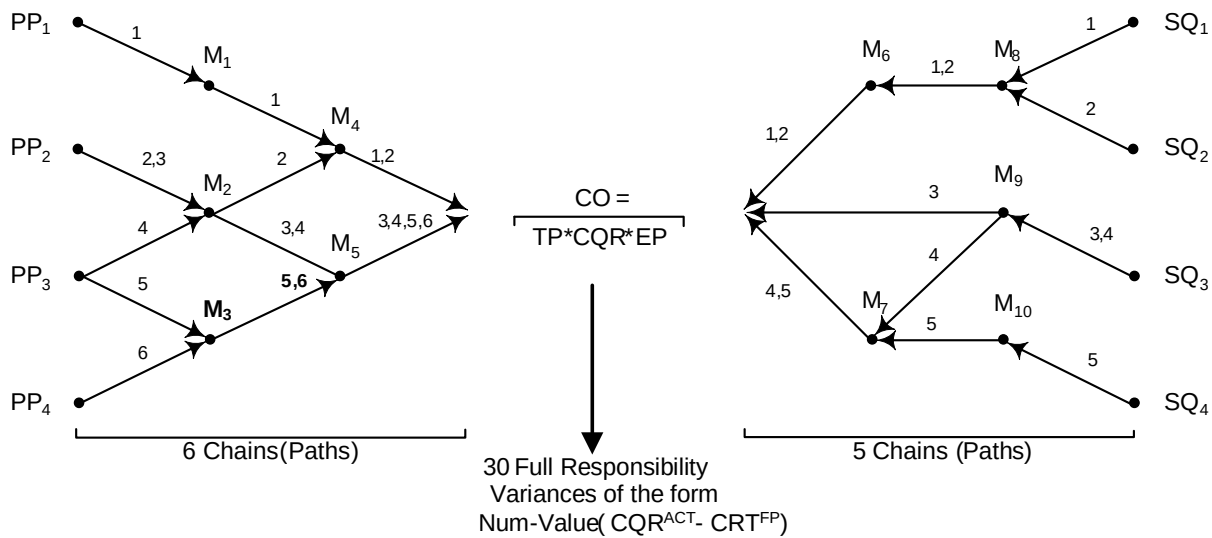


Fig. 24: Example of thirty cost chains with a common consumption rate

Drill-down Variance Analysis. A brief note is made on one of the explorative variance analysis procedures systematized in Fig. 25, namely the NRR drill-down variance analysis (B.2. Fig 24 and p.109). This is a procedure that has been used in practice for a long time, but it is hardly mentioned in the literature and is certainly not treated under the term "variance analysis".

In the light of the classification of a variance analysis developed here, it can be assigned to the procedures of an explorative variance analysis. This text later reports on how profit hierarchies can be used in the planning system of the Integrated Target Commitment Planning (s.p.114). Such profit hierarchies serve the practice of conducting exploratory analyses. For example, Chemetall in Frankfurt used sixteen profit hierarchies to perform a hierarchical drill-down analysis based on a profit at the top.¹⁷⁵

As the developers of this system informed me in a conversation, the drill-down analyses carried out with the system were mainly used to determine the actual-plan variance of the profit sizes in the hierarchies and such an approach is a hierarchical drill-down variance analysis according to the systematization developed here. The actual and plan values of such a drill-down variance analysis do not have to come from the actual and planning model of an Integrated Target Commitment Planning (as with Chemetall). In such a case, this hierarchical drill-down variance analysis is to be classified under the category of (non-responsibility-related) NRR-drill-down variance analysis (B.2 Fig. 25 on page 109).

However, if the actual and plan values of such a drill-down variance analysis come from the actual and planning models of an Integrated Target Commitment Planning, then this is a (re-

¹⁷⁵ See: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, Berlin 2001, (82 pages), p. 44f., www.lnzpla.de/IN11-2001a.pdf. (Text in German, title translated)

sponsibility-related) RR-drill-down variance analysis.¹⁷⁶ If it is applied and a drill-down is carried out to the lowest level, i.e., to the actual-plan variances of the basic parameters, then someone in one of the three types of responsibility can always be held "responsible" for these actual-plan variances of the basic parameters as described.

Such an RR-drill-down variance analysis of the actual-plan variance can, therefore, be carried out through the entire model tableau system of an Integrated Target Commitment Planning up to the actual-plan variance of each basic parameter, going beyond the profit hierarchies. Whether such an in-depth variance analysis makes sense, however, is another question.

A description of the so-called profit hierarchies is still pending (s.p.114). For these profit hierarchies, such a drill-down variance analysis within their profit sizes is very useful. If Riebel claims that a drill-down analysis in profit hierarchies enables an analyst to "*form a correct picture of the sources of success*", then in these cases the "sources of the variance between the actual and plan of success" is investigated.¹⁷⁷

In one of the following sections (s.p.155), I will describe my preference for the use of hierarchies as a means of exploring the information "contained in a model".

Various types of one- and multidimensional hierarchy systems are described that can be used in the Integrated Target Commitment Planning system.¹⁷⁸ All of these hierarchies, whose elements describe the actual values, the plan values, or the actual-plan variances of certain variables of an Integrated Target Commitment Planning model, are primarily suitable for performing a drill-down variance analysis.

Kilger's cost object profit calculation as variance analysis. One might think that with the development of the general classification scheme of a variance analysis and the classification of the individual procedures in this scheme, the theme of "variance analysis" has come to an end. However, another method of variance analysis must be mentioned which is not specified in this scheme. This is the cost object profit calculation dating back to Kilger.

It is described by Kilger in his standard work and forms a significant element of his cost accounting. Kilger describes his method of cost object profit calculation as "*relatively complicated*". However, it is extremely complicated in the way Kilger only illustrated it using one example.¹⁷⁹

Since cost object performance calculation plays a central role in his system, I reconstructed Kilger's example in the light of a plan cost-performance model and its corresponding actual model.

The result was that in the light of a model and process based reconstruction, Kilger's cost object profit calculation proves to be a simple cumulative variance analysis of selected profit parameters of a cost-performance model such as a cost object profit, a cost object group profit

¹⁷⁶ It is not included in Fig. 25 on page 109.

¹⁷⁷ See to this quotation by Riebel: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., p.70, www.Inzpla.de/IN11-2001a.pdf. (Text in German, title translated)

¹⁷⁸ See Fig. 42 on page 155 and Fig. 43 on page 156

¹⁷⁹ See also: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 241., www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

and also the operating result.¹⁸⁰ However, a simple cumulative variance analysis of the actual-plan variances of the variables of a cost-performance model is generally considered a inferior method of variance analysis.¹⁸¹ For that reason it will not be shown in the overview Fig. 25.

Has it been worth the effort to analyze Kilger's cost object profit calculation and identify it as a variance analysis procedure?

I think so, yes. Kilger, the most renowned representative of cost accounting, has described a certain procedure in detail and emphasized it as a pillar of his cost theory. If it is shown that this procedure is inferior, then it can be removed from the inventory of cost accounting procedures. The deletion of a procedure previously regarded as important is also a contribution to the further development of cost accounting.

Kilger's cost object profit calculation should, therefore, at least always be replaced by an NRR variance analysis in the form of the Kloock or Wilm's method (B.1 or B.4.2 in Fig. 25). However, if an Integrated Target Commitment Planning is used to carry out an operational planning, neither Kloock's nor Wilm's methods of variance analysis are suitable for this. In such a case, only the RR-Min variance analysis (2 in Fig. 25) would be the appropriate method of an explorative variance analysis.

I consider the RR-Min variance analysis, with which I began my entry into the "world of variance analysis", to be very informative, because it is the only method of a variance analysis that shows who is responsible for this actual-plan variance in a certain way for all actual-plan variances of the model variables (including the operating result) that occur.

Their development and software implementation was very complicated. However, the practical significance of this procedure is likely to be small because it is not transparent for a practitioner. However, this is a prerequisite for any practical application. I will discuss this aspect later (s.p.165) when the question is discussed whether the procedure of an Integrated Target Commitment Planning and Control will not be too complicated for practical application.

My work on "variance analysis and control" began with the question of how the actual and setpoint values of the control variables of an Integrated Target Commitment Planning are to be defined. After this question was clarified, the RR-Min variance analysis was developed as a method of an explorative variance analysis. It proved to be the consistent further development of the differentiated cumulative variance analyses described in the literature in the light of the Integrated Target Commitment Planning and Control. The procedures of the variance analysis of Kloock and Wilms were analyzed by me and placed in a classification system, which was supplemented by further procedures.

Within the framework of the considerations on the systematization of these procedures, however, it also became clear to me that it is necessary to distinguish between a normative and an explorative variance analysis. The control procedure of the Integrated Target Commitment Planning was classified in this system of variance analysis as a procedure of a normative variance analysis.

¹⁸⁰ The name "*profit calculation*" is already misleading. This is because the system does not determine the profit of certain cost objects, but attempts to reveal the causes of their actual-plan variance.

¹⁸¹ Zwicker, E., *Control and variance analysis...*, op. cit. p. 204f

After this procedure, I believed (one can of course always be mistaken) that I had put the procedures of a model-based variance analysis in their relationship to the Integrated Target Commitment Planning and Control into a reasonable context. However, the question of how the often cited a control loop planning or a cybernetic planning and control of companies behaves towards the Integrated Target Performance Planning and Control remained open. That was the next task in line.

Control loop planning and control. One thing was clear to me relatively early on: The Integrated Target Commitment Planning and Control is not a control loop planning or cybernetic planning and control. This is because models for an Integrated Target Commitment Planning do not contain any "control variables" (that can be fully influenced) with which a specified "setpoint value" is regulated if a multi-period planning is carried out. However, this finding was not sufficient to clarify the relationships between a control loop planning or cybernetic planning and control and the Integrated Target Commitment Planning and Control. To bring about this clarification, I saw no other possibility than to compare both concepts with each other in a model-based manner.

A model-based representation of the control loop planning and the control of companies is not common in the literature. The control loop concept is almost only presented "verbally" in the controlling and planning literature with a simple control loop schema. On the one hand it is claimed that planning and control in a company takes place in the form of a control loop (factual assertion), but on the other hand it is also suggested that they must be realized in this way (design requirement). Küpper, for example, citing such a control loop schema, claims "*the link between planning and control...[can] be illustrated and designed with the concept of a cybernetic control loop ...*".¹⁸²

I was only interested in "*designing*", since the "*designing*"... of "*the link between planning and control*"... means proceeding according to certain regulations of planning and control. Typical of such demands, however, is also their vagueness. Does Küpper only think that the "linkage" of planning and control already described elsewhere (but where?) should be "designed" or that planning and control itself should be part of such a control loop?

In view of these ambiguities, I decided to make the claim to the realization of a "cybernetic control loop" for company planning more concrete. The more concrete claim was that a model for the one-year operational planning of a company should be designed in the sense of a control loop planning.

There is only one way to verify this claim. A multi-periodic stochastic and dynamic planning model of a company must be developed. This model is then used to show how it can be used (using control loop-specific variables such as manipulated variables, setpoint variables, disturbances, etc.) to carry out a planning and control procedure that represents such a control loop planning. This control loop planning can then be compared with the Integrated Target Commitment Planning and Control. Since both plans are designed as operational plans for a planning horizon of one year with twelve monthly periods, they are thus comparable.

¹⁸² Küpper, H. U., Controlling. Konzeption, Aufgaben, Instrumente, 5th. Ed., Stuttgart 2008, p. 225.

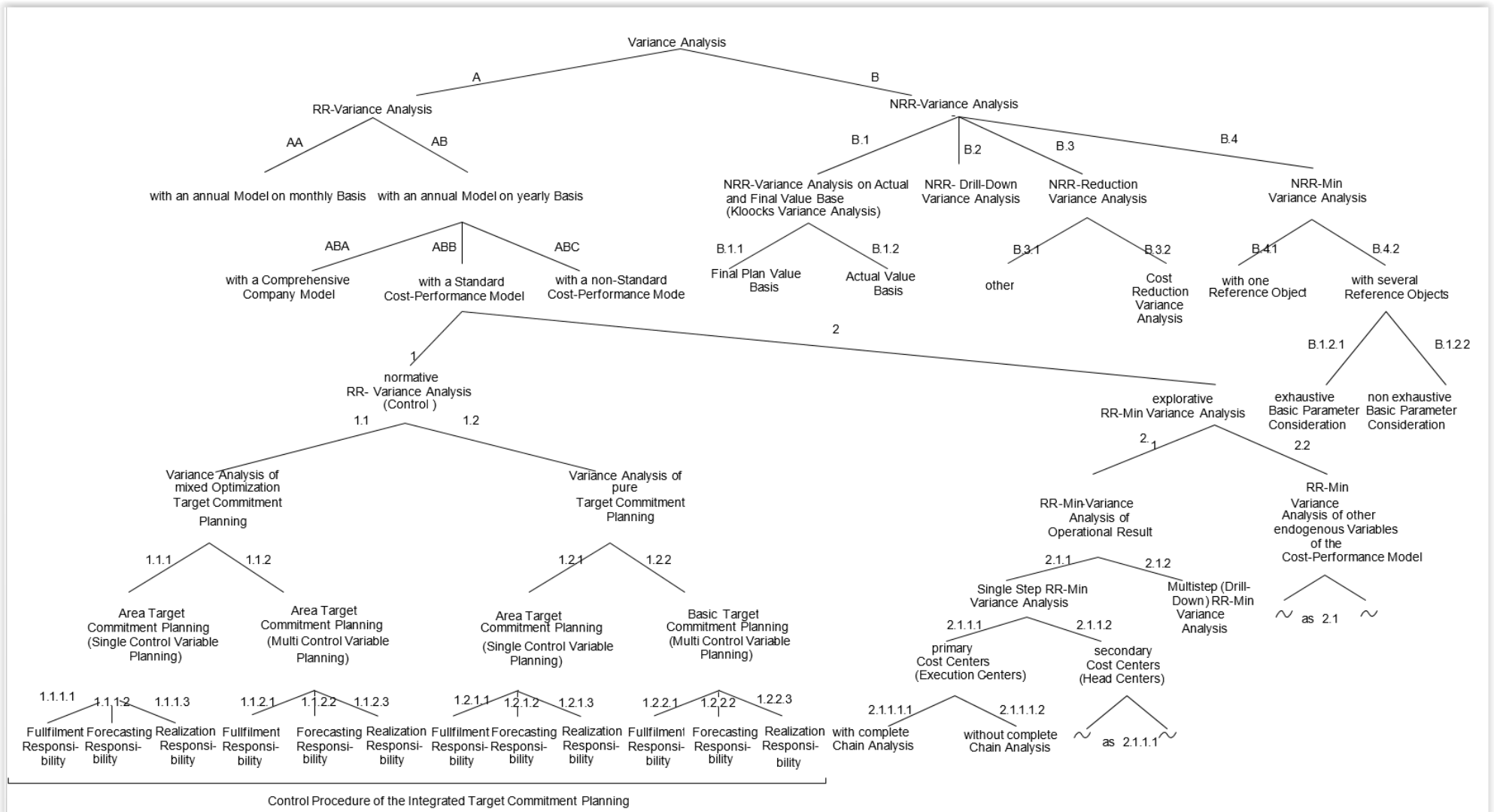


Fig. 25: Types of variance analysis

The representatives of a control loop planning would then have to demonstrate the superiority of this planning and control procedure over the Integrated Target Commitment Planning and Control. My job in such a situation would be to convince the audience of the opposite. Such an analysis was carried out by me and described in detail elsewhere.¹⁸³

As a result, it emerged that the required a control loop planning is an inadequate operational planning and control procedure for companies.

To carry out a control loop planning, the first step is to develop a model that describes the system to be influenced (here the company). This model contains an action variable, which is referred to in the control loop terminology as a so called manipulated variable. Furthermore, a setpoint value is to be specified which an endogenous variable and this is the controlled variable, should "comply with as far as possible". However the amount of this controlled variable, which is to correspond to the setpoint value, is changed by a disturbance variable.

In order to optimally control such a control loop in the sense of modern control theory, a decision rule must be developed which minimizes the expected value of fluctuation between the set point value and the controlled variable. The previous requirement to "*comply as far as possible*" with a setpoint is thus specified as an extremization.

Since the disturbance variable is described in the model as a stochastic variable, a multi-period stochastic model is obtained. The required determination of „manipulated variable is, therefore, the result of a multi-periodic stochastic optimization. The action variable (or manipulated variable) that is to cause this minimization of fluctuation would be a (completely controllable) decision variable in the terminology of the Integrated Target Commitment Planning, whose value is to be determined for the twelve months of the planning period.

As mentioned, such decision variables cannot be found in cost-performance models of companies. That is a falsifiable assertion. However, there is no doubt that they do not occur in all cost-performance models on which the SAP-CO system is based because the SAP model configuration system does not allow their use.

However, if they would exist, then it would never be the goal of an operational planning to determine its numerical values in such a way that the expected value of a fluctuation measure (such as a quadratic variance) is to be minimized by a setpoint to be defined in any way. Rather, it can only be the goal to maximize the expected value of the operating result for the specified planning periods.

The demand to introduce a control loop planning and control in companies whose goal it is to "regulate" a target value, which seems so plausible a first glance, is going nowhere.

¹⁸³ For more information, see: Zwicker, E., *Control and variance analysis...*, op. cit., p. 215f. www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated). For an even more detailed treatment see: Zwicker, E., *Integrated Target Commitment Planning and Control Loop Planning*, Berlin 2002, www.Inzpla.de/IN19-2002e.pdf. (Text in German, title translated). Furthermore, I later created a text in which Küpper's considerations for planning and control with feedback loops are critically analyzed. See: Zwicker, E., *Küpper's Characterization of the Control Theory for the theoretical Foundation of Controlling in the Light of the Integrated Target Commitment Planning*, Berlin 2011, www.Inzpla.de/IN41-2011d.pdf. (Text in German, title translated).

Setpoints also exist in the system of the Integrated Target Commitment Planning in different applications. For the basic targets, they act as threshold values. The central planning negotiates with the areas to ensure that they do not exceed or fall below a certain threshold value in the form of a basic target.

The areas are thinking about what measures they can take to comply with these thresholds (or setpoint) of the basic targets. But the measures they consider and their assumed impact on the setpoints of their target commitment are not subject to the modeling or the formal planning procedure.¹⁸⁴

This is why a control loop planning is a concept that cannot be applied to the annual operational planning and control of a company. On the one hand, at the aggregation level of an operational planning model, there are no completely controllable variables that can be considered as "manipulated variables". And if you could find some, they would always be used to maximize the operating result and not to "adjust" a setpoint.

Development of a classification of setpoint-actual control systems

The above considerations on normative and explorative variance analysis had long since been completed when I attended a conference in Vienna in 2013 at which Teemu Malmi gave a lecture on *"opportunities, challenges and research directions"* in the field of *"management control systems"*. This presentation inspired me to develop an own classification of such systems due to the shortcomings of management control systems described by Malmi. A management control system is a "setpoint-actual control system", i.e., exactly the type to which the control system of an Integrated Target Commitment Planning belongs.

As a result, the control system of the Integrated Target Commitment Planning described in this section can be classified as a subsystem of this general setpoint-actual control system. The structure of this system and also the motivation that would have led to its development are described elsewhere (s.p.195f.), although from a systematic point of view it could also be mentioned here as a control theory going beyond the Integrated Target Commitment Planning and Control.

¹⁸⁴ See also the remarks on the linkage of actions and targets from the perspective of Simon's theory of bounded rationality, on page 480.

9. Actual models, profit hierarchies and profit segment analyses as parts of a planning and control system

The Integrated Target Commitment Planning is carried out using cost-performance models or comprehensive company models. However, you also need an actual model corresponding to these planning models. Actual models are used to calculate at the end of the planning period the actual values of variables of a planning model that are not observation variables. The "most prominent variable" is the actual operating result. It does not require any reasoning that the actual values of the top targets of an operational planning must be determined.

However, actual models are also necessary in order to carry out the control procedures described for an Integrated Target Commitment Planning. A series of analysis procedures, such as the explorative variance analysis mentioned above, would not be possible if, in addition to a plan cost-performance model, an actual cost-performance model corresponding to this model were not available.

Actual cost-performance models are hardly dealt with in the literature.¹⁸⁵ This is astonishing since actual cost-performance models differ in their structure and semantics from their corresponding plan cost-performance models. One could tend to believe that an actual cost-performance model can be generated by replacing the (plan) values of the model parameters of the corresponding plan cost-performance model with the actual values obtained at the end of the plan period based on measurement and counting.

That, however, is not the case. In a cost and performance accounting model referred to as the "actual model", model parameters may occur which are not observation variables, but rather parameters with which forecasts or irreal condition forecasts can be made. These different types of model parameters of an actual model must be distinguished exactly from each other because they require a separate treatment.¹⁸⁶ If the semantics and structure of actual models and the relationships of these actual models to the planning models corresponding to them are not clear, then it is not possible to develop a closed model-based planning and control system.

Types of an actual model. After recognizing the importance of actual models for the development of the Integrated Target Commitment Planning and Control, I decided to look more deeply at the structure and semantics of these models and their relationships to the planning models. This occupation led me to the realization that one should distinguish three types of actual models.¹⁸⁷

¹⁸⁵ See for a discussion of the statements of well-known authors on the structure of actual models in: Zwicker, E., *Actual Cost-Performance Models: Structure, Semantics and Application*, Berlin 2008, p. 8, www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated).

¹⁸⁶ For a systematization of the cognitive status of the model parameters in actual models, see the classification scheme in: Zwicker, E., *Actual Cost-Performance Models...*, op. cit., p. 8. www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated).

¹⁸⁷ For more information, see: Zwicker, E., *Actual cost-performance models...*, op. cit., www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated). And also in: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 83f.,

The first type is a pure actual model. Such a model consists only of definition equations whose basic parameters are observation variables. Such models correspond to the type of an actual model in the natural sciences.

The second type consists of the mixed actual models. The "actual models", which are used in practice as actual cost-performance models or actual comprehensive company models, are never pure actual models because their "actual calculations" always contain basic parameters (such as depreciation), which are not observation parameters but decision values in the form of decision parameters. Variables such as imputed entrepreneurial wages are not observable but are described by irreal condition forecasts. Reserves in the balance sheet of actual models are forecast figures and, therefore, not actual values (determined by measurement and counting).

The third type of an actual model is an ex-post planning model. Compared to the mixed actual models, their structure and semantics are clearly defined.¹⁸⁸ They possess the same structural equations as the planning models corresponding to them.¹⁸⁹ Therefore, they also contain all hypothesis equations of these planning models. The parameters of their hypothesis equations are only revised after the end of the planning period, taking into account the actual values that have occurred, so that the hypothesis equations of these ex-post planning models precisely forecast the actual values of their variables that are to be explained "ex-post".

When asked whether a mixed actual model should be preferred to an ex-post planning model, the decision is clear: The ex-post planning model is always preferable. An actual model was marked so that the actual values of the variables of a planning model that are not observation variables are determined using actual models. In an ex-post planning model, however, the actual values of the endogenous variables of the corresponding (ex-ante) planning model, which are explained there by hypothesis equations and are therefore observation variables, are also forecasted ex-post. Such an actual model, therefore, contains all variables of the planning model corresponding to it as actual values.

It was initially claimed that all procedures of an explorative variance analysis are not feasible if there is no actual model corresponding to a planning model. However, a more precise assertion is that such variance analyses are only possible if an actual model is available in the form of an ex post planning model.

The described RR-Min variance analysis can only be carried out if it is based on an ex-post planning model which (by definition) contains the same structural equations as its ex-ante planning model (previously simply referred to as "planning model").

The other methods of an explorative variance analysis (B in Fig. 25 on page 109) are also based using an ex-post planning model. Only with an ex-post plan cost-performance

www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

¹⁸⁸ Mixed actual models are models that are not purely actual models but also not ex-post planning models.

¹⁸⁹ For more information, see: Zwicker, E., *Actual cost-performance models...*, op. cit., p. 19f. www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated).

model, it is possible to make so-called "what would have been if-forecasts" (irreal condition forecasts) of the operating result, which can be a very helpful explorative analysis methods.

Another advantage of ex-post planning models is that they can be generated automatically by a configuration system after the creation of an ex-ante planning model (previously called planning model). The rules for revising the values of the model parameters of the (ex-ante) hypothesis equations in the planning model (for generating the ex-post hypothesis equations) are applied in the light of the actual values that have occurred. Therefore, after you have configured a planning model, you do not need to create a corresponding actual model again by entering equations.

It has already been pointed out at the beginning that one could tend to believe that an actual model should always be developed by replacing the final plan values of its model parameters in the planning model used for planning with their actual values that are obtained after the end of the planning period. This view is indeed held by some authors in a more or less clear form.¹⁹⁰ However, this is not true. Only through the theory of the structure and semantics of actual models (ex-post planning models) and the clarification of their relationship to the planning models (ex-ante planning models) of an Integrated Target Commitment Planning developed here is it possible to establish a seamless connection between the two model types.¹⁹¹

Multidimensional profit hierarchy systems

The profit in form of the operating result plays an important role in a cost-performance model because it serves almost always as the top target of the planning that is carried out with this model. In addition to the (total) operating result as a "peak profit size", however, a model may also contain other profit sizes. However, these are not necessary in order to carry out a pure basic Target Commitment Planning. In this planning procedure, only the relationships between the operating result as the only top target and the basic targets as the commitment variables for the areas are of interest. In a standard cost-performance model, however, basic targets are never profit sizes.

However, the situation is different for the area Target Commitment Planning. Here, certain area profits function as area targets for the sales areas. These area profits must occur as variables of a cost-performance model if you want to carry out pure area Target Commitment Planning with it. Therefore, I designed the model tableau system in such a way that the area profit of each sales area is determined in a tableau (the area profit tableau).¹⁹² This area profit is made up of the sum of the profits of the articles sold by this sales area.¹⁹³

Quite early on, I realized that the three types of profit sizes that appear in the model tab-

¹⁹⁰ See on this view in the literature: Zwicker, E., *Actual cost-performance models...*, op. cit., p. 37f. www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated).

¹⁹¹ For information on the structure and semantics of actual models, see Zwicker, E., *Actual cost-performance models...*, op. cit., (Text in German, title translated)

¹⁹² See the example in Fig. 5 on page 41. There, an area profit of € 627,500 is listed in the area profit tableau of the sales area.

¹⁹³ In the area profit tableau of the sales area shown in Fig. 5 on page 41 there are two article profits (for sofas and beds) amounting to € 120,000 and € 507,500.

leaus of a cost-performance model of the Integrated Target Commitment Planning form a profit hierarchy. The article profits of the sales areas are located at the lowest level of this hierarchy. They are linked by hierarchy lines to the area profits of the sales areas that are arranged in the second hierarchy level. These are connected via hierarchical lines with the operating result as the top of the resulting profit hierarchy.¹⁹⁴

The realization that the profit sizes described in the model tableau system constitute a certain profit hierarchy led me to become interested in profit hierarchies. To learn more about this, I systematically searched the literature for texts in which such hierarchies were treated. My goal was to determine what types of profit hierarchies are used in the literature and what purposes they serve.

The question about the purposes could be answered quickly. All profit hierarchies described in the literature are only for exploratory purposes. These explorative purposes are described very aptly by Riebel's already quoted sentence (s.p.106) that such an analysis serves "*to form a correct picture of the sources of success*". This "*source of success analysis*" in profit hierarchies was developed by me into a comprehensive and systematic method of analyzing multidimensional profit hierarchy systems. I would like to give you a brief account of how this happened.

At the beginning, I had not the slightest idea of developing such a system. I just wanted to categorize the examples of profit hierarchies listed in the literature and collected by me.

The profit hierarchy most frequently discussed in the literature comes from Agthe and Mellerowicz. It is usually referred to as a multi-stage contribution margin calculation. With the contribution of Agthe and Mellerowicz, an article profit hierarchy was formulated for the first time (1959) and propagated as a generally applicable exploration object. Riebel (1964) also gave four examples of different profit hierarchies in an article. Seicht (1990) described a profit hierarchy that represents a modification of the profit hierarchy of Agthe and Mellerowicz. As already mentioned (s.p.105), a practical report by Chemetall (1988) described sixteen profit hierarchies that served the corporate management primarily for performing drill-down variance analyses. Dunne and Wolk also described (1977) the profit hierarchy of a company using a numerical example.¹⁹⁵

After studying the structure and use of the profit hierarchies discussed in the literature, I came to the conclusion that these profit hierarchies (and thus their profit sizes) are not necessary for the procedure of an Integrated Target Commitment Planning and Control. However, the literature study confirmed my opinion that profit hierarchies are of great value for every planning and control and thus also for the Integrated Target Commitment Planning and Control. This is because they provide valuable information about the occurrence of certain relevant profit sizes and in particular on the operating result.

If a comprehensive operational planning and control system such as the Integrated Target

¹⁹⁴ In the light of the cost-performance model used, these hierarchy lines prove to be a description of the definitional links between the profit variables. The profit values of one level act as additive definition components of the profit values of the next higher level.

¹⁹⁵ The examples of profit hierarchies found in the literature and how they are used are described in detail in: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., www.lnzpla.de/IN11-2001a.pdf. (Text in German, title translated).

Commitment Planning and Control is to be developed, it would be quite unsatisfactory if hierarchical connections of certain profit sizes that are regarded as important were not delivered by the system "at a touch of a button", but had to be generated by a user only by entering their definition equations. It would, therefore, be desirable to develop a closed theory that includes all possible profit hierarchies as variants and thus enables their generation and analysis in the simplest way with the aid of an IT system.

The idea of developing such a system of multidimensional profit hierarchies was based on the following considerations: The profit sizes at the lowest level of a profit hierarchy are always the profits of the finished products, which are recorded in the profit tableaux of a sales area.¹⁹⁶ You can distinguish between three profit types of this quantity of an article sold; the net profit, the contribution margin₁, and the contribution margin₂.

Since the term "contribution margin" is defined very differently in the literature, it is necessary to define the terms "contribution margin₁" and "contribution margin₂" as they are to be used in the following.

The contribution margin₁ of the quantity sold for a finished product (or article) corresponds to the usual definition of the article contribution margin in marginal cost accounting, that is

Article contribution margin₁ = (sales price – variable unit costs) • sales quantity.

The contribution margin₂ of the sold quantity of a finished product (or article) is defined as,

Article contribution margin₂ = Article contribution margin₁ - individual article fixed costs.

The individual article fixed costs are these fixed costs that could be eliminated if the article would be removed from the sales program.¹⁹⁷

The contribution margin₂ of an article group (as a profit segment) does not result solely from the addition of the contribution margins₂ of the individual articles in this group. The sum of these contribution margins₂ must still be reduced by the fixed costs, which can only be assigned to certain combinations of articles in this article group, but not to an individual article. These are, for example, the fixed costs of a production area that only create services for two articles in this group.

The net profit of the quantity sold of a finished product (or article) is defined

Net profit = (sales price - full cost rate) • sales quantity.

The net profit of an article group results from the addition of the net profits of the articles of this group.

The quantities of a sold article listed in the area profit tableaux can under certain circumstances be classified multi-dimensionally. For example, you can distinguish the articles listed in the area profit tableaux according to the two dimensions article type and region

¹⁹⁶ To a detailed description on the structure see: Zwicker, E., *Explorative and normative ...*, op. cit.

¹⁹⁷ For an exact definition, see page 135.

(sales area). This yields a classification matrix. If you classify the articles entered in this way according to a further dimension, e.g., direct or indirect sales, you get a classification cube. If a classification according to further criteria is possible, then this classification cube corresponds to a so-called hypercube, which eludes a graphic representation.

At some point, I came up with the idea of "applying" so-called edge hierarchy to the edges of these matrices, cubes or hypercubes.

With an edge hierarchy, it is possible to access certain profit segments as partial elements of an existing profit cube. Fig. 27 shows such a profit matrix with two edge hierarchies in the form of an article hierarchy and a region hierarchy.¹⁹⁸

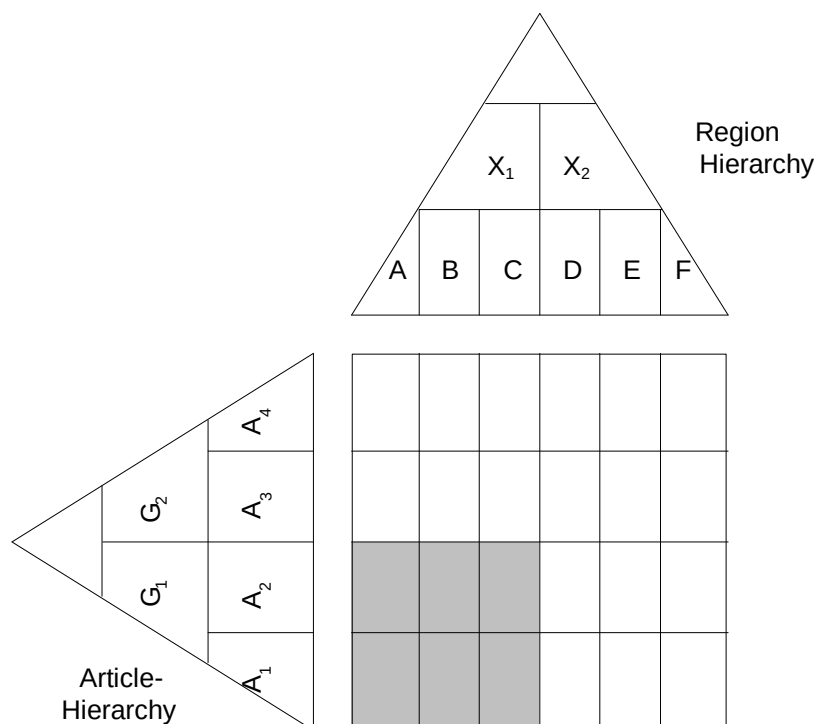


Fig. 26: Two-dimensional hierarchical segment classification with edge hierarchies

By using the INZPLA program system, different hierarchical elements can be selected, e.g., the segment $\{G_1, X_1\}$ in the segment matrix, to study their profit and other definition components of their profit as for example, their sales volume, sales prize and article costs. Each of the three profit types can be selected as segment profit. The drill-down analysis that is usually performed can be carried out with regard to the plan values, the actual values and above all the actual-plan variances of one of these three profit sizes.

This combined approach to profit segments, which is based on several hierarchies, was called by me as a multidimensional hierarchical analysis of profit segments.¹⁹⁹ As already mentioned, an analyst may be interested in the contribution margin₂ of product group G_1 in region X_1 . Fig. 26 shows the six basic segments marked in grey, which are addressed

¹⁹⁸ This two-dimensional hierarchy has already been used to demonstrate the selection of profit segments of a profit center which should form the basic parameters a the central planning model. See page 74.

¹⁹⁹ Since the focus is on profit, these segments are to be referred to as profit segments. However, as mentioned sales quantities, sales prices, and costs are also allocated to these segments, so that one could also speak of sales segments or even cost segments.

by the selection of G_1 and X_1 .

As already mentioned, the contribution margin₂ of this selected profit segment does not necessarily result from the sum of the contribution margins₂ of its six basic segments. Rather, individual fixed costs can also occur as negative definition components of this contribution margin₂. These are the fixed costs that are assigned to more than one of these six basic segments in the assessment relationships of the full cost version (of the full cost model). An example would be the fixed costs of a product manager who is only responsible for product group G_1 in region X_1 , i.e., for all six basic segments.

Such a multidimensional classification of profit segments (or sales segments) by edge hierarchies was not described anywhere in the literature at that time.

Based on this hierarchical multidimensional classification of profit segments, I then developed a computer program with which such a user-controlled multidimensional hierarchical analysis of profit segments could be carried out. The following text describes the process of a two-dimensional hierarchical analysis of profit segments. The hierarchies, which are to explore, are contribution margin hierarchies₂. Since a drill-down analysis is to be performed, the highest profit size, that is, the operating result is the starting point.

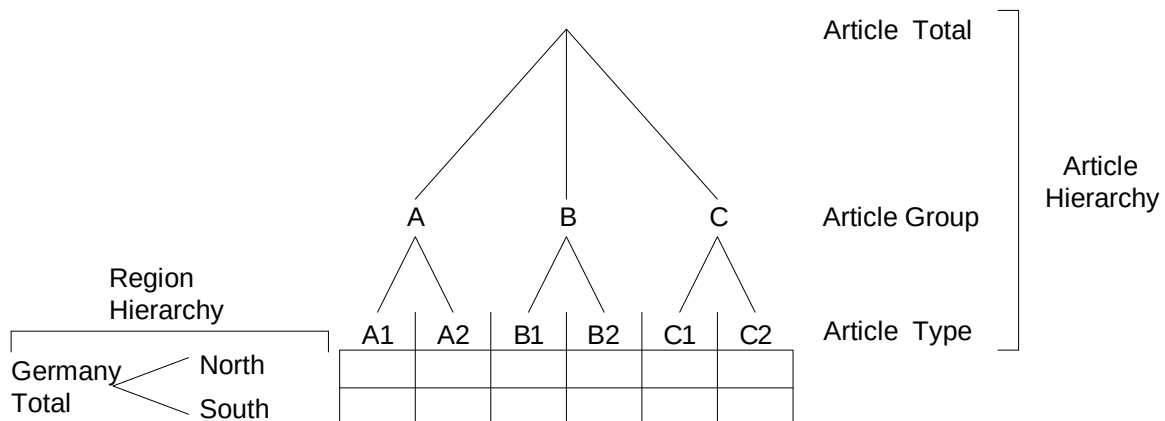


Fig. 27: Two-dimensional hierarchical profit segment classification with two basic regions and six types of articles

The selection of the segments of a profit cube using edge hierarchies is demonstrated using an example whose two-dimensional hierarchical profit segment classification is somewhat simpler than the hierarchical classification of the profit segments shown in Fig. 26. The two-dimensional profit segment matrix of this example shows Fig. 27. The region hierarchy has two hierarchy levels 1 and 2. The article hierarchy has three hierarchy levels 1, 2 and 3.

The value of the operating result, from which the analysis is starting, is shown as € 162,810 in the so-called hierarchy tableau of Fig. 28.

The operating result corresponds to segment {Germany-Total, Article-Total}. Since the company's products are only sold in Germany, as Fig. 27 shows, the hierarchy point

"Germany-Total" is the top regional hierarchy. The (non-base) segment {Germany-Total, Article-Total}, which comprises all twelve basic segments of the company, is identified by the hierarchy elements "Germany-Total" of the regional hierarchy and "Article-Total" of the article hierarchy.

Hierarchy-Level		Profit of the entire company	Amount (€)
Reg.	Art.		
2	3	Operating result {Germany-Total, Article-Total}	162,810

→ Fig. 29

Fig. 28: Starting tableaus of the described hierarchical profit segment analysis

It is assumed that the drill-down analyst decides to continue "the origin" of the value of the operating result of € 162,810 by moving down one level (from 3 to 2) in the article hierarchy (and not the regional hierarchy). The result shows the tableau in Fig. 29.

Hierarchy-Level		Contribution margin level ₂ - or individual fixed costs with segment assignment	Amount (€)
Reg.	Art.		
2	2	Contribution margin ₂ Segment {Germany-Total, Article Group A}	332,860
2	2	Contribution margin ₂ Segment {Germany-Total, Article Group B}	198,400
2	2	Contribution margin ₂ Segment {Germany-Total, Article Group C}	231,550
		Total	762,010
		- Individual fixed Costs Segment {Germany-Total, Article-Total}	- 600.000
2	3	= Operating result segment {Germany-Total, Article-Total}	162.810

Fig. 30

← Fig. 28

Fig. 29: Hierarchy tableau of the profit segment {Germany-Total, Article-Total}, i.e., of the entire company with the operating result as a profit value.

Based on this tableau, the drill-down analyst can see the amounts of the contribution margins₂ of article groups A, B, and C that lead to the operating result. The "individual fixed costs" {Germany-Total, Article-Total} in the amount of € 600,000 listed in Fig. 29 are the fixed costs that could be dropped in the long term if the entire segment {Germany-Total, Article-Total}, i.e., the entire company, were to be shut down. These are the fixed costs that are allocated to all twelve basic segments or their final cost objects when the full cost model is generated according to a specific assessment key. In the present case, it is assumed that the drill-down analyst now wants to know how the contribution margin₂ of the profit segment {Germany-Total, Article Group A} in the amount of € 332,860 was created. It is stated in the first line of the hierarchy tableau in Fig. 29.

The drill-down analyst could decide which contributions₂ of the two sub-regions (North and South Germany) led to the value of € 332,860. In this case, he must go down from

level 2 to level 1 using an instruction in the "Reg" column of the region hierarchy in Fig. 29. However, he can also investigate whether which of the two articles (A1 and A2) of article group A, which are sold in Germany, with which contribution margins₂ and possibly, which individual fixed costs lead to the amount of € 332,860. In this case, he should go down from level 2 to level 1 in the "Art" column in Fig. 29. This is the procedure to be followed. The result is shown in Fig. 30.

It is further assumed that the drill-down analyst is now interested in the contribution₂ of the profit segment {Germany-total, Article A1} of € 177,680 in Fig. 30. In this case, you can only move the regional hierarchy down from level 2 to level 1. The drill-down analyst has now reached the level of the basic segments. The tableau that provides this information is called the basic segment tableau.

Hierarchy-Level		Contribution margin ₂ - or Individual Costs with segment assignment	Amount (€)	
Reg.	Art.			
2	1	Contribution margin ₂ Segment {Germany-Total, Article A1}	177.680	→ Fig. 31
2	1	Contribution margin ₂ Segment {Germany-Total, Article A2}	167.580	
		Total	345.260	
		- Individual costs Segment {Germany-Total, Article group A}	- 12.400	
2	2	Contribution margin ₂ Segment {Germany-Total, Article group A}	332.860	← Fig. 29

Fig. 30: Hierarchy tableau of the profit segment {Germany, Article Group A}

Fig. 31 shows this basic segment tableau. The values of the basic segment contribution margins₂ are listed in column 8 of the tableau. As they are basic segments of contributions₂, they depend no longer on other profit sizes. The variables that define them, such as the sales price, the sales quantity, the sales value, the variable unit costs, and the fixed costs for individual articles, are also specified in the basic segment tableau.

		Segment-name	1	2	3	4 = 3•1	5	6 = 1•2	7 = 4 + 5	8 = 6 - 7	
Hierar-chical Level			Sales-quantity	Price	Vari-able unit costs	Variable Costs	Individu-al-Article fixed Costs	Sales-value	Individual Article-Costs	Article-Contribution-margin	
Reg	Art		(Unit)	(€/Unit)	(€)	(€)	(€)	(€)	(€)	(€)	
1	1	{Germany-North, Article A1}	8.000	25,60	12,38	99.040	3.000	204.800	102.040	102.760	
1	1	{Germany-South, Article A1}	6.000	25,60	12,78	76.680	2.000	153.600	78.680	74.920	
2	1	Contribution Margins ₂ {Germany-Total, Article A1}									177.680 ← Fig. 30

Fig. 31: Basic segment tableau of the profit segment {Germany-Total, Article A1}

However, a drill-down analyst does not have to work his way down step by step to the contribution margins₂ of certain basic segments, as has been described so far. When per-

forming a drill-down analysis with the described hierarchy tableaus, the analyst may also come across the contribution margin₂ of a profit segment that he no longer wants to drill down. Rather, he wants to know immediately to which profit sizes of the *n* basic segments the profit of the profit segment in question can be traced back. Furthermore, he might also be interested in which individual fixed costs reduce the sum of the profits of the *n* basic segments in order to achieve the profit of the profit segment in question. The analyst might also be interested in finding out how the profits of the *n* basic segments can be reduced to their sales and costs.

Hierarchical Level		Segment Name	1	2	3	4=31	5	6=1*2	7=4+5	8=6-7
			Sales Quantity	Price	Variable Unit Costs	Variable Costs	Individual-Article Fixed Costs	Sales Value	Individual Costs	Article-Contribution-margin ₂
Reg.	Art.		(Piece)	(€/Piece)	(€/Piece)	(€)	(€)	(€)	(€)	(€)
1	1	{Germ North, Article A1}	8.000	25,60	12,38	99.040	3.000	204.800	102.040	102.760
1	1	{Germ South, Article A1}	6.000	25,60	12,78	76.680	2.000	153.600	78.680	74.920
1	1	{Germ Nord, Article A2}	7.000	29,00	14,51	101.570	2.200	203.000	103.770	99.230
1	1	{Germ South, Article A2}	5.000	29,00	14,93	74.650	2.000	145.000	76.650	68.350
1	1	{Germ North, Article B1}	8.000	21,80	11,71	93.680	2.600	174.400	96.280	78.120
1	1	{Germ South, Article B1}	1.000	21,80	12,13	12.130	1.800	21.800	13.930	7.870
1	1	{ Germ North, Article B2}	7.000	24,00	13,01	91.070	1.400	168.000	92.470	75.530
1	1	{Germ South, Article B2}	4.000	24,00	13,28	53.120	1.200	96.000	54.320	41.680
1	1	{Germ North, Article C1}	6.000	25,90	14,78	88.680	0	155.400	88.680	66.720
1	1	{Germ South, Article C1}	5.000	25,90	15,11	75.550	0	129.500	75.550	53.950
1	1	{Germ North, Article C2}	5.000	28,70	16,30	81.500	0	143.500	81.500	62.000
1	1	{Germ South, Article C2}	4.000	28,70	16,48	65.920	0	114.800	65.920	48.880
Total:						913.590	16.200	1.709.800	929.790	780.010
1	2	- Article Groups fixed Costs {Germ South, Article Group B}								-4.800
1	2	- Article B Groups fixed Costs {Germ Total, Article Group A}								-12.400
2	3	- Article-Total fixed Costs = Overhead Costs {BRD-Total, Article-Total}								- 600.000
2	3	= Operative Result { BRD-Total, Article-Total }								162.810

Fig. 32: Basic segment tableau of the profit segment {Germany-Total, Article-Total}, i.e., of the entire company with the operating result as segment profit.

To find this out, the analyst could also decide at the beginning of the drill-down analysis, which is described in Fig. 28 that the basic segment tableau of the operating result should be generated.

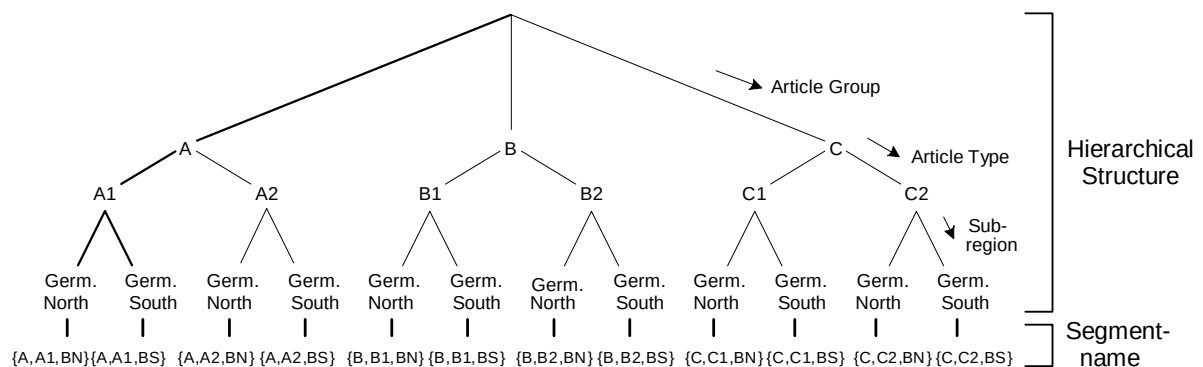


Fig. 33: Reconstruction of a drill-down analysis as a drill-down path (bold) of a non-edge hierarchy

This basic segment tableau of the operating result is represented in Fig. 32, showing the contribution margins₂ of the twelve basic segments (column 8 lines 1 to 12) and the indi-

vidual fixed costs of certain profit segments (columns 8, lines 14 and 15) and the (fixed) overheads costs (column 8, line 16) that produce the operating result of € 162,810.

The drill-down analysis described in Fig. 28 to 30 can now be reconstructed as the "descending" as a certain path of a certain profit hierarchy. This profit hierarchy does not correspond to either of the two edge hierarchies, but it uses individual differentiation criteria of these edge hierarchies. Such hierarchies should, therefore, be referred to as (derived) non-edge hierarchies.

Fig. 33 shows a non-edge hierarchy derived from the two edge hierarchies shown in Fig. 27. Two differentiation criteria originate from the article hierarchy, and one differentiation criterion is taken from the region hierarchy. The non-edge hierarchy differentiates the operating result at the first level (from above) according to the profits of the three article groups A, B, and C, that is, a criterion of the article hierarchy, that is, the first edge hierarchy.

At the second level (from above), the system differentiates according to article types, that is, another criterion in the article hierarchy. On the third (lowest) level, a differentiation takes place according to the regions Germany-South and Germany-North, i.e., a criterion of the region hierarchy and thus of the second edge hierarchy.

The non-edge hierarchy described in Fig. 33 is also the hierarchy that contains the drill-down path on which the drill-down analysis demonstrated in Fig. 28 to 31 is based.

This reconstruction shows that the drill-down analyst has moved down the branch "A - A1" marked in bold in Fig. 33, thus reaching the segment {Germany-Total, Article A1}. From there he then called up the basic segment tableau of the contribution margin₂ of this profit segment, i.e., of the segment {Germany-Total, Article A1}.

An important implication of a multidimensional profit hierarchy is that you can derive a certain number of such non-edge hierarchies based on the edge hierarchies defined by a user.

As already mentioned, these non-edge hierarchies are hierarchies that use differentiation criteria of the edge hierarchies but are not identical to any of the edge hierarchies. In the case of the described example of a two-dimensional hierarchical profit segment analysis, four non-edge hierarchies can be generated:

1. article group - article type - sub-region (shown in Fig. 33)
2. article type - sub-region
3. sub-region - article type
4. sub-region - article group - article type

It can be shown that in the case of a two-dimensional profit segment classification with two two-stage edge hierarchies described in Fig. 26, fourteen different non-edge hierarchies can be derived.²⁰⁰

The number of levels of hierarchies of regions and articles used in companies is some-

²⁰⁰ See: Zwicker, E., *Integrated Target Commitment Planning and...*, op. cit., p. 104, www.Inzpla.de/IN-37-2008c.pdf. (Text in German, title translated).

times considerable. As Fig. 34 shows, the Schering AG uses a ten-level article hierarchy with 28,243 article types at the base and a seven-level regional hierarchy with 350 base regions.²⁰¹ One can imagine the large number of non-edge hierarchies that could be generated in this case.

Region Hierarchy			Product Hierarchy		
Level	Hierarchical Structure	Example of a Drill-Down-Path	Level	Hierarchical Structure	Example of a Drill-Down-Path
7	World (1)	World	11	Assortment (1)	Sortiment
6	Area (8)	Europe	10	Strat. Business Unit (7)	Fertilitätskontrolle/Hormonther
5	Main Division (15)	Region I	9	Segment (21)	Fertilitätskontrolle
4	Division (19)	R I GeKo	8	Subsegment (75)	Orale Kontrazeptiva
3	Country Group (25)	R I GeKo Skand.	7	Productgroup (119)	Orale Kontrazeptiva
2	Country (213)	Sweden	6	Product Subgroup (133)	Orale Kontrazeptiva (Gestoden)
1	Mandant (350)	Schering AB	5	Product (1.254)	Femovan
			4	Productform (4.607)	Femovan 21 Dra
			3	Original Package (6.209)	Femovan 21 Dra
			2	Grundpackung (9.083)	Femovan 3x21 Dra
			1	Substance (28.243)	Femoden 3x21 St.

Fig. 34: Product and Region Hierarchy of the Schering AG

However, a drill-down analyst can also define from the beginning certain edge and non-edge hierarchies that he wants to use for a drill-down analysis. The sixteen profit hierarchies of Chemetall mentioned above (s.p.105) are thus formed. Thus the drill-down analyst "saves" himself the described ad hoc exploration on the basis of the hierarchy tableaux, which as shown can be interpreted as wandering through a certain drill-down path of an edge or non-edge hierarchy. The drill-down analyst may even choose to use only one particular drill-down path from an edge or non-edge hierarchy.

I was able to show that the examples of profit hierarchies found in the literature, such as those of Riebel, Chemetall and other authors, can be reconstructed as edge hierarchies or non-edge hierarchies of a multidimensional hierarchical system of contribution margins₁, contribution margins₂ or net profits.

The goal of developing a comprehensive system of profit hierarchies was thus not yet achieved. This is because profit hierarchies have also been described in the literature, which cannot be derived from this general classification system. This included the already mentioned Agthe-Mellerowicz profit hierarchy. It contains the contribution margins₁ and contribution margins₂ of certain article profit segments as hierarchy elements.

²⁰¹ For an explanation of these hierarchies and the partial coverage of the hierarchy elements (so-called hierarchy redundancy) of center and regional hierarchies as well as center and article hierarchies (such as department or main department in the center hierarchy or strategic business units in the article hierarchy), see: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., p. 46, www.Inzpla.de/IN11-2001a.pdf. (Text in German, title translated).

Since its hierarchy elements contain two types of profit sizes, it is referred to as a mixed profit hierarchy.²⁰²

The Agthe-Mellerowicz profit hierarchy is based on a certain definition scheme of profit sizes, which I have generalized into a general definition scheme of mixed profit hierarchies. This definition schema can be used for other edge hierarchies (and not only for an article hierarchy as in the case of Agthe and Mellerowicz) but also for each of the (derived) non-edge hierarchies.²⁰³

The different profit types in a mixed profit hierarchy are due to the fact that from a certain level of the hierarchy with contribution margins₁, the profit parameters of the higher level no longer form contribution margins₁ but contribution margins₂.²⁰⁴ This contribution margins₂ of the higher hierarchy level result from the totals of the contribution margins₁ of the lower level minus the individual fixed costs of the profit segment of the higher hierarchy level. At the top of all edge and non-edge hierarchies that lead to a mixed profit hierarchy in this procedure is always the operating result, as in the case of pure profit hierarchies.

After developing this system of edge and non-edge hierarchies and pure and mixed profit hierarchies, I believed and still believe today that I have described all types of possible profit hierarchies based on a cost and performance model through a general classification system.

Based on such a classification system it was now possible to develop the described procedure of a drill-down analysis of multidimensional profit hierarchies. In addition, the development of this comprehensive classification system, which also takes into account certain special features of hierarchy formation such as the occurrence of so-called "hierarchy redundancies", made it possible to develop an efficient configuration system for multidimensional profit hierarchies.

This system is directly linked to the planned and actual cost-performance models of an Integrated Target Commitment Planning. If an Integrated Target Commitment Planning is carried out in a company, and an actual model has been created after the end of the plan year, then a user can carry out a drill-down variance analysis of the actual values of the operating result without great effort, using a profit hierarchy that he can determine ad hoc, either pure or mixed.²⁰⁵

With the development of this system, a number of new terms such as edge hierarchies,

²⁰² The profit hierarchies discussed so far are, therefore, pure profit hierarchies.

²⁰³ During the reconstruction of the profit hierarchy of Agthe-Mellerowicz, it became apparent that this hierarchy as described by the authors is not feasible because it contains an inconsistent classification rule. See: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., p. 66f., www.Inzpla.de/IN11-2001a.pdf

²⁰⁴ The determination of the individual fixed costs of a contribution margin₂ profit segment, which is necessary to determine the values of the contribution margin₂ of this segment, requires a comprehensive structural analysis of a cost-performance model in question. The values of the profit variables that are controlled as part of the analysis are not determined on the basis of explanatory equations of the cost-performance model. There are too many potential variables. At the time of the analysis, the variable values are derived by structural analysis and simulation from the cost-performance model.

²⁰⁵ The analysis with profit hierarchies can also refer to monthly values or cumulated monthly values in the plan, actual, or with regard to the forecasts for the remaining plan year and their variances.

non-edge hierarchies, mixed and pure profit hierarchies, hierarchy redundancy, etc. were introduced, which unfortunately cannot be avoided when a comprehensive systematization is applied.

Before I developed this system, I studied the literature to see if there were any contributions to a "theory of the classification of profit hierarchies". There were only two publications by Röhrenbacher and Weigand who contributed to this topic.

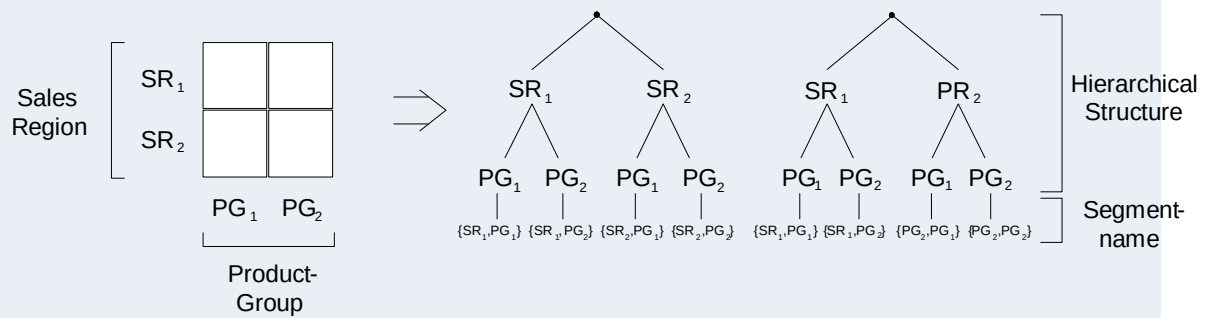


Fig. 35: Relationship between a two-dimensional profit segment classification and its non-edge profit hierarchies

Weigand points out that in profit hierarchies there are apparently "hierarchies in the hierarchy".²⁰⁶ He gives an example of a profit hierarchy in which the total profit is first differentiated by region and then again (this is the hierarchy in the hierarchy) by product groups.

Röhrenbacher, on the other hand, points out that two profit hierarchies can be derived if there is a profit segment matrix with two characteristics of each dimension.²⁰⁷ Fig. 35 shows such a procedure.

These two remarks served me as an impetus to develop the multidimensional hierarchical profit segment system described above.

From the point of view of this system of multidimensional profit hierarchies, Weigand's "hierarchies in the hierarchy" are edge hierarchies or parts of these edge hierarchies whose differentiation criteria are used to form a non-edge hierarchy. Röhrenbacher's note, on the other hand, can be interpreted in the light of the classification system as the derivation of two non-edge hierarchies from a two-dimensional classification of the profit segments using two "degenerated" edge hierarchies of a 2•2 profit segment matrix. They are degenerate because they have only one level.

This classification system was conceived by me around 1990, and at this time the just described computer-supported analysis system of a multi-dimensional hierarchical profit segment analysis was also developed, which was further maintained from then on.²⁰⁸

One of the basic ideas was, as described, the introduction of edge hierarchies and the derivation of all possible types of non-edge hierarchies of the three profit types based on the defined edge hierarchies.

²⁰⁶ Weigand, C., *Entscheidungsorientierte Vertriebskostenrechnung*, Wiesbaden 1989, p. 316.

²⁰⁷ Röhrenbacher, H., *Die Kosten- und Leistungsrechnung im Handelsbetrieb*, Berlin 1985, p. 91f.

²⁰⁸ See in detail: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., www.Inzpla.de/IN11-2001a.pdf.

The development of this classification system and the analysis system based on it was not a focus of my activities. Such a system was not part of the planning and control procedures of the Integrated Target Commitment Planning and Control, but rather formed an exploration procedure that is perhaps quite useful, which is particularly well suited for a drill-down analysis of the actual-plan variances of the operating result.²⁰⁹

It may sound a little strange, but after the development of this classification system, I was plagued by a thought that did not let me go for a while. I could not believe that such a multidimensional classification (generation of an edge and derivative of non-edge hierarchies) had not already been described somewhere in the literature. After all, this classification can be used for all sets of objects that can be classified in several dimensions as soon as suitable edge hierarchies have been found. The classification of sets of objects is a sub-area of science theory. Therefore, I studied the rich literature on this topic but found no references there.²¹⁰ At some point, the interest in this question was extinguished.

However, there has been a development that has led me to resume this question. As a result of the analysis of data stored in databases, the concept of a multidimensional OLAP table was developed.²¹¹ Such tables are also called n-dimensional OLAP data cubes.²¹²

The developers of databases had recognized that the arrangement of data in the form of such data cubes enables a particularly efficient and fruitful evaluation of this data. Codd (1993) was the first to formulate twelve principles of a computer and data logic nature that should be observed when developing such a data cube. One of these principles (Principle 12) already refer to the "*data dimensions*" of a data cube and call for the establishment of "*an unlimited number of user-defined aggregation levels*" above these "*data dimensions*". However, dimension hierarchies are not yet explicitly mentioned.

In 1995, Pendse and Creeth formulated five criteria that an OLAP system should fulfill. The authors now demanded as the main criterion that an OLAP system should be able to enable a multidimensional structuring of the data with the full support of the dimension hierarchies.

This was the first time that I came across a text that dealt with the concept of a dimension hierarchy and thus the concept of a multidimensional hierarchical classification. However, even today, I am still quite sure that this evident classification concept was used long before my "integration" into a program system for the hierarchical exploration of profit segments and the derivation of non-edge hierarchies in any scientific field for the classification of object sets. The use of such dimension hierarchies for exploring multidimensional (OLAP) data cubes is commonplace today and implemented in every database system.

The procedure I described for generating non-edge hierarchies based on edge hierarchies (or dimension hierarchies) cannot (to my knowledge) be carried out by a user interested

²⁰⁹ See variant B.2 in Fig. 25 on page 109 for its systematization as a form of variance analysis.

²¹⁰ For example, the standard work on Bailey's classification methods at the time did not contain a reference to the use of multidimensional hierarchical classifications. See Bailey, K. D., *Typologies and Taxonomies: An Introduction to Classification Techniques*, London 1994.

²¹¹ OLAP = online analytical processing.

²¹² If n is greater than three, these data cubes correspond to the hypercubes already named, see p.117.

in it with the OLAP systems available today. However, such a thing can easily be changed, and the existing systems allow hierarchies to be generated that prove to be non-edge hierarchies.

The multidimensional hierarchical analysis propagated by Pendse and Creeth reawakened my interest in the method of multidimensional hierarchical analysis of profit segments already developed by me. Therefore, I wondered whether the OLAP systems developed according to these standards on a large scale could replace my computer-supported hierarchy analysis system when it comes to analyzing the actual and plan values of certain model variables delivered by the actual and plan cost-performance models as elements of profit hierarchies.

The development and maintenance of a program system are very laborious. Therefore, if an established program system for the implementation of the multidimensional hierarchical analysis of profit segments described by me had offered itself, this would have been very desirable.

Ideally, the INZPLA-System would transfer the actual and planned profit sizes it generates to the OLAP system in the form of a data cube. All functions considered necessary for a hierarchical profit segment analysis, such as the generation of profit hierarchies, the execution of the described drill-down analyses or the generation of output reports, could then be carried out easily with this OLAP system. You do not have to program anything anymore, just configure the system (according to a manual) and then a drill-down analyst can work with it. The theory is implemented, but the laborious work of programming and program maintenance is eliminated.

However, the result of my investigations was negative for one simple reason. It turned out that the majority of the multidimensional profit hierarchies I described cannot be generated with these OLAP systems. This is perhaps somewhat astonishing for some readers because the two-dimensional hierarchy of regions and articles described in Fig. 26 is cited in many of the relevant works on multidimensional hierarchical data analysis as "the" application of an OLAP data cube in companies.

The main reason for this non-applicability is as follows: The values of the aggregated values assigned to a hierarchy element (such as the profit of product group G_1 in region X_1 in Fig. 26) must always be defined as the sum of the values of the base elements of the hierarchy. These values of the basic elements are the values of the OLAP data cube. Therefore, the values of the OLAP data cube are sufficient to calculate the values of all edge and non-edge hierarchies of this cube. However, for the profit hierarchies that can be generated using the described classification system, these values of an OLAP data cube are not sufficient to calculate all profit values of these hierarchies. The only exceptions are the net profit hierarchies.

To calculate the operating result at the highest level, a contribution margin₁ hierarchy requires not only the sum of the contribution margins₁ of the elements directly below it but also the total fixed costs that are included as a negative component in the definition equation. However, these do not exist in the basic segments, so that the value of the operating result at the top of the hierarchy cannot be calculated with the aggregations that are possible with an OLAP system allows.

Contribution margin₂ hierarchies require even more definition components to define their profit sizes, which are not included in the basic segments of the hierarchy and, therefore, not included in an OLAP data cube of the basic profits. To determine the contribution margins₂ of a hierarchy segment, the individual fixed costs of this hierarchy segment are subtracted from the aggregated contribution margins₂ of the directly subordinate level, as described. However, the amounts of these individual fixed costs are not included in the OLAP data cube as basic information. Therefore a multidimensional OLAP analysis is not only not possible for the pure profit hierarchies (except the net profit hierarchies) but also for mixed profit hierarchies, because certain individual fixed costs are also required there as definition components that do not exist in the OLAP profit cube. Therefore, a mixed profit hierarchy such as the often quoted Agthe-Mellerowicz profit hierarchy cannot be analyzed with an OLAP system.

The OLAP concept for analyzing multidimensional data cubes is extremely successful and is used in almost all database systems in use today.²¹³

Nevertheless, it should be noted that OLAP systems are not capable of mapping profit hierarchies in the form of contribution margins₁ and contribution margins₂, which could be used for drill-down analysis based on a cost-performance model.

However, other hierarchies that can be generated as an implication of an actual or plan cost-performance model for drill-down analysis purposes cannot be analyzed with an OLAP system. For example you can assign specific cost center total costs to the areas in a management hierarchy with the execution areas at the base. This results in a hierarchy of total cost center costs. The total cost center costs of a line center X are derived from the definition rule: Total cost center costs of the centers subordinate to this center X minus the internal delivery costs between these subordinate centers (s.p.156). An OLAP cost cube cannot supply the values of these internal delivery costs, which must be determined by a structural analysis. It contains only the total costs of the primary (execution) cost centers of this line hierarchy as cube elements.

The same applies to pure sales hierarchies if the amount of the sales reductions is determined only by the total sales of a customer (in a customer hierarchy) for an article group or all articles in an article hierarchy based on contractual regulations in non-linear dependency on this total sales. The sales deductions with regard to total sales are then not included in the OLAP data cube of the sales values of the sold finished products (or articles).

Given the limited possibilities of an OLAP system to generate the profit hierarchies described above, it is questionable whether a planning and control system that obtains its data from a cost-performance model should be linked to an OLAP system in order to perform analyses of profit hierarchies there. The question is whether it makes more sense to develop appropriate tailor-made procedures for implementing a multidimensional hierarchical analysis of profit segments in a planning and control system that is directly linked

213 The relevance of this concept can be seen from the fact that the keyword "OLAP" led to 11,100,000 entries in a search in Google on July 1, 2010.

to the planned and actual cost-performance models that supply the data. In such a case, the data required for such analyses can be provided directly by a model simulation or model structure analysis at the moment of a user's request without great delay. The drill-down analysis (s.p.118) of a two-dimensional profit hierarchy described in this chapter is an example of this.

In contrast to an OLAP system, the profit sizes listed in the basic segments of the profit segment system can then also be tracked directly into the number system of the actual and plan cost-performance models from which these profit sizes originate via a drill-down analysis. In the basic segment tableau of Fig. 32, for example, the contribution margin₂ of article {Germany-North, Article A1} is listed in the amount of € 102,760, which would form the value of the basic element in an OLAP data cube. In the basic segment tableau, on the other hand, it is already traced back to the variables defining it. One of these definition components are the variable unit costs of € 12.38. Due to this "seamless connection" between the profit segment system and the plan or actual cost-performance model, the "origin" of this variable unit costs could be further pursued by the drill-down analyst directly in the model tableaus of the underlying actual or planning model on the basis of a drill-down analysis.²¹⁴

In retrospect, however, my assertion about the limited possibilities of an OLAP system must be put into relative terms. Based on the "pure OLAP theory", only elements of the dimension hierarchy can be used whose numerical values come about by pure aggregation of the basic elements of the OLAP data cube. In today's OLAP systems, however, it is possible to "post" additional values in addition to the aggregated values at the level of hierarchy nodes, which means that any value in a hierarchy can be generated. During data analysis, the ratios of all characteristics that are subsumed under a hierarchy node and assigned directly to it are aggregated to this node.

If a user, therefore, received a list of all individual fixed costs and the basic segments assigned to them from the INZPLA-System, then he could with this information also implement the described hierarchical profit analyses in an OLAP system. However, that would not be very comfortable and the number of the potential individual cost component, which are to be determined by a structural analysis and transferred to the OLAP system would be very large.

Almost all major companies worldwide use the SAP-CO system. If these companies perform an OLAP analysis with numerical values from actual and plan cost and performance accounting, then these are delivered by their SAP-CO application. However, such an SAP-CO application does not allow to determine the individual fixed costs of certain groups of basic segments by means of a structure analysis, because the SAP-CO system

²¹⁴ In the model tableau system of the furniture model (in Fig. 5 on page 41), the variable unit costs of 2,500 €/unit and 700 €/unit for the sofas and beds sold are shown in the two cost object tableaus. In the corresponding case, these would be the values that the drill-down analyst would then have to follow further via the model tableaus.

does not permit this as a "calculating database".²¹⁵ It is, therefore, no disadvantage that the multidimensional hierarchy systems of the OLAP data cubes cannot generate the profit hierarchies described because of their pure aggregation function.

A drill-down analysis from the value of a base element (for example, the net profit of an article) of an OLAP data cube of an SAP external OLAP system into the plan or actual cost-performance model of an SAP-CO system that supplies this value of the base element is also not possible. This is because there is no closed cost-performance model available in the SAP-CO system since the model structure information is stored in different data tables in a coded form. A drill-down analysis of the base profits of a profit hierarchy down to the basic parameters of a cost-performance model is, therefore, not possible in the case of an SAP-CO application.

The existing commercial systems are, therefore, not yet in a position to implement the concept of a multidimensional hierarchical analysis of profit segments described here.

Optimal elimination planning of profit segments. The contribution margin₂ segments, which act as elements of multidimensional hierarchical profit systems, also serve to carry out an elimination planning. This planning procedure allows to decide whether certain reference objects are to be eliminated or not. A planning period of more than one year is assumed. For the practical application of this elimination planning, I developed an (optimization) procedure which selects the profit segments (partial cubes of the hypercube) in such a way that their contribution margins₂ result in the highest negative value of all possible eliminations. For n sold articles, there are $2^n - 1$ possible article combinations that form segments of contribution margin₂.²¹⁶ The elimination of the profit segment with the highest negative contribution margin₂ from this set of article combinations would, therefore, maximize the operating result.

The resulted segments to be eliminated can be identified by the elements of the edge hierarchies. For example, the operating result in the plan cost-performance model may be maximized by eliminating the profit segment {Article-Group B, France}. The two-dimensional hierarchical identification of this segment to be eliminated is based on the two-dimensional classification of the contribution margin₂ profit segments with an article and region hierarchy as edge hierarchies.

To carry out such an optimization, a comprehensive structural analysis of the cost-performance model used is required, which serves to determine the individual fixed costs of all possible contribution margin₂ profit segments. When such a profit segment is eliminated, it is assumed that the individual fixed costs of the profit segment in question (e.g., fixed costs of the product manager responsible only for the segment "Article group

²¹⁵ For details, see page 333.

²¹⁶ For the developed optimization procedure of such an elimination planning, see: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., p.5, www.Inzpla.de/IN11-2001a.pdf.

B/France") can also be reduced in the long run.²¹⁷ Therefore, this planning is a planning that is not an annual planning but works with a planning horizon that allows you to reduce the individual fixed costs entered completely.

Other analytical methods. Furthermore, a series of explorative analysis procedures was developed, which should enable a planner to better understand the connections described by his plan and actual model. Such methods are primary cost analysis, sensitivity analyses, target value analyses, clustered top target relationship analyses, various drill-down analyses, and the development of order quantity diagrams that graphically describe the relationships of the order quantities between the cost objects. An example of such an order quantity diagram describing the relations between the costs objects of the multi-level production of ThyssenKrupp Steel is shown elsewhere.²¹⁸

²¹⁷ This elimination planning realized within the framework of the INZPLA program system is later propagated as a preferable alternative to an elimination planning, which was propagated by Robert S. Kaplan as a completely new planning procedure, but represents an inferior procedure in the light of a model-based planning. See page 187.

²¹⁸ See page 151. For the Kilger model order quantity diagram, see page 153.

10. Clarification of the conceptual instruments of cost accounting through the Integrated Target Commitment Planning

The concept of the Integrated Target Commitment Planning works with terms whose definitions are based on specific types of models and procedures. The very detailed regulations of this planning and control procedure and the procedures for exploring models, force the introduction of terms, which are not used in classical cost accounting because they are not required there. I regard these definitions however as a desirable clarifications of the concept system of general cost accounting and not only as necessary for using the Integrated Target Commitment Planning. Therefore, I will briefly describe how the conceptual pairs "*fixed costs - variable costs*" and "*individual costs - overhead costs*" that are trusted by everyone who deals with the topic of cost accounting are used in the system of an Integrated Target Commitment Planning. Then it will be shown how these conceptual pairs differ from the definitions of other authors.

In the text "*Variable costs vs. fixed Costs, individual Costs vs. overhead Costs in the relevant Cost Accounting and the Integrated Target Commitment Planning*" the definitions of these central terms in the frame of the Integrated Target Commitment Planning are discussed in much more detail and compared with the definitions a used by four well-known authors.²¹⁹

Variable costs are usually defined as those costs that change (linearly) depending on the employment of a cost center. They are described by a cost hypothesis (or cost function). In the following, a distinction is made between (model) explicit and (model) implicit cost hypotheses. Explicit cost hypotheses are cost hypotheses that are directly listed as structural equations in the full cost and marginal cost tableau system of a cost-performance model of the Integrated Target Commitment Planning.

Thus, they are structural equations of the cost-performance model. Implicit cost hypotheses are hypotheses that do not appear directly in the model tableaux as structural equations. However, they can be derived (as implications) from the cost-performance model.

The explicit cost hypotheses of a cost center can occur in two forms

$$CO = FC + PCR \cdot EP \quad (66)$$

or

$$CO = FCQ \cdot PP + CQR \cdot PP \cdot EP. \quad (67)$$

With ²²⁰

CO - Costs (€)

FC - Fixed costs (€)

PCR - Proportional cost rate (€/EU)

CQR - Consumption rate (CU/EU)

²¹⁹ Zwicker, E., *Variable Costs vs. Fixed Costs, Individual Costs vs. Overhead Costs in the relevant Cost Accounting Concepts and the Integrated Target Commitment Planning*, Berlin 2003, www.Inzpla.de/IN24-2003b.pdf. (Text in German, title translated)

²²⁰ The following applies to the dimension units: EU - employment unit, CU - consumption unit.

PP - Procurement price (€/CU)

EP - Employment

FCQ - Fixed consumption quantity (CU)

EU - Unit employment

CQ - Consumption quantity

CU - Unit consumption quantity

The terms "PCR • EP" and "CQR • PP • EP" in the two cost hypotheses describe the variable costs. You can use the explicit cost hypotheses (66) and (67) to describe the primary cost elements of a cost center.

The secondary cost elements of a cost center always contain a procurement price (PP) that originates from the cost element tableau or the cost object tableau of another cost center as an explanatory variable of their hypothesis equation. They are transfer prices between the reference variable units and are only contained in hypotheses of the form (67).²²¹

The cost object tableaus of the Integrated Target Commitment Planning model tableau system also contain primary and secondary cost elements that are described by linear hypothesis equations. They have the same form as the hypotheses (66) and (67). However, instead of the employment, the number of products manufactured or the number of finished products (or articles) sold acts as an explanatory variable. However, the variable and fixed costs described by these explicit hypotheses in the cost element and cost object tableaus do not exhaust the terms "variable and fixed costs" in a cost-performance model. Thus, the same costs described by the explicit cost hypotheses (66) and (67) in the cost element tableaus of a cost-performance model can also be described by alternative implicit cost hypotheses.

The employment (EP) in the explicit cost hypotheses (66) or (67) of production areas is in a cost-performance model almost never a basic parameter. It is normally influenced by one sales quantity (SQ) or several sales quantities (SQ₁,..., SQ_n) or also by fixed order quantities (FCQ₁,...,FCQ_m) of other production areas using structural equations.

This relationship between the employment (EP) in (66) or (67) and its initial quantity drivers SQ₁,...,SQ_n or FCQ₁,...,FCQ_m can be described by a reduced driver hypothesis.²²²

With two sales quantities as initial quantity driver (SQ₁ and SQ₂), you can get for example the following reduced driver hypothesis

$$EP = M_{11} \cdot M_{12} \cdot SQ_1 + M_{21} \cdot M_{22} \cdot M_{23} \cdot SQ_2 \quad (68)$$

The quantities M_{ij} are the already mentioned (s.p.31) quantity multipliers, i.e., consumption rates, production coefficients or also scrap rates of the production areas, which receive a performance from the production area with the employment (EP), whereby their performance, however, again goes through other production areas or also directly into the articles to be produced with the sales quantities SQ₁ and SQ₂. With (68) in (66) one ob-

²²¹ The cost object tableaus used to determine the cost rates of the cost objects are in an Integrated Target Commitment Planning model always assigned to a specific cost area and, therefore, belong to the area model of this cost area.

²²² For an explanation of the concept of an initial quantity driver, see pages 31 and 104.

tains an implicit cost hypothesis of the same costs (CO) whose explicit cost hypothesis (66) has already been described. It has the form

$$CO = FC + PCR \cdot M_{11} \cdot M_{12} \cdot SQ_1 + PCR \cdot M_{21} \cdot M_{22} \cdot M_{23} \cdot SQ_2 \quad (69)$$

The terms " $PCR \cdot M_{11} \cdot M_{12} \cdot SQ_1$ " and " $PCR \cdot M_{21} \cdot M_{22} \cdot M_{23} \cdot SQ_2$ " describe variable costs, which are now variable with in relation to the variables SQ_1 and SQ_2 (and not in relation to EP).

If the employment (BE) in the explicit cost hypothesis of the costs (CO) of a model tableau or the production quantity (PQ) in the explicit hypotheses of the costs (CO) of a cost object tableau depend on a certain sales quantity (SQ), then these costs are variable once with respect to the employment (BE) or the production quantity (PM) but also with respect to the sales quantity (SQ). Of these driver variables in a production chain, sales quantities are the most important since they are the initial "variability producers". Therefore, when we talk about the variable costs of a cost element, we must always add with regard to which of the possible "driver variables" these costs are variable.

In addition to the implicit hypothesis equations of certain costs in the cost element and cost object tableaus, the definition of the individual costs of a reference object is also of importance. To define them, it must first be clarified what is meant by a reference object.

Reference objects describe delimitable units in a company that create a service which can be "eliminated". The service of these units is terminated when their activity is eliminated. All possible combinations of cost centers and cost objects can be considered as potential reference objects.

A reference object is characterized by the fact that certain sales and individual costs can be assigned to it causally. These are the sales and costs that would be dropped if the reference object were to be eliminated. The costs incurred are referred to as the individual costs of the reference object and consist of the variable costs of all sales quantities to be eliminated and the individual fixed costs of the reference object. The difference between these sales value and the individual costs is the contribution margin₂ of the reference object. It can be negative or positive.

Each reference object can be described by a so-called reference object vector. The elements of this vector are certain reference variables. A reference object is eliminated (in the model) when the reference variables of its reference object vector and its individual fixed costs are set to zero. In the following, we will assume that only cost objects or a cost centers are regarded as a reference objects.

In the case of a cost object, its reference object vector has only one reference variable. This is its order quantity. A single-reference variable cost center has, as the name implies, a reference object vector with one reference variable. This is always its employment.

The individual fixed costs of a cost center or a cost object are defined in the following way.

If a cost center is to act as a reference object, its individual fixed costs result from the sum of three components:

1. The primary fixed costs of this cost center in its cost element tableau (PFCC₁)
2. The primary fixed costs of all cost centers and cost objects that perform an activity exclusively for the cost center in question (PFCC₂)
3. The variable costs of all cost centers and cost objects that perform an activity exclusively for the cost center in question but whose variable costs are not allocated as variable costs in the cost element tableau of this cost center. (PFCC₃)

If a cost object is to act as a reference object, its individual fixed costs result from the sum of three components:

1. The primary fixed costs of this cost object in its cost object tableau (PFCO₁)
2. The primary fixed costs of all cost centers and cost objects that perform an activity exclusively for the cost object in question (PFCO₂)
3. The variable costs of all cost centers and cost objects that perform an activity exclusively for the cost object in question but whose variable costs are not allocated as variable costs in the cost object tableau of this cost object. (PFCO₃)

The cost objects interpreted as reference objects also include the cost objects of a sold finished product (article). They are most important with regard to the analytical relevance of the individual fixed costs of these reference objects and are only dealt with in the following.

The individual fixed costs of a sold finished product (individual article fixed costs) already played a role in the context of multidimensional profit hierarchies (s.p.187). They were defined there as the fixed costs that could be eliminated if the article were to be deleted, that is, if its sales quantity were set to zero in the planning model.

The variable cost as well as the primary fixed costs of their reference objects (cost center and cost objects) PFCC₁ and PFCO₁ can easily be taken from the model tableaus of an Integrated Target Commitment Planning. However, the fixed costs i.e., PFCC₂, PFCC₃, PFCO₂, and PFCO₃, can only be determined by a differentiated structural analysis using the full cost model.

Based on the terms “variable costs”, “individual costs”, “individual fixed costs” and “reference objects” developed, the term overhead costs should also be defined. In the system of the Integrated Target Commitment Planning, the term "overhead costs" is only used in regard to a certain types of reference objects, and these are the cost objects of the sold finished products (or articles).

The following terminology can be used especially for the cost objects of the sold finished products. The cost components PFCO₁, PFCO₂, and PFCO₃ are, according to the above definition, the individual fixed costs of a sold finished product.

Overhead costs are the fixed costs originating from cost centers and cost objects that do not exclusively perform an activity for one of the sold finished products (articles). As a result, in a full cost model, they are not allocated directly or indirectly to the cost object

tableaus of the sold finished products via upstream intermediate cost objects alone.

Variable Costs 913.590€	Total Fixed Costs 633.400€		
	Individual Article Fixed Costs 16.200€	Article Group Fixed Costs 17.200€	Total Article Fixed Costs 600.000€
Article Individual Costs 929.790€		Overhead 617.200€	
Total Costs 1.546.990€			

Fig. 36: Total costs of the sold units of all finished products with regard to their classification into variable and fixed costs as well as individual and overhead costs in cost-performance models of an Integrated Target Commitment Planning.

The question is how to classify the total costs in a cost-performance model of the Integrated Target Commitment Planning in such a way that certain partial costs are explicated that are regarded as informative. Such classification of the total costs into cost items is informative if these cost items can be used to solve practical problems. In the light of the Integrated Target Commitment Planning, this means that they are useful for planning, control and certain model explorations that are considered as important.

Such a classification, which is carried out in the following, leads to the definitional overlap diagram in Fig. 36. The numerical values of the individual cost terms given there originate from the basic profit segment tableau of Fig. 32.

The total variable cost of the twelve items sold amounted to € 913,590. The fixed costs, which are only assigned to one article, were designated as individual article fixed costs. Their sum was € 16,200. The variable cost of the twelve items and their individual item fixed costs add up to a total article individual cost of € 929,790. (Sum of column 7 in Fig. 32) The total fixed costs of € 633,400 are made from three components, the sum of the individual article fixed costs, the sum of the article groups fixed costs and the sum of the total article fixed costs.

The total article fixed costs include the fixed costs, which in the full cost version of a cost-performance model are always allocated to all finished cost objects (and not just a subgroup of these) according to certain criteria.

The article group fixed costs are the fixed costs that are assigned neither to an article nor to all articles, but a specific subgroup of articles.

The overhead costs are positively defined as the article group fixed costs and the total article fixed costs. In Fig. 32, the article group fixed costs are determined by the sum of the fixed costs for the article groups of two profit segments in lines 13 and 14. Together they amount to € 17,200. The total article fixed costs are shown in row 15 with an amount of € 600,000.

The procedures to be used to determine these cost components, i.e., the variable costs and

the three categories of fixed costs, can be interpreted as rules for an operational definition of these components. The definition is, therefore, "strictly model-based". This makes it possible to determine the numerical values of the cost components described in Fig. 36 for a cost-performance model in question and to generate and output them by an IT system.

Individual Costs	Overhead Costs	
	Unreal Overhead Costs	Real Overhead Costs
Variable Costs		Fixed Costs

Fig. 37: Classification of the total costs of the sold units of all finished products with regard to their division into variable and fixed costs as well as individual and overhead costs according to Schweitzer and Küpper

As has been shown, these values are also determined if a multidimensional hierarchical profit segment analysis is performed and an analyst orders the analysis system to output the basic segment tableau of the operating result (see Fig. 32) of a planning alternative.²²³ However, the definitions described also show the limits of a model-based (operational) definition. It is necessary that a reference object (in the model) is described by one or more reference variables whose zeroing could be interpreted in a meaningful way as an "elimination of this reference object". Furthermore, an alternative planning must be assumed which describes the case of non-zeroing. Only under these conditions it is possible to deliver a model-based definition of these cost concepts.

The definitions of the various cost concepts described in this text and the overlapping diagram in Fig. 36 differ from the division of the total costs of a cost-performance model customary in the literature. The relevant literature does not distinguish between explicit hypotheses of the primary and secondary costs of the cost centers and cost objects and the implicit cost hypotheses of the same costs. And the definitions (s.p.134) of the individual costs of cost objects and cost centers can not be fined in this literature.

Küppers cost classification. Hans-Ulrich Küpper, one of the leading German-speaking representatives of controlling and cost accounting (s.p.502), also uses the two pairs of terms "variable costs - fixed costs" and "individual costs - overhead costs" in his standard work on cost accounting published with Schweitzer to classify the total costs. The authors also developed a definitional overlap diagram to identify the two pairs of terms they defined, which can, therefore, be compared directly with the overlap diagram in Fig. 36.

In addition to the the commonly used pair of terms "variable costs vs. fixed costs" and "individual costs vs. overhead costs", they use a third pair of terms. It serves to divide the

²²³ The following applies to actual models in the form of ex-post planning models.

overhead costs in real and non-real ones. Fig. 37 shows the overlapping of the three pairs of terms used by Schweitzer and Küpper to subdivide the total cost of the sold units of a finished product.²²⁴

For Schweitzer and Küpper, the individual costs are always variable costs. As we can see, the variable costs can not only be individual costs but also real and unreal overhead costs. The unreal overhead costs are always variable costs. The fixed costs, on the other hand, are always real overhead costs. The real overhead costs can, therefore, be variable and fixed costs.

What definitions apply to the cost concepts used by the authors in this overlap diagram? According to the authors' definition, unreal overhead costs are costs that are "actually" variable with regard to a certain sales quantity, but which are allocated to the final cost objects in a full cost model as fixed costs according to certain keys. The amount of these costs assigned to the units of a sold item is added to the overhead of the item. They are "overhead costs" in the sense of the authors because they are not causally attributed to the articles (in the model). However, since they are "actually" variable, they could also be attributed to an article in the model as variable costs.

If these unreal overhead costs were to occur in a model tableau system of the full cost model of an Integrated Target Commitment Planning (the authors call the costs of the operating supplies as an example), they would be entered in a cost object (costs of operating supplies) in the form of fixed cost values and allocated to the final cost objects according to a key (for example, the direct material costs). They are, therefore, fixed costs in a cost-performance model with regard to all sales quantities of the articles. This is particularly evident in the marginal cost version (or the marginal cost model), in which they are directly included in the sum of fixed costs, which occurs as a negative component in the definition equation of the operating result.

For the concept system of the Integrated Target Commitment Planning, however, the following applies: Whether these costs are "actually" variable is irrelevant, the decisive factor is how they are described in the model, and there they do not appear as variable costs but as fixed costs. The differentiation of costs into "actually variable, but not variable in the model" is not necessary in a concept formation that only characterizes what is covered by a model.

Since the concept of unreal overhead costs is, therefore, unnecessary for the Integrated Target Commitment Planning, this also applies to the counterterm of real overhead costs. The differentiation of the total costs of all items into individual costs and overhead costs is also unacceptable, because Schweitzer and Küpper's concept of individual costs does not start from a well-defined reference object, which can be eliminated by zeroing its reference variables and its individual fixed costs and can, therefore, be interpreted as the cause of these individual costs, because they are eliminated (in the long term) in the case of an elimination of the reference object.

At least for the implementation of an Integrated Target Commitment Planning, the cost

²²⁴ Schweitzer, M., Küpper, H. U., Systeme der Kosten- und Erlösrechnung, München, 2008, 9th. Ed., p. 530.

term pairs overhead vs. individual costs and real overhead vs. non-real overhead as defined by Schweitzer and Küpper are not useful, because they are not used for the normative and explorative analyses there and partly also do not permit a model-based operative definition.²²⁵

Schneider's cost classification. In a rather controversial study, Dieter Schneider set himself the goal of "*pointing the finger at the wounds of intellectual uncleanness in the basic concepts of financial, income and cost accounting*" (p.68).²²⁶ For "*he who, like wide areas of the literature on accounting, speaks unclearly in the basic concepts has either not thought clearly or wants to conceal something*" (p.62). In his analyses of the use of accounting terms, he notes a "*beginnerish confusion of terms*" (p.367) and a use of terms in cost accounting that is "*empty of content*" (p.365) and leads to "*dangerous blather*" (p.365). However, Schneider does not only criticize, he also defines the pairs of terms "variable costs - fixed costs" and "individual costs - overheads". He expects that "*carelessness*" in the use of these terms will now "*disappear in the future*" through his definitions.²²⁷ Schneider's definitions are analyzed with regard to the model-based cost definitions developed here, and the result is that they lead to contradictions and cannot be reconstructed as useful (model-based) definitions of a cost-performance model.²²⁸

Riebel's cost classification. Paul Riebel rejects the use of variable and fixed costs in his cost theory. He takes the view that such costs cannot be determined in a company. In contrast to this, the "*relative individual costs*" form the central elements of his system. In the light of the Integrated Target Commitment Planning and the flexible plan cost accounting, I conclude in a detailed study that such a categorical rejection of this pair of terms cannot be justified.²²⁹

I reconstructed Riebel's central concept of relative individual costs in the light of a model-based view. This was necessary because Riebel does not carry out such a model-based explication of his concept of "*relative individual costs*". Riebel's presentation bases mainly on examples. I have not succeeded in reconstructing Riebel's definition of the term "*relative individual costs*" in such a way that a model-based definition of his concept of relative individual costs can be made with respect to certain model-based defined reference objects. Riebel defines a reference object as "*an object of calculation and investigation to be objectively and temporally delimited, to which money or quantities are allocated*". To identify a reference object as an "originating instance" of relative individual costs and relative individual sales (of the reference object), it must be "eliminable" in the description categories of the model. However, once you have eliminated Riebel's refer-

²²⁵ See in detail: Zwicker, E., *Variable Costs vs. Fixed Costs, Individual costs vs. Overhead Costs in the relevant Cost Accounting Concepts and the Integrated Target Commitment Planning*, Berlin 2003, p. 14f., www.Inzpla.de/IN24-2003b.pdf. (Text in German, title translated).

²²⁶ Schneider, D., *Betriebswirtschaftslehre*, vol. 2, Rechnungswesen, München/Wien 1993.

²²⁷ Schneider, D., *Betriebswirtschaftslehre...*, op. cit., Preface.

²²⁸ See: Zwicker, E., *Variable Costs vs. Fixed Costs...*, op. cit., p. 38-49.

²²⁹ Zwicker, E., *Variable Costs vs. Fixed costs...*, op. cit., p. 26-37.

ence object and thus changed the model structure, the remaining model must still describe a feasible planning alternative against the initial alternative with certain costs and sales. The same applies if a reference object is additionally included in the model.

Due to this elimination requirement, combined with exactly calculable difference costs and difference sales of the elimination alternative, not only Schweitzer and Küpper's concept of a reference object fails but also the general definition of Riebel's reference objects, which leads erroneously to the expectation that many such reference objects could be identified with the description categories of a cost-performance model.

The definition of a reference object in the system of the Integrated Target Commitment Planning is not suitable to be a reference object in the sense of Riebel. This is not possible because variable costs are assigned to such reference objects that do not exist for Riebel. However, even if it is assumed that a plan cost-performance model does not have variable costs, it is not possible to find reference objects in it that prove to be a model-based concretization of an *"an object of calculation and investigation to be objectively and temporally delimited, to which money or quantities are allocated."*

Cost allocation overview. To provide a better overview of the allocation structures of cost accounting systems, I developed a tableau, which is called the cost allocation overview.²³⁰ All cost centers described in a cost-performance model correspond to the rows in this tableau. They are differentiated between flow areas and non-flow areas. Flow areas are production areas that receive certain quantities of intermediate products, process them and forward them to other production areas as well as to intermediate or final inventories. If all flow areas allocate their activities directly to the cost object tableaus of the finished products sold, then a single-stage cost object calculation (but a multi-stage production) exists.²³¹ However, it would be much more desirable for all flow areas to calculate their production costs using their own cost object tableau and then "charge" them to the following production areas. Then one would not only have determined the costs of the intermediate products but could also precisely describe the flow of quantities through the production areas and the inventories. This would be the case of a multi-stage cost object calculation.

The cost allocation overview provides information on the extent to which such flow modeling is applied. If real order quantity relationships exist between service cost centers and between service cost centers and production areas, flow modeling can also be performed between them. An example is the supply of electricity if electricity is generated in the company itself. In many cases, the performances exchanged between the service cost centers and the performances of the service cost to the production areas cannot be described quantitatively (as delivery quantities). In such cases, the allocation of costs for the

²³⁰ See in detail: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 85, www.lnzpla.de/IN06-2000a.pdf.

²³¹ This is the case for the furniture model. Here (see Fig. 5 on page 41) all costs of the three production areas are charged directly to the cost object tableaus of the sofas and beds to be produced. The production flow between the three production areas is not modeled.

activities created is carried out using assessment keys. Such an allocation is described in the Integrated Target Commitment Planning system by the allocation category of a fictitious order quantity (s.p.25).

The developed cost allocation overview provides information on the "quality" of this allocation. The following applies: The more real order quantities are allocated between cost objects, the better the "allocation quality" of the cost accounting system in question.

Finally, to assess the degree of differentiation of a cost accounting system, it is also important whether the costs incurred in the service cost centers and the flow areas are allocated directly to the final cost objects or in the case of a multi-stage production to the cost objects of the subsequent production stage. The more these costs are charged directly to the cost objects of the finished products (or articles) sold, the greater is the probability that the existing cost accounting system does not represent a causally allocation of costs.

In such a cost allocation overview, each cost center corresponds to one row of this tableau. In systems with a large number of cost centers, this would lead to a very large tableau. In such cases, you would, therefore, need to use a cost center hierarchy to control the tableau contents using a top-down procedure.²³²

²³² For the significance of hierarchies in the system of the Integrated Target Commitment Planning, see page 156.

11. How to approach the Integrated Target Commitment Planning?

The development of the Integrated Target Commitment Planning was described in this text in order to gain a better understanding of this normative theory. However, it is not a strictly systematic presentation. This form of a presentation is only to find in the text "*Integrated Target Commitment Planning and Control - A Procedure of Comprehensive Company Planning and Control*".²³³ A reader who reads this text on the development of the Integrated Target Commitment Planning should, therefore, also read this systematic text if he wants to become more familiar with this planning and control procedure.

Who is not interested in following the procedure practiced in this text, i.e., the description of the Integrated Target Commitment Planning in the context of its development, but is nevertheless interested in the procedure, should directly start with the above mentioned text.

The examples given in this text (furniture model, comprehensive company planning model) will be explained there in detail, and the text covers topics not mentioned here. This text also forms the basis for a more in-depth study. Reference is made to this in-depth presentation there.

For example, in this systematic text, sales planning is only described by one sales planning procedure, which consists of the following: The sales price of an article should be set by the corporate management or another executive body and on this "business basis" the sales area manager should make his bottom-up sales quantity commitment, the final commitment value of which is then negotiated during the planning procedure. This procedure can be observed almost exclusively in practice.

However, there is a more detailed text, which comprises about 40 pages, discusses the possible variants of sales planning in the system of an Integrated Target Commitment Planning, and compares them with the procedures of sales planning propagated in the literature.²³⁴ The same applies to other areas such as the structure of the model tableau system²³⁵, the structure and use of actual cost models²³⁶, the profit center planning²³⁷, the area Target Commitment Planning²³⁸ and other topics.

²³³ Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., www.Inzpla.de/IN37-2008c.pdf. (126 pages), (Text in German, title translated).

²³⁴ See: Zwicker, E., *The Integrated Target Commitment Planning and Sales Planning*, Berlin 2002, (40 pages), www.Inzpla.de/IN21-2002g.pdf. (In German, title translated). The procedure mentioned above is a so-called singular price-sales-quantity commitment. This variant is systematized under 2.1.1 in Fig. 1 on page 23 of the text "*Integrated target commitment planning and sales planning*".

²³⁵ Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., www.Inzpla.de/IN06-2000a.pdf. (133 pages) (Text in German, title translated).

²³⁶ Zwicker, E., *Actual Cost-Performance Models: Structure, Semantics and Application*, Berlin 2008, (45 pages), www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated).

²³⁷ Zwicker, E., *Structure and Process of Profit Center Planning in the System of the Integrated Target Commitment Planning*, Berlin 2002, (58 pages), www.Inzpla.de/IN16-2002b.pdf. (Text in German, title translated).

²³⁸ Zwicker, E., *Area Target Commitment Planning and Control of primary and secondary Areas of Responsibility in the System of the Integrated Target Commitment Planning*, op. cit.,

The strongest deepening is realized in the area "Control and Variance Analysis". This subject is dealt with in this text on 26 pages. In the text "*Control and Variance Analysis in the System of an operational Planning*", this area is discussed in much more detail and compared with other procedures, resulting in a text of 301 pages.²³⁹

The Integrated Target Commitment Planning and Control is a comprehensive planning and control procedure. With the planning and actual models developed for such planning and control, certain model explorations can also be carried out. The system of an Integrated Target Commitment Planning and Control, therefore, includes not only a normative theory of planning and control but also a not inconsiderable number of certain exploration procedures (s.p.100).

The question arises as to how one can familiarize oneself with this system within a certain amount of time.

The planning and the following control, which takes place in the system of the Integrated Target Commitment Planning and Control, are two procedural steps that can be easily distinguished from each other. An engagement with the Integrated Target Commitment Planning and Control should always begin with planning. This is also the case in the text "*Integrated Target Commitment Planning and Control - a procedure for a comprehensive company planning and control*", which is recommended as a systematic introduction. The different types of an Integrated Target Commitment Planning are described by two classification schemes, which are taken from the mentioned text "*Integrated Target Commitment Planning and Control...*" and discussed there in detail. These classifications were already referred to in the discussion of the pure basic Target Commitment Planning, the pure area Target Commitment Planning and the comprehensive company planning (s.p.47 and 56).

As shown in Fig. 38, the first classification of the types of the Integrated Target Commitment Planning is based on a tree diagram.²⁴⁰ The first differentiation of this tree, seen from above, distinguishes between three application areas of an Integrated Target Commitment Planning. Firstly, pure operating result planning, which is based exclusively on a cost-performance model. Secondly, comprehensive company planning, which includes plan account closing and allows the use of balance sheet top targets, and thirdly the profit center planning, whose aim is an isolated planning of a profit center.

As can already be seen from the different levels of detail, the focus of the Integrated Target Commitment Planning application area is on pure operating result planning. Some of the planning procedures for an Integrated Target Commitment Planning listed in the overview contain a reference to six examples. Example 1 of a pure basic target commitment plan has already been explained in this text in abridged form (designated as furnish-model). Example 3 of a pure area Target Commitment Planning was also discussed

www.Inzpla.de/IN09-2000d.pdf. (60 pages), (Text in German, title translated).

²³⁹ Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

²⁴⁰ See: Zwicker, E., *Integrated Target Commitment Planning and Control...*, op. cit., p. 22

using the furniture model. The same applies to example 6 of a one-step comprehensive company planning.²⁴¹

The second classification of the types of an Integrated Target Commitment Planning is shown in Fig. 39 using a two-dimensional classification scheme.²⁴² The Integrated Target Commitment Planning is a normative theory (or a normative procedure) using models, with which certain (planning) procedures are carried out. Fig. 39 shows which models are used for planning with which planning procedures. The possible models correspond to the columns, the possible planning procedures to the rows of the schema. The grey fields show the permissible combinations of model and planning procedures.

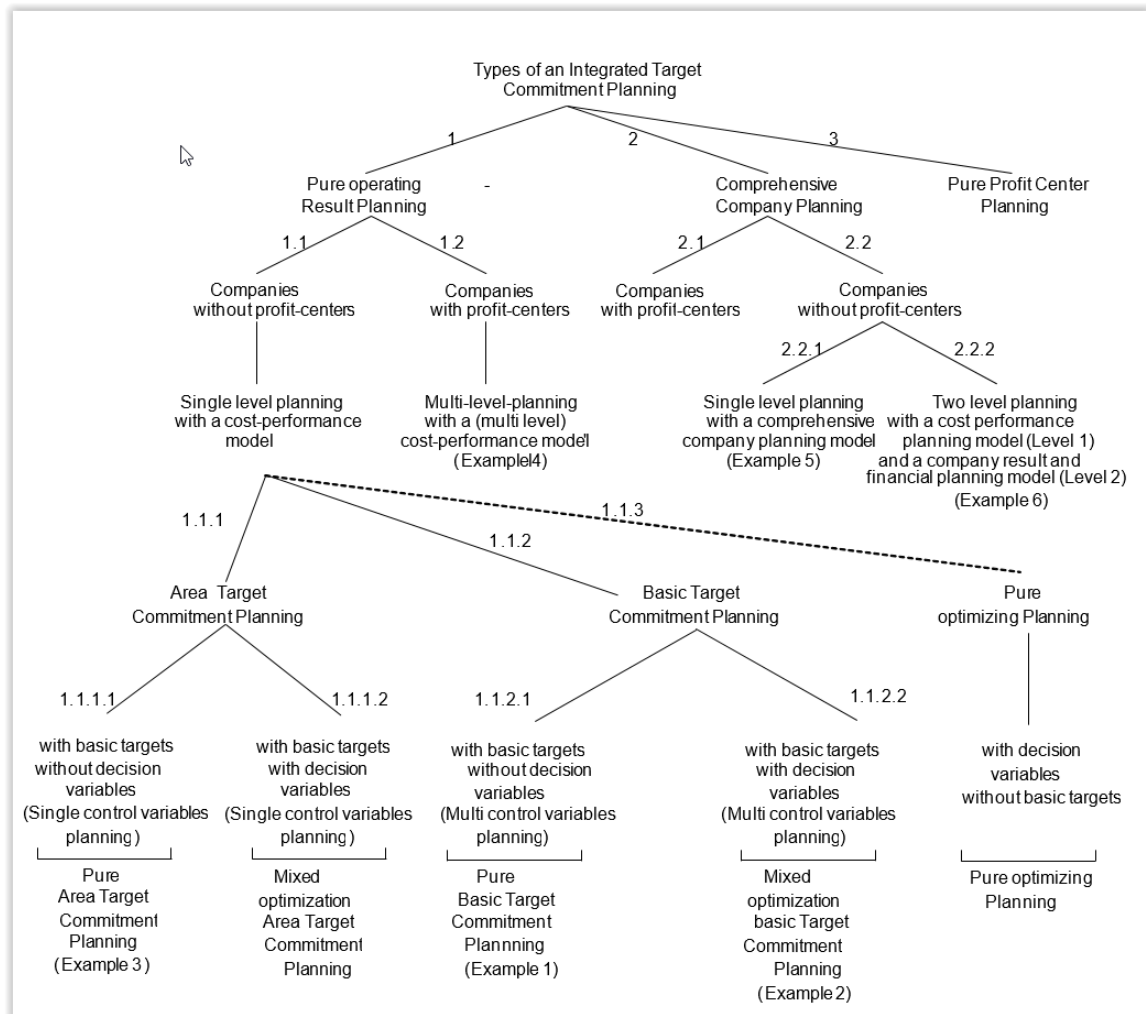


Fig. 38: Types of an Integrated Target Commitment Planning

The control procedure following the Integrated Target Commitment Planning was described as a sub-area of variance analysis (s.p.103) referred to there as "normative variance analysis". It is systematized in Fig. 25 on page 109 together with the explorative variance analysis using a tree diagram.

²⁴¹ For more information about these examples, see pages 40, 48 and 68.

²⁴² See: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 75, www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated).

Like the two systematizations of the planning areas and planning procedures, this diagram can also serve as the basis for a systematic entry. The best way to get started is with the introduction mentioned above, which also contains this overview and is discussed there.²⁴³

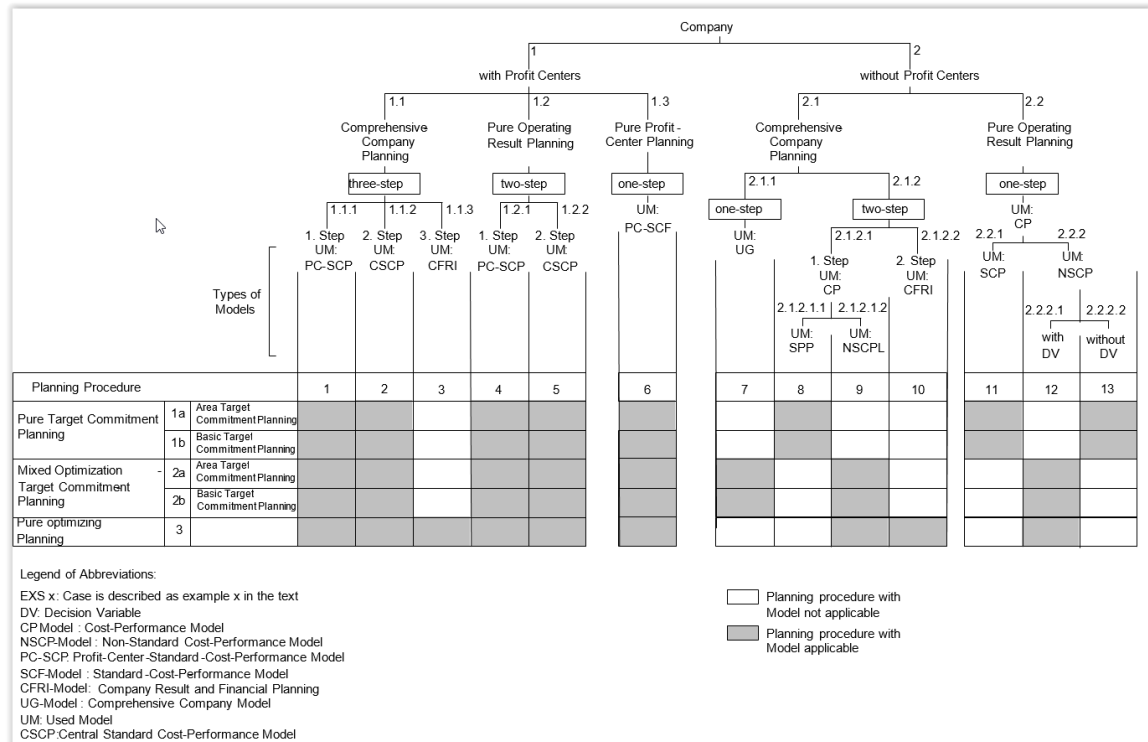


Fig. 39: Models and planning procedures for an Integrated Target Commitment Planning

However, the control and other procedures of a variance analysis are not dealt with in the text "*Integrated Target Commitment Planning and Control*" in the same detail as the planning. If this topic is to be discussed at the same level of detail as planning, it is advisable to turn to the text "*Control and Variance Analysis in the System of an operational Planning*".²⁴⁴ There one finds on the first forty pages a summary of the following text, oriented by examples and appealing to intuition. This summary and the introductory text "*Integrated Target Commitment Planning and Control,...*" refer to the more detailed literature on the individual areas.

All the texts quoted there, which are also listed in the bibliography of this text, comprise about 1,800 pages. For the most part, they are only suitable for those who want to deal more intensively with the Integrated Target Commitment Planning and Control. However, if you only want a first overview that touches all areas, it is sufficient to read the introductory text "*Integrated Target Commitment Planning and Control...*" and the first forty pages of the text "*Control and Variance Analysis...*".

²⁴³ See: Zwicker, E., *Integrated Target Commitment Planning and Control...*, op. cit., p. 82.

²⁴⁴ Zwicker, E., *Control and Variance Analysis in the System of an operational Planning...*, op. cit. www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

This introductory text and the other texts of the bibliography are systematic texts and, therefore, contain no descriptions of the considerations as to how I arrived at the development of certain concepts and systems, i.e., considerations as they can be found in the grey-colored text passages here. And texts that describe certain events and findings from my professional career, i.e., bibliographical information, as here on the yellow text passages, will certainly not be found there.

Probably every author will ask himself what he can reasonably expect of a reader of his texts. In view of the extensive new terminology and the somewhat unusual model-based approach of the Integrated Target Commitment Planning and Control for some readers, even those interested in the field may shy away from a more detailed systematic study. If that is the case, I can only quote the words from a preface by Mark Twain, "*This book contains a considerable volume of information. I deeply regret this, but unfortunately, it was inevitable*".²⁴⁵

12. Isn't there an easier way?

Nobody disputes the demand to describe a complex as simply as possible. But what are the criteria that show, whether a complex has been presented as simply as possible? The saying "*Keep it simple and stupid*" is common and generally accepted idiom. Albert Einstein, who thought a lot about how he could simplify his special theory of relativity, also agreed with this demand. But he put a restriction on it, "*Keep it simple and stupid but not too simple and not too stupid.*" When the Berliner Illustrierte awarded a price to someone who was able to explain the relativity theory to the normal public in a simple way, he thought a lot about how this could be done because he wanted to win the price money. However, he concluded that it would not work and waived participation.

Many levels below, in the lower floors of the skyscraper, so to speak, I always asked myself during the whole development, how could I explain the interrelationships in the system of the Integrated Target Commitment Planning and Control as simple as possible. Only then will there be any chance at all that potential interested parties will deal with this system. And in my opinion, the most important interested parties should be the users and not the colleagues. Whether an applicable theory developed by someone is successful is ultimately decided by the users and not by his colleagues.

How was an attempt made to meet the demand for the simplicity of a planning and control system, but with Einstein's restriction, in the system of the Integrated Target Commitment Planning and Control? Two areas are to be distinguished here:

1. Simplicity of model development and model transparency. The development of a model should be done with as little effort as possible. Furthermore, those who use the model to carry out a planning and control should be able to analyze the model relationships of interest without great effort,

²⁴⁵ Taken from the introduction by Twain, M., *Roughing It*, Berkeley 2002.

2. Simplicity of planning, control and further model analysis procedures. The procedures should be so simple that the areas involved in the planning, i.e., the responsibility areas and the corporate management, understand what they are doing when they apply these procedures.

For the simplicity of model development and model manageability

Let us turn to the first point. The first requirement was that the development of a model should be as simple as possible. The models for carrying out operational planning are generally developed by project groups in the central controlling department. What can be done to make their work as easy as possible? Originally, a configuration system was developed for the INZPLA-System in order to be able to create plan cost-performance models of companies.

This configuration system works on the basis of the described model tableaux.²⁴⁶ To create a model, the model tableaux of the different areas are generated. With the creation of these model tableaux, the structural equations of the "model tableau submodel" are also created at the same time, without an input of equations. The model tableaux (or submodels) generated in this way are then linked to one another using two allocation methods. Due to the already mentioned order quantity-price interpretation of all allocations, you only need to declare one real or one fictitious order quantity of an area (model tableau) compared to another area (model tableau). The system then generates all links between the model tableaux based on this entry. The system automatically generates the transfer prices corresponding to the order quantities and their links as well as the links between the order quantities and the sizes of employment of the cost centers in the form of structural equations.²⁴⁷ Then the system "automatically" generates the marginal and full cost version (or the corresponding marginal and full cost model). Furthermore, the (automatic) generation of an individual cost version and total cost version, i.e., the generation of the corresponding individual cost models, total cost models, and other versions, is also possible.²⁴⁸

After developing the plan full cost version of a cost-performance model, the configuration system is able to (automatically) create the structural equations of the corresponding actual models, that is, the actual marginal cost-performance model, the actual full cost-performance model, the actual individual cost-performance model, and the actual total cost-performance model. As mentioned (s.p.114), the actual models have slight structural

²⁴⁶ See page 23 and more detailed: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., www.Inzpla.de/IN06-2000a.pdf (Text in German, title translated).

²⁴⁷ This link between the order quantities and the employment of a cost center exists in the automatic generation of their order collection tableau (see 2.3.2.2 in Fig. 1 on page 23). Furthermore, the cost rate determination tableau (see 2.3.2.3 in Fig. 1 on page 23) corresponding to this order collection tableau is also generated automatically, which determines the cost rates or transfer prices of the incoming order quantities depending on the determined cost rates of the employment.

²⁴⁸ See: Zwicker, E., *Full and Part Cost-Performance Models and their Use in the Framework of an Integrated Target Commitment Planning*, Berlin 2001, www.Inzpla.de/IN14-2001d.pdf. (Text in German, title translated)

differences compared to their plan versions, but the configuration system “knows” how to consider these.

I could not think of anything else to further simplify the modeling process without restricting the modeling possibilities. The simplicity of model development can be best assessed by comparing it with other configuration systems. Thomas Hein wrote his diploma thesis at my department in 1993. In this work, he has created a variant of the Kilger model with our configuration system. From 1993 until today, he has been working as a system consultant (now at BearingPoint Consulting) and has dealt almost exclusively with the SAP-CO module and in particular with the configuration of SAP-CO systems in companies. He, therefore, knows both systems quite well.

In his opinion, the configuration of the Kilger model with the SAP-CO system takes "ten times more time" than a corresponding configuration with the INZPLA configuration system would require. For configurations of other models, the result is likely to be similar.

However, this configuration system is no longer up-to-date. As will be described in more detail later on, all companies eligible for the Integrated Target Commitment Planning already use the SAP-CO system for planning their operating results or just for cost accounting (s.p.333). They would, therefore, never think of generating a parallel model and planning system using the INZPLA configuration system. The INZPLA configuration system has, therefore, not been in use for several years.²⁴⁹ His function has been replaced by the program system INZPLA-Connect, as will be described in more detail. With this system, an SAP-CO system already in use in a company can be transferred to an INZPLA-System.²⁵⁰ Therefore, all possible models for the Integrated Target Commitment Planning are configured with the CO module of the SAP System. The question of the simplicity of configuring a cost-performance model must, therefore, be raised with regard to the SAP-CO system. Given that this system is used by thousands of companies to configure their cost-performance models, a few general comments are made.

Configuring an SAP-CO application is very time-consuming and requires a high level of knowledge. SAP offers twelve courses for learning the controlling module, which together last about ten weeks and cost about € 25,000. (The information about the training is taken from the SAP training plan May 2006.) However, only basic knowledge is imparted here. Several years of experience are necessary to master the system well. Emanuel Trugly, a graduate of my courses of Controlling at the Technical University of Berlin, has been working in a consulting firm since 2005 almost exclusively on projects for the introduction of SAP-CO Cost Object Controlling systems. In his opinion, at least three

²⁴⁹ However, this configuration system was used to create the model for the Crop Protection division of Schering AG (see page 162) and also the activity-based cost model for Landesbank Berlin (see page 169).

²⁵⁰ See page 333 for its development and application.

years are required to be an expert in this field when working exclusively with SAP's cost object accounting.

This brings us to the second criterion, which was mentioned under the first point, i.e., the manageability of the model relationships. In an INZPLA cost-performance model, as mentioned, the interrelationships are represented by certain model tableaus and their interconnection. The link is described by two types of an order quantity-price relationship.²⁵¹ I could not think of anything more to make the model relationships even simpler. Each area has, as described, an area model, which is a sub-model of the whole cost-performance model (s.p.49). These area models, which are described by a series of model tableaus linked to each other, are relatively easy to understand.

Each area manager can analyze his area model. Corresponding to the management hierarchy, a manager in this hierarchy can analyze the model tableaus of its subordinate areas and the link between these model tableaus. The higher his position in the hierarchy is located, the more model tableaus are available, whose links can be analyzed by him. But soon the limit of manageability is reached. In extreme cases, if the central controlling or the corporate management has all model tableaus available to study the structural relationships and the semantics of their cost-performance model, then the required model overview is hardly guaranteed.

The Kilger model has 197 model tableaus. If you take some time, you can still have a good overview of its model tableaus and their links. For example, starting from the operating result.²⁵²

Fig. 40 shows an overview of the models of some companies whose SAP-CO system was transferred to an Integrated Target Commitment Planning model with the help of INZPLA-Connect. All model relationships of the original SAP-CO system could be reconstructed using the model tableaus of the Integrated Target Commitment Planning. As you can see from the overview, the number of generated model tableaus is very large. If one starts from a model tableau, e.g., the operating result tableau or the cost object tableau of a finished product, and jumps from there into the other tableaus to study the model relationships and numerical values of the variables, then one will soon get completely lost in the "tangle of model tableaus" and hardly get the desired insights about the model connections and numerical values.

To demonstrate this somewhat drastically, the INZPLA-model of ThyssenKrupp Steel AG transferred from the SAP-CO system should be mentioned.²⁵³ As shown in Fig. 40, it has 21,869 model tableaus, 1,821 of these tableaus are cost object tableaus, that is, tab-

²⁵¹ This means that the eleven allocation types that occur in the SAP system can be traced back to these two allocation types that are used in this model tableau system alone (see page 334).

²⁵² See the structural data for the Kilger model in Fig. 40 on page 150 and Zwicker, E., *The Kilger model - Structure and configuration and its connection with a CRFI model in the context of a two-step comprehensive company planning*, Berlin 2003, www.Inzpla.de/IN30-2003h.pdf. (Text in German, title translated).

²⁵³ It will be discussed in more detail later on page 337.

leaus that determine the variable unit costs and the full cost rates of the intermediate and finished products.

The links between these 1,821 intermediate and finished products (or their cost object tableaux) can, as mentioned, be described by an order quantity diagram. The arrowhead of this diagram points to an intermediate product required by the intermediate or finished product from which the arrow originates. Figs. 40 and 41 show an extreme reduction in the order quantity diagram of the 1,821 cost objects in the ThyssenKrupp Steel model for the plan year 07/08.

	MENZOLIT	CBW	DaimlerChrysler Werk Berlin	VW	Deutsche Bank	Thyssen 07/08	Kilger
Moduls							
1 Overhead Cost Management CO-OM	yes	yes	yes	yes	yes	yes	yes
2 Product Cost Controlling CO-PC	yes	yes	no	no	no	yes	yes
3 Profitability Analysis CO-PA	yes	yes	no	no	no	yes	yes
Cost element statistics							
4 Number of cost elements	11.568	2.170	1.131	10.188	34.626	8.888	279
5 thereof primary cost elements	857	384	815	1.494	2.340	304	103
6 thereof secondary cost elements	10.711	1.786	316	8.694	32.286	8.584	176
Tableau statistic:							
7 Number of cost centers	667	140	317	8.695	32.287	2.353	46
8 Number of cost objects	10.045	1.647	0	0	0	1.821	130
9 of which are sold articles	3.071	196	0	0	0	209	37
10 Number model tableaux	17.855	5.286	8.409	12.836	37.052	21.869	197
Variable statistics							
11 Number of parameters	62.851	9.832	35.451	130.175	212.228	231.994	2.079
12 Total number of equations	525.566	78.085	288.782	562.266	600.373	2.609.035	19.418
Cost Object Calculation:							
13 Highest stage	20	10	0	0	0	33	11
Calculation time in seconds:							
14 (Reference computer 3.0 GHz)	0.172	0.028	0.127	0.283	0.438	15	$? \cdot 10^{-3}$

Fig. 40: Structural features of the model of the Integrated Target Commitment Planning at ThyssenKrupp Steel and other companies as well as the Kilger model

The lines leading from a lower point to an upper point describe the order quantity of the lower cost object (tableau) ordered at the upper cost object (tableau). This is the order quantity of intermediate products required to create the cost object corresponding to the lower cost object tableau. This, in turn, is an intermediate product. Only the dots (cost object tableaux), from which no order quantity lines (from below) lead in, symbolize the 209 finished products.

The two illustrations are only intended to give an impression of the complexity of the interrelationships based on the "shadow structure". They do not provide any deeper information, especially, since the individual connecting lines are not clearly visible. However, an interested reader can call up a PDF file online, which combines both fields and can be enlarged to such an extent that the links become visible.²⁵⁴ Even there, one still gets only an impression of the diversity of the interrelationships.

If such an order quantity diagram is displayed on a larger PC screen, selected symbols or groups of symbols can be enlarged by zooming so that the material number (or other information) can be read. By clicking on a symbol of the cost object, you can then call up the tableaux of cost objects corresponding to this cost object and study the generation of the cost rates.

²⁵⁴ The diagram can be called up under www.Inzpla.de/Thyssen-Bestellmengendiagramm.pdf.

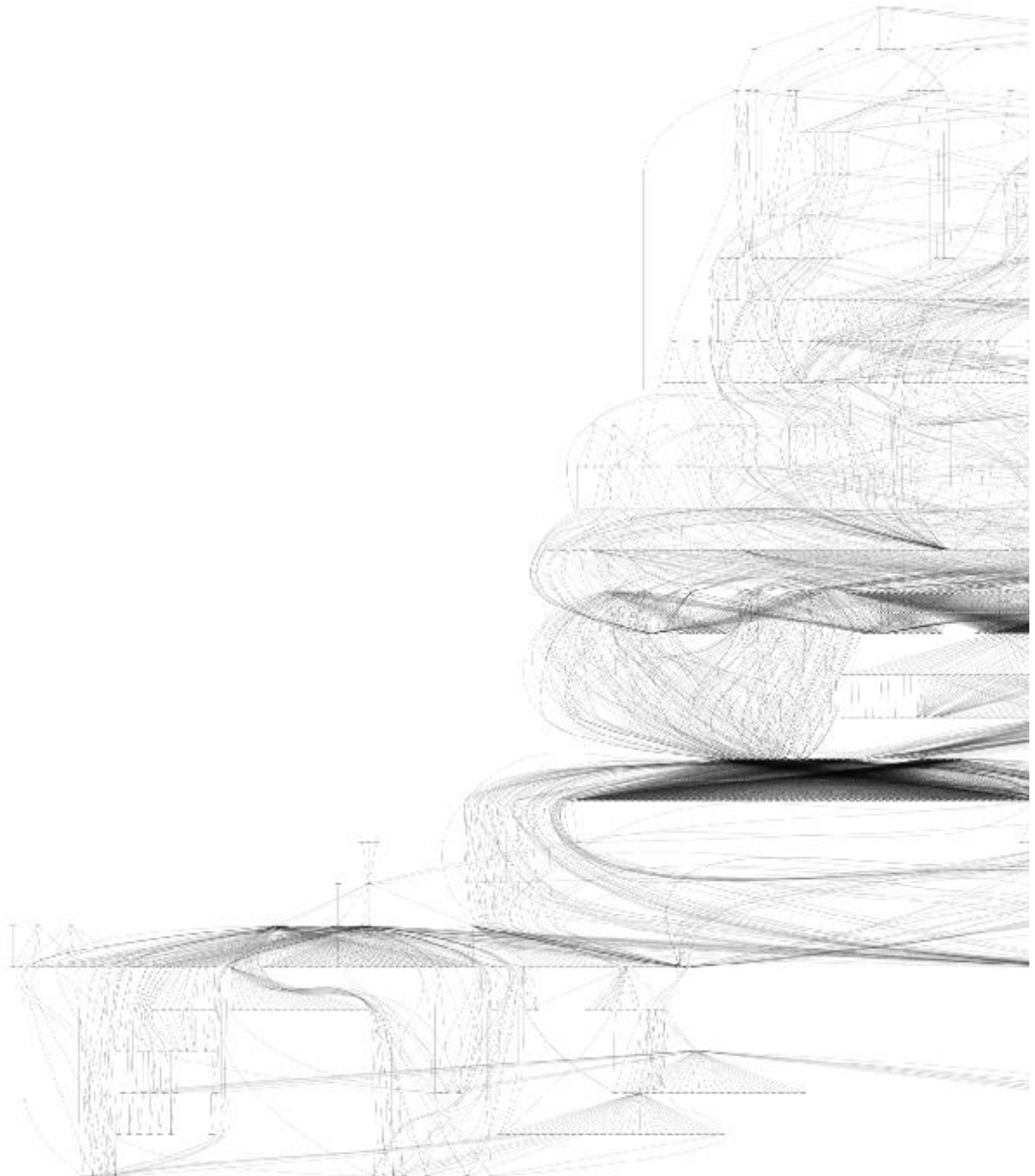


Fig. 41: Left half picture of the order quantity diagram of 1,821 cost objects of ThyssenKrupp Steel's cost-performance model in plan year 07/08 (s.p.149). Better visible under: www.Inzpla.de/Thyssen-Bestellmengendiagramm.pdf.

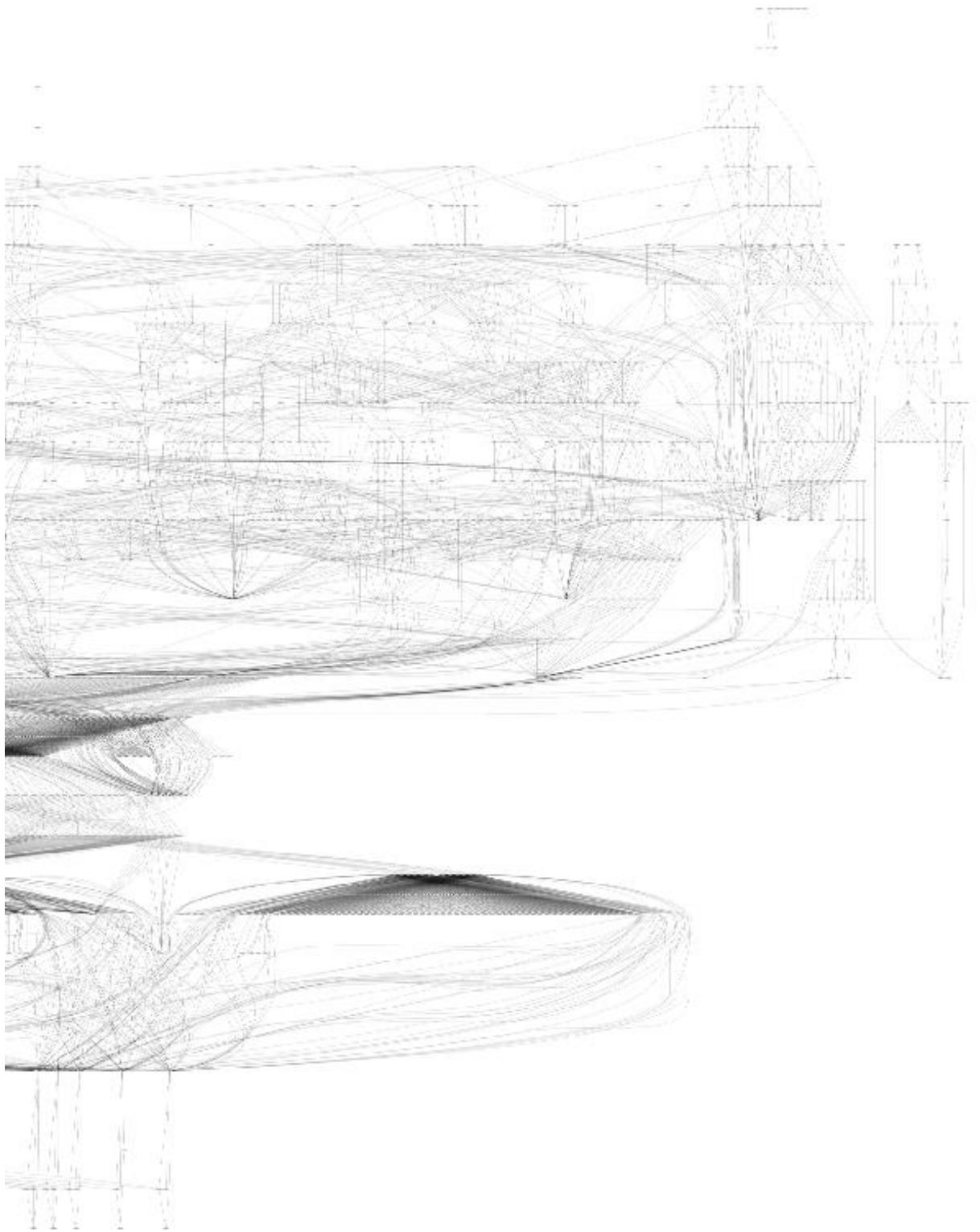


Fig. 42: Right half picture of the order quantity diagram of 1,821 cost objects of ThyssenKrupp Steel's cost-performance model in plan year 07/08 (s.p.149). Better visible under: www.Inzpla.de/Thyssen-Bestellmengendiagramm.pdf.

Starting from these cost object tableaus, it is possible to "surf" through the other model tableaus by tracking the input and output variables in the form of transfer prices or order quantities.

However, if there are 21,869 model tableaus in the ThyssenKrupp Steel model, it is no longer possible to overlook such a model using such a procedure. One way to keep track of large systems is to "hierarchically control" the model tableaus of a cost-performance model. For example, you could develop an order quantity diagram that contains the profit centers as reference objects for a purchase order. The diagram then describes the relationships of the order quantities (or cost allocation) between the profit centers. By selecting a profit center in the profit center hierarchy, you can analyze the order quantity relationships between the profit centers subordinate to this profit center. This procedure would allow you to "go down" in a branch of this profit center hierarchy to a primary responsibility area of one of the profit centers at the basis. Other hierarchical analyses of the order quantity system (and thus also of the cost allocation system) are also possible.

For example, the generation of five subsystems could be required, and the model tableaus could be arranged into these five subsystems by an algorithm in such a way that the number of order quantity-price relationships (or the amounts of the cost allocations) between these five subsystems is minimized.

However, whether a model in question is better to overlook when using such analyses can only be answered in individual cases. The methods of the so-called "system analysis" offers different procedures for a better overview of such large graphical structures.

When analyzing the model relationships, you can also start from a cost object tableau or another model tableau and have an order quantity diagram created that only displays the order quantity chains that originate from this tableau or lead into it.

The order quantity diagram of the Kilger model for all cost reference objects can be called up online.²⁵⁵ The 46 cost centers of the model or their reference variable units for cost centers with several reference variable units are indicated by a rectangle. The 130 cost objects of the finished products and intermediates are described by an ellipse.

Real order quantities have a continuous arrow, while fictitious order quantities are indicated by broken arrow lines.²⁵⁶ Even in this simple model, the complete representation of the relationships between the order units leads to an information overload.

The question arises as to whether a cost allocation sheet (CAS) cannot serve as an instrument with which a cost accounting system can be "as simple" as possible and can also be designed. This question is of interest because the cost allocation sheet is considered to be of great importance in the literature. Schweitzer and Küpper describe the cost alloca-

²⁵⁵ The order quantity diagram can be accessed at www.Inzpla.de/Kilger-Bestellmengendiagramm.pdf. An order quantity diagram of the Kilger model, which only includes the cost objects, can be found at www.Inzpla.de/Kilg-Kostentraeger.pdf. A corresponding diagram of the cost centers and their reference variable subunits shows www.Inzpla.de/Kilg-Kostenstellen.pdf.

²⁵⁶ For the exact description of the difference between real and fictitious order quantities see: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, Berlin 2000, p. 39f. www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated).

tion sheet CAS as “*the most important tool for performing cost center accounting tasks*”.²⁵⁷ In my experience, however, the cost allocation sheet is neither of importance for cost center accounting nor can it provide better insights into the model relationships with regard to the question at hand.

The assertion that the cost allocation sheet (CAS) is so important for the entire cost center accounting can only be contradicted here with a short note. How can a tableau be so important for the planning and analysis of a cost accounting system when it is created by removing one column each from a subset of model tableaus, namely only the cost element tableaus of the cost centers, which can have a maximum of eleven columns (column 10 in Fig. 2 on page 33) and thus creating this tableau? None of the different types of basic targets used for the Integrated Target Commitment Planning is included in this column.

A cost allocation sheet can be obtained from the model tableau system of an Integrated Target Commitment Planning by taking the columns “Total costs cost elements” from the cost element tableaus of all cost centers and arranging them next to each other. You then get a tableau in the form of a matrix. The rows in this matrix record all primary and secondary cost elements incurred in the company. The columns in this matrix, on the other hand, correspond to all cost centers of the company. The matrix created is called “cost-center-cost-element-matrix” abbreviated as CCC-matrix. It differs from a standard cost allocation sheet by additional information. However, by deleting a few lines of this matrix, you obtain the usual standard form of a cost allocation sheet.

Such a cost center-cost-element-matrix of the Kilger model can be called up as an Excel file.²⁵⁸ It is matrix which was generated from the plan full cost version of the Kilger model.²⁵⁹

If you imagine that some companies have hundreds of cost centers (and these, in turn, have up to eight reference variable units) and a large number of primary and secondary cost types, then it is obvious that such a tableau bursts all dimensions and is thus relatively worthless.

In 1999, Mario Laube wrote his diploma thesis on a plan cost-performance model of Berliner Verkehrsbetriebe (Berlin Public Transport) by reconstructing the plan cost and performance accounting of BVG using the INZPLA configuration system. In this context, he created a plan cost allocation sheet several meters wide and about 1.5 meters high by taking out the total cost columns from the cost element tableaus of the cost centers. This cost allocation sheet, fastened to a wall, was marveled at by all (even by the chairman of the board), but nobody had the need to use it for planning or for other analyses. And you can't blame anyone for that.

²⁵⁷ Schweitzer, M., Küpper, H. U., *Systeme der Kosten- und Erlösrechnung*, 10th Ed., p. 134.

²⁵⁸ www.Inzpla.de/KSKA-Tableau-Kilger.xls.

²⁵⁹ There is still a corresponding tableau of the marginal cost version. This tableau contains the fixed and variable costs in each column of a cost center. There are correspondingly two marginal and full cost versions for the actual cost model.

Hierarchies as means of accessing information

Cost hierarchies. One way to use the information of a CCC-matrix is, as shown schematically in Fig. 43, to create so-called edge hierarchies at the rows and columns of this cost center cost element matrix.²⁶⁰

Only the rows of the primary cost elements of the cost center cost element tableau are used as rows of the matrix. The columns of the matrix, on the other hand, correspond to all cost centers in the cost center cost element tableau.

Fig. 43 shows such a two-dimensional cost center and cost element matrix of the Schering AG. It leads to a cost element hierarchy of the total 2002 primary cost elements at the base, which correspond to the rows of the matrix, and a cost center (or management) hierarchy of 4 levels, which lies above the columns of the matrix. With the help of these edge hierarchies, a drill-down analyst can then select specific cost segments and perform a drill down from there.

For example, he can choose "Total costs", i.e. the top of the cost element hierarchy, as the starting point for his drill-down, and "Total research" as management unit in the management hierarchy. From the cost value "Total Research Costs" displayed there, he can choose two drill-down paths. In the first case, he decides to trace the "Total Research Costs" back to the total research costs of the departments that are directly subordinated to the total research. The drill-down therefore runs through the management hierarchy.

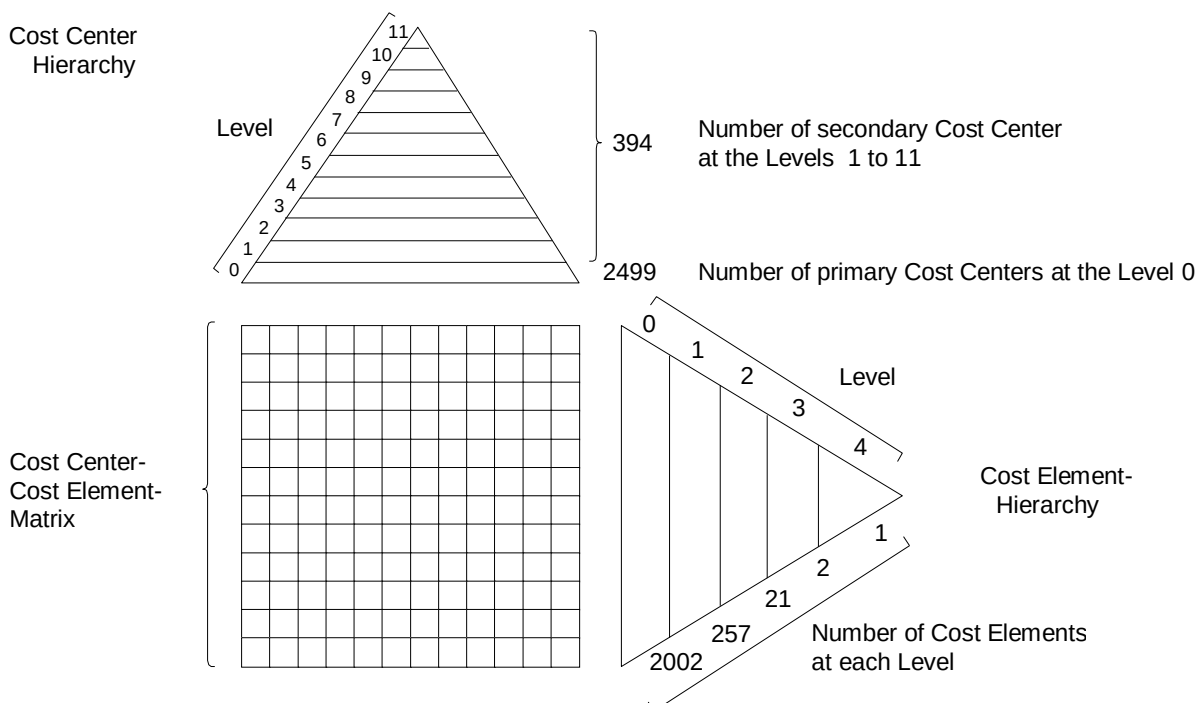


Fig. 43: Example of a cost center cost element matrix and the assigned cost center cost element hierarchy of Schering AG ²⁶¹

²⁶⁰ For the term edge hierarchy see page 114.

²⁶¹ When assessing the number of 394 secondary cost centres, it should be noted that there are real and fictitious line cost centres in this system. A fictitious secondary line cost center does not have a line

In the second case, he decides to drill down the "Total Research Costs" via the cost element hierarchy. With the cost element hierarchy used in this case, this would lead to the distribution of the total costs of research into the cost elements personnel and material costs.

If you select the top of both edge hierarchies as the starting point for the drill-down, the value output corresponds to the total costs (planned, actual or planned-actual) of the company under consideration.

In my opinion, the easiest way to analyze the incurred values of planned or actual costs and the resulting variances between planned and actual values of certain cost parameters is to use such a drill-down analysis, which is operated using two edge hierarchies.²⁶² In particular, the most obvious way to do this is to analyse the variance between planned and actual costs and therefore to carry out a drill-down variance analysis with them (s.p.106). There is no evidence in the literature that it is appropriate to perform a cost element cost center analysis with such a hierarchical two-dimensional drill-down system.

Another cost hierarchy is the area cost hierarchy. It describes both the area costs of the primary responsibility areas and those of the higher-level management units up to the top of the company. The area costs of the higher-level management units are the area costs of the lower-level units minus the internal delivery costs between these lower-level units. At the top of the hierarchy, all internal delivery costs (secondary costs) are eliminated, so that the costs displayed there correspond to the total of all primary costs.

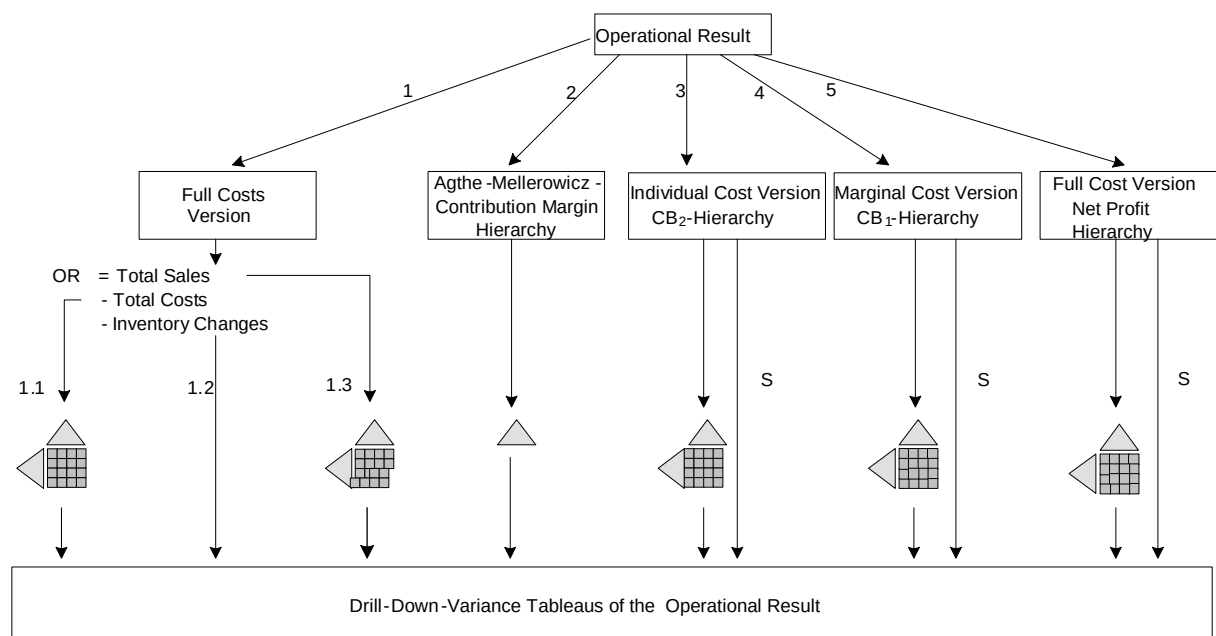


Fig. 44: One- and two-dimensional profit, sales, and cost hierarchy systems in a cost-performance models

manager but it is ultimately always subordinate to a real secondary cost center with a line manager. This means that there are less than 394 cost center managers of the secondary cost centers in the cost center hierarchy.

²⁶² See also page 576 for the structure of such cost hierarchies..

The development of this hierarchical drill-down system, requires an intensive model structure analysis of the allocation relationships in order to identify and eliminate these internal deliveries at the different levels of the cost center hierarchy.

The description of a two-dimensional hierarchical analysis in order to obtain the information contained in a cost-performance model should provide the occasion to say something about hierarchies. I am convinced that complex systems can best be understood through a "hierarchical exploration of information". And very often, such an approach is possible in the case of systems, which are represented here by equation models.²⁶³ The procedures for an operational planning and control should also be organized hierarchically if possible. The subject of "hierarchies" has been occupying me for a long time. My interest in hierarchies was particularly stimulated by Herbert Simon's fundamental article on this topic.²⁶⁴ I cannot deepen this topic here, because then I would have to go too far. However, my preference for hierarchies has had a great impact on the system of the Integrated Target Commitment Planning. I have, therefore, constantly analyzed whether it is possible to "hierarchically tap" relevant information contained in the models of the Integrated Target Commitment Planning. Such an approach is the easiest way, guided by one's own interest, to acquire the "stored knowledge" in a model.

In the area of cost object analysis, I have, therefore, described a series of hierarchical model exploration procedures that can contribute to a better understanding of the model relationships between the cost objects of the actual and plan cost-performance models used.²⁶⁵

Profit hierarchies. However, a cost-performance model does not only contain cost or order quantity hierarchies but also profit hierarchies. The structure of these profit hierarchies has already been discussed (s.p.114).

Fig. 44 shows the profit, cost and sales hierarchies that can be used in the system of the Integrated Target Commitment Planning and Control. The drill-down analysis of the total cost version (or total cost model) in Fig. 44 uses certain cost and sales hierarchies that are based on the total costs and total sales as initial sizes. The square with the created edge hierarchies (1.1 in Fig. 44) symbolizes the cost center and cost element hierarchies already described. The profit hierarchies (2 to 5) are indicated in the figure by a two-dimensional hierarchical classification. As mentioned above, the profit segments can be described by classification cubes with edge hierarchies that have three or more dimensions. However, two-dimensional systems with a regional and an article hierarchy are probably the most common.

²⁶³ However, a simultaneous system of equations that describes the interdependent relationships between prices in a company cannot be "hierarchically explored". There is no hierarchy. For this purpose, I developed the concept of a minimal feedback arrangement of the price loop representation in order to present the connections as simple as possible even in such cases. See on this Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 133f., www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

²⁶⁴ Herbert Simon can probably be regarded as the founder of a theory of hierarchical systems. His first fundamental contribution to this was published in: Simon, H. A. *The Architecture of Complexity*. In: *Proceedings of the American Philosophical Society* 106 (1962), p. 467- 482. See also: Simon: H. A. *The Sciences of the Artificial*, Cambridge Mass., 1981.

²⁶⁵ See: Zwicker, E., *Control and Variance Analysis*, op. cit., p. 176f. www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

Hierarchies in the planning process. In addition to the analysis of the hierarchical relationships between the variables of the models of an Integrated Target Commitment Planning, the planning procedure itself is also based on certain hierarchies.

The target system of pure basic Target Commitment Planning is described by a two-level target hierarchy, that is, the basic target level (level 1) and the top target level (level 2).²⁶⁶

The pure area Target Commitment Planning can, as mentioned, be differentiated in a single-level or multi-level area Target Commitment Planning

The single-level area Target Commitment Planning works with a target hierarchy that comprises three levels (s.p.50). These are the basic target level, the area target level of the primary responsibility areas and the top target level.

A multi-level area Target Commitment Planning is performed (s.p.54), if each executive in the management hierarchy owns his own area targets.²⁶⁷ The number of levels corresponds therefore with the number of levels in the management hierarchy.

The developed concept of profit center planning also works with a hierarchy of profit center profits.²⁶⁸

Overview tableaux. However, it is not only the hierarchies with which one can try to present the structure and semantics as well as the planning and control procedures of a cost-performance model more clearly. Overview tableaux with the possibility of a drill-down analysis of the listed numerical values (e.g., the total number of basic parameters) have also been developed. They are intended to provide a better overview of the structural and semantic properties of a model. It has already been pointed out (s.p.140) that within the framework of the model system of the Integrated Target Commitment Planning, a so-called cost allocation overview of a cost-performance model can be generated, which provides certain information on the type of cost centers regarded as relevant and the type of further allocation of their costs.

Fig. 40 shows another overview tableau. It describes key structural features of the Integrated Target Commitment Planning models generated with INZPLA-Connect at ThyssenKrupp Steel and other German companies. In addition, the structural features of the Kilger model, i.e., the model that served as a reference model during the entire development of the Integrated Target Commitment Planning and Control are also given for comparison.

Simpler models are the goal. So far only the case was described, with which procedure an already developed cost-performance model can be overlooked as simply as possible. It is obvious to point out that the efforts described so far to make complex relationships

²⁶⁶ See page 49. A detailed discussion can be found in: Zwicker, E., *Operational Target Systems of the Company in the Light of the Integrated Target Commitment Planning and Control*, Berlin 2008, (49 pages) www.Inzpla.de/IN36-2008b.pdf. (Text in German, title translated).

²⁶⁷ To the structure of such a target system that corresponds with a management hierarchy and the assessment of its consistency, see: Zwicker, E., *Operational Target Systems* ..., op. cit., p. 20f.

²⁶⁸ See: Zwicker, E., *Operational Target Systems* ..., op. cit., p. 18f. and Zwicker, E., *Structure and Process of Profit Center Planning in the System of the Integrated Target Commitment Planning*, Berlin 2002, p. 3f., www.Inzpla.de/IN16-2002b.pdf. (Text in German, title translated).

easier to understand are pointing in the wrong direction. The primary goal should not be to present complex cost-performance models simply, but rather to develop simple cost-performance models from the beginning.

This demand can be agreed immediately. However, a simpler model must also require that a planning can be carried out with it. For a planning, however, you need parameters in the model provided for this purpose that can be specifically controlled, i.e., in the light of the Integrated Target Commitment Planning; decision parameters, decision variables, and basic targets. Trying to aggregate the relationships of a standard cost-performance model would result in a model with fewer equations and model parameters. This model could be described as a "simpler model". However, such a model would no longer contain the three types of planning parameters that can be influenced in explicit form as model parameters. And with this model, planning (by means of a forecast influenced by the model parameters) would no longer be possible. However, an uncontrollable (pure) forecast could always be realized.

This would be the case of a model that is too strongly aggregated for planning purposes, which I came across as mentioned at the beginning of my study in the study of Company Result and Financial Planning Models (CRFI models). As described (s.p.10), such CRFI models are not suitable for a one-step comprehensive company planning, because almost none of their parameters can be influenced by individually responsible persons.

When you carry out a hierarchical profit center planning, you can disaggregate the targets downwards in stages. This simplifies the top-down planning process. However, even with such a planning, cost-performance models must always be used on the basis of parameters that can be influenced.

Eliasson has, as already mentioned (s.p.28) conducted a highly informative and groundbreaking study on the formal planning and control of companies. In his research, he found that the planning and control systems used in many companies are of an exorbitant size. He also provides an explanation for this observation, which confirms the arguments put forward so far on the need for large models. Eliasson notes on this,

*"In fact, any intelligent, but unprepared outside observer prejudiced by theorizing... should be stunned when confronted with the immense numberflow that constitutes a modern economic planning system of a business organization - until he realizes that these figures of extreme and impossible detail, that he sees, have been gathered to meet a control purpose."*²⁶⁹

The "immense numberflow" mentioned by Eliasson is described in a model of the Integrated Target Commitment Planning by the model relationships and the variables explained by them. It is necessary that someone can be held responsible for the realization of the "numbers" (or basic parameters) that trigger this "numberflow" and that compliance with these "numbers" (or basic parameters) can be controlled subsequently by determining the variance between the actual and the planned figures. Only in this way will the

²⁶⁹ Eliasson, G., *Business Economic Planning - Theory, Practice and Comparison*, Stockholm 1976, p. 87.

"control purpose" emphasized by Eliasson can be achieved. The result of this differentiation process are very large models with basic parameters for whose actual vs. setpoint variances one can always "blame" someone in a certain type of responsibility.

For the simplicity of planning and control procedures and other analysis procedures.

This brings us to the second point, i.e., the requirement to use procedures that are so simple that a user can easily understand them. Only the already discussed procedure of a pure basic Target commitment planning, which is systematized in Fig. 38 on page 144 under 1.1.2.1 and in Fig. 39 on page 145 by line 1b and column 11, is to be dealt with.

The process of a pure basic Target Commitment Planning is easy to understand. There are specific variables for which someone in one of three types of responsibility is responsible. The most relevant type of a responsibility parameter is the parameter to describe the fulfillment responsibility. All responsibility areas with a fulfillment responsibility must commit themselves to adhere to certain numbers. Meeting such "numerical commitments" is nothing new. Such an approach has long been practiced by companies in the implementation of their operational planning. The responsibility areas need not be interested in which calculations then take place with these figures using the cost-performance model. However, they know that their figures influence the operating result.

If-then-then-calculation tableaux. The planning procedure of a pure basic Target Commitment Planning can be carried out using a so-called if-then-calculation tableau. The schematic structure of this tableau is shown in Fig. 45. Each responsibility area has its own if-then-calculation tableau. The lines of this tableau correspond to the basic targets of the area. The names of the basic targets used are given in the first column. In the second column, the bottom-up values of the basic targets of the responsibility area in question are entered. The third column with the name "Present Value" contains the values of the basic targets that describe a particular planning alternative currently in question.

The intersection points of a basic target line with the operating result column indicate the value of the variator (sensitivity coefficient) of this basic target determined by the program system.²⁷⁰

The variator indicates by what percentage the operating result changes if the value of the basic target in question (without changing the other basic targets) is changed by ten percent in its direction of burden decrease. As mentioned above, each basic target has a burden direction (s.p.40). Accordingly, it also has a direction of burden decrease. If the commitment value of a basic target of an area is changed in its direction of burden decrease, then the changed commitment value is associated with a lower burden on the area to realize this value, as is already apparent from the naming.²⁷¹

²⁷⁰ An if-then-calculation tableau of the furniture model with numerical values of the variators can be found on page 172. For further examples of the use and application of if-then-calculation tableaux, see page 180.

²⁷¹ The main features of a basic target are described on page 171.

			Operating Result
Present Value			
Bottom-Up-Value			
Variance			
Basic Target	Bottom-Up-Value	Present Value	Variator

Fig. 45: Schematic representation of the If-then-calculation tableau of a responsibility area

This direction of the burden decrease is indicated in another column which is not shown in Fig. 45. A further extended tableau also shows which target relationships (conflicting or complementary) exist between the operating result as the top target and the respective basic target.²⁷² The identification of these target relationships, between the basic targets and the operating result in question, is based on the target theory associated with the Integrated Target Commitment Planning, which will be discussed in detail later (s.p.171). This target theory makes it possible to provide the central control and also the areas with important information on the relationship between the operating result and a basic target in question directly via the if-then-calculation tableau.

It is also possible (s.p.368) that a company uses besides the operating result some more top targets. As a consequence of this, the tableau would have then a column for each of these top targets.²⁷³ The basic targets of an area listed in an if-then calculation tableau are sorted in descending order according to the numerical values of their variators.

During the individual planning steps, the if-then-calculation tableau is used as follows:

Bottom-up planning. As part of the bottom-up planning, the areas enter the bottom-up values of their basic targets in their if-then-calculation tableaux.²⁷⁴ The central controlling then uses them and the bottom-up values of the other basic parameters to carry out the bottom-up planning, i.e., the cost-performance model is calculated once for determining the bottom-up operating result.

Top-down planning. Top-down planning usually works this way:²⁷⁵ The "top-down planner" changes the bottom-up values of the basic targets of the area in question, taking into account the resulting operating result, until he arrives at a set of values of the basic targets that temporarily satisfy him. Then he selects the next area and proceeds in the

²⁷² For an if-then-calculation tableau that contains such a "target relationship column", see page 370

²⁷³ For an if-then-calculation tableau with three top targets see page 370.

²⁷⁴ However, there are also other input options, see page 338.

²⁷⁵ See also the further description of this planning step on page 485.

same way. In this way, all areas are "processed" by him. In the best case, the "top-down planner" manages to achieve the top-down value of the operating result desired by the corporate management in one pass. However, this one pass processing of the areas of responsibility to determine the values of the top-down basic targets often do not lead to a satisfactory result. In this case the areas must be run through in several loops in order to finally determine the prescribed top-down value of the operating result.²⁷⁶

Confrontation planning. In the course of the confrontation planning that follows, central controlling uses the if-then-calculation tableaux to immediately determine the effects of a basic target value that has been discussed with an area and provisionally changed on the operating result.

If-then-calculation tableau in the SAP-CO system. It should be noted in advance that the creation of such an if-then-calculation tableau in the SAP-CO system is practically impossible. The SAP-CO system at ThyssenKrupp-Steel for example took one working day step to calculate an operating result for one planning. That is still a good result. In contrast to this, T-Com needed up to ten working days for a calculation.²⁷⁷ With the INZPLA-System, it takes 15 seconds to calculate the ThyssenKrupp Steel model (s.p.335).

In order to calculate the variator of a basic target, however, in addition to the basic calculation, a further calculation of the entire model is required with a ten percent change in the burden decrease direction of this basic target. It is obvious that you cannot determine such variators in an appropriate period with the SAP-CO system and, therefore, an if-then-calculation tableau cannot be generated.

In order to determine the values of the variators of all the basic targets listed in the if-then-calculation tableau, the entire model must, therefore, be calculated once for each of these basic targets. The calculation of the variators must be repeated for each basic target listed in the tableau if the value of only one basic target of the last planning alternative is changed to determine another planning alternative. This is necessary because almost all values of the variators of the other basic targets change, even if sometimes only slightly.

The if-then-calculation tableau is thus the most important tableau of the planning procedure of a pure basic Target Commitment Planning. It is available to all users, i.e., the central controlling as the representative of the corporate management and the responsibility areas. However, not only the central controlling as representative of the corporate management can use such if-then-calculation tableaux. They can also be used by members of the corporate management themselves.

In 1984, a planning model with the configuration system of the INZPLA-System was created for the Crop Protection division of Schering AG. This meant that such an if-then-calculation tableau was available. Klaus Pohle, then Chief Financial Officer of Schering AG, used this if-then-calculation tableau extensively to determine the effect of changes in some selected model parameters on the profit of the Crop Protection division (such as the

²⁷⁶ If the GBM top-down planning procedure already mentioned on page 60 is used for top-down planning, the if-then-calculation tableau only serves as an output medium..

²⁷⁷ See page 326 for the reasons for this high time expenditure.

change in the sales quantity of Betanal in France).²⁷⁸ I entered the values, but it is so simple that he could have done it himself.²⁷⁹

One might think that a member of the Management Board responsible for the controlling would have something better to do than go much into detail. However, there are various reports that some top managers use this possibility with a great deal of time. For employees, who are thus deprived of their information monopoly, this has considerable psychological effects on their behavior towards the corporate management. Because of its simplicity, such a system offers even a top manager the possibility to advance to the core of an upcoming operational planning without great effort and independently of his employees by means of an ad-hoc controlled search process.²⁸⁰

From the point of view of model theory, an if-then-calculation tableau can be interpreted as an extremely simplified version of the planning model used. The cost-performance model with its thousands of equations is a "black box" for the user of an if-then-calculation tableau, which does not interest him. For him, it is only of importance how the isolated change of a questionable basic parameter (BP) affects the operating result (OR). In principle, this relationship can be described by a one-equation model in the form of a reduced equation of OR with only one basic target (BT) in question as a symbolic explanation component, i.e., in the form²⁸¹

$$OR = F(BT) \quad (70)$$

The course of this monovaryable function could be indicated in the line field of the basic target of the if-then-calculation tableau. However, only an information in the form of a number will be delivered about the course of this function in the if-then-calculation tableaux. As already mentioned, this is the information by what percentage the operating result changes if a basic target (or more generally a basic parameter) is changed by ten percent.

Procedural simplicity in comparison with SAP. It is obvious to compare the procedures practiced with the same planning model in the SAP-CO and INZPLA-system.

²⁷⁸ Schering AG did not develop a cost-performance model using INZPLA-Connect, but a model of the entire cost center accounting was generated via INZPLA-Connect. At that time, it was not possible to use INZPLA-Connect for the entire company because Schering operated its own software for Cost Object Controlling and Profitability Analysis. However, a model of the Crop Protection division was developed with the configuration system, i.e., that system which, as mentioned (see page 148), was no longer used after the development of INZPLA-Connect.

²⁷⁹ We were actively supported in the development of this model by Joachim Fischer, who was then responsible for "Controlling Methods" at Schering AG and is now Professor of Business Information Systems in the Department of Business Informatics at the University of Paderborn.

²⁸⁰ See: Zwicker, E., *Possibilities and Limits of the Application of Executive Information Systems*. In: Führungskräfte und Führungserfolg, Krystek, U., Link, J. (Ed.), Wiesbaden 1995, p. 231f., www.inzpla.de/EUS-Systeme.pdf. (Text in German, title translated).

²⁸¹ A reduced equation of an endogenous variable (V) of an equation model is (see also page 36) the equation of this endogenous variable as a function of the n basic parameters of the model influencing it, i.e., $V = F(BP_1, \dots, BP_n)$. You can determine whether all or only some of the influencing basic parameters should appear in a symbolic form. In the quoted equation $OR = F(BT)$ only one basic parameter in the form of a basic target (BT), is left in symbolic form. The influence of the other basic parameters is only expressed by the numerical values on the right side of the equation.

However, it is not possible to compare both systems with regard to the simplicity of their planning procedures and other model analyses, since the planning and analysis procedures of the INZPLA-system do not exist in the SAP-CO system. As already mentioned, it is not even possible within the SAP-CO system to generate such a simple tableau as an if-then-calculation tableau.

Since almost all planning, control and model exploration procedures require successive calculations of the cost-performance model in question, they cannot be implemented in the SAP-CO system. There is another problem with regard to certain analysis procedures that could be used for the SAP-CO system. The SAP-CO system is structured in such a way that some of the basic parameters to be used in the tableau can only be defined indirectly (s.p.331). Therefore, they do not have a name and are not explicitly available as model parameters. This means that almost no mathematical analyses described in the various texts of the Integrated Target Commitment Planning are possible in the SAP-CO system. This is because they require a model in the form of equations that contain specific model parameters. The difficulties that arise when you want to calculate an SAP cost-performance model once, that is, when you want to generate a planning alternative, will be discussed in detail later (s.p.326).

Clustered top target relationship analysis. Various procedures have been developed to simplify the procedures for the Integrated Target Commitment Planning. An example of this is the clustered top target relationship analysis. It may make it possible to reduce the number of top targets which originally were intended to be used for planning by the corporate management.

The pure basic Target Commitment Planning as a part of an Integrated Target Commitment Planning works with one top target, the operating result. Planning with a comprehensive corporate model, on the other hand, requires the use of at least two top targets, a profit target, and a liquidity target. However, it is also possible to use more than this minimum number of top targets in a planning for both model types.²⁸² If the corporate management postulates their application, central controlling must meet this requirement. Particularly in connection with the introduction of the Balanced Scorecard planning concept, there is a tendency to use more top targets to carry out operational planning, which does not increase the simplicity of planning (s.p.191)

The clustered top target relationship analysis is a method with which one can possibly convince the corporate management that a further top target B that it considers necessary in addition to the top target A does not need to be used. This is the case if it can be shown that the target value B^* (because of an approximate target complementarity to A) can already be achieved by the top target A used in any case if the target value A^* for A is achieved.

²⁸² See on using more than one top target in cost-performance models: Zwicker, E., *Use of alternative Top Targets in Cost-Performance Models*, op. cit., www.Inzpla.de/IN10-2000e.pdf. (Text in German, title translated).

If this proof is successful, then the waiver of the top target B is a contribution to simplifying the planning procedure. The clustered top target relationship analysis is discussed in more detail elsewhere in this text (s.p.175). The planning procedures and control procedures, as well as the model explorations that are implemented in the system of the Integrated Target Commitment Planning, cannot be dealt with here in detail under the question of how "simple" they are and whether they could have been made even simpler. However, the development of these procedures always considered place of the requirement that all procedures that can be left to a computer for execution must also be carried out by the computer. In addition, the principle was that meta-information systems should always be developed for all processes in order to give a user the best possible overview of the status of the process.²⁸³

Uwe Brück has probably published one of the most widely read books on the SAP-CO system.²⁸⁴ In this book, he points out that it is practically impossible to check whether the allocations created with the configuration of an SAP-CO model have been calculated correctly because in specific cases the *"relationships are too complex"*. He concludes, *"You simply have to believe the assessment results of SAP R/3 in practice."*²⁸⁵

In the INZPLA-System, the allocation of cost allocations can be easily tracked with the help of "surfing" through the model tableau system. The allocation of costs can, therefore, be easily traced using the model tableaux. "Belief" is not required.

Limits of simplification of a procedure demonstrated by the example of RR-Min Variance Analysis

However, the phrase *"you simply have to believe that"* is obvious when using certain analytical procedures of the Integrated Target Commitment Planning, whose logic, on the one hand, is very difficult to communicate to a user, but whose results are of relevance to this user on the other.

An example of this is the already mentioned (responsibility-related) RR-Min variance analysis. It is not part of the control procedure of the Target Commitment Planning, but it allows you to determine at the end of a plan year who caused the actual-plan variance in the operating result and is, therefore, fully or partly responsible for this variance.

Suppose a company has performed such a RR-Min variance analysis and as a result of this analysis, the actual-plan variance tableau of the operating result shown in Fig. 22 on page 97 has been created. It is also assumed that an actual-plan variance of € -500,000 was determined for production area X in the category "fulfillment responsibility". It is thus assumed that the area manager of production area X has caused this unfavorable variance for him alone by the non-compliance with his target commitments and is completely responsible for it.

²⁸³ The demand for the realization of metainformation systems was almost a mania from me, with which I was getting my coworkers on their nerves.

²⁸⁴ Brück published two standard works on controlling with SAP at SAP Press. His work *"Praxishandbuch SAP-Controlling"* (SAP Controlling Practice Manual) ranked first in the Amazon sales list of top sellers on 5.07.2013 among 276 books on the keyword "SAP Controlling."

²⁸⁵ Brück, U., *Praxishandbuch SAP-Controlling*, 2. Ed., SAP-Press, Bonn 2007, p. 92.

Obviously, the head of this area asks the central planners who inform him, *"How does this amount come about?"* The most convenient answer would be, as in the case of Brück, to say, *"You just have to believe that"*. But the demand made at the outset that the procedures for planning and control that affect the interests of the parties involved should also be understood by these parties should also be taken into account. It is, therefore, necessary to give the area manager a satisfactory explanation as to why the operating result deteriorated by €500,000 due to the non-achievement of his basic target commitments. However, this is not that simple.

Why this is the case should only be indicated. It is assumed that the area manager has to meet ten basic targets. He picks out one of these basic targets, namely the consumption quantity rate (CQR). Specifically for this basic target, he intends to determine whether he has exceeded his target or has met it exactly. The consumption quantity rate (CQR) he is interested occurs in a cost equation of his cost element tableau defined by ²⁸⁶

$$CO = PP \cdot CQR \cdot EP \quad (71)$$

(CO - costs, CQR - consumption quantity rate, PP - procurement price, EP - employment)

The definition of the action-setpoint variance of this cost element (CO) for which the manager is responsible is described on page 81 in accordance with (23).

$$CO^{ACT} - CO^{SP} = PP^{FP} \cdot CQR^{ACT} \cdot EP^{ACT} - PP^{FP} \cdot CQR^{SP} \cdot EP^{ACT} \quad (72)$$

(ACT-actual value, FP - final plan value, SP - setpoint value)

It is assumed that in this case there is a favorable variance of -1,500 €. The area manager will, therefore, say, *"By reducing the consumption quantity rate from CQR^{SP} to CQR^{ACT} , I have saved the company € 1,500 and thus increased the operating result by € 1,500. In the actual-plan variance analysis of the operating result I am, therefore, fully responsible for this amount in the favorable sense and it must be attributed to me causally"*.

However, the answer to this assertion would be, *"Your conclusion is not correct. By realizing the actual value of your consumption quantity rate, that is, CQR^{ACT} , you have influenced the costs of various activities. The costs of these activities are described in the cost-performance model by a cost chain in which your consumption quantity rate is an influencing parameter. Each of these cost chains results in a variance amount for which you are fully responsible. However, the sum of these full responsibility variances is not -1,500 €, but only -1,000 €. This is the amount by which you have actually improved the operating result."*

Then you can show the area manager Fig. 24 on page 105 as an example of such cost chains. Further, one must then (as already done in the text) explain to him how one arrives by the described analysis procedures at certain full and co-responsibilities, which are attributed to him. Whether such an explanation is understood and thus accepted by him, however, should be rather questionable.

However, the area manager will be completely irritated if he is informed, for example, that as a result of the RR-Min variance analysis the actual-plan variance of his operating

²⁸⁶ It corresponds to the type of cost-target commitment function described on page 81 by (20).

costs, for which he is fully responsible has been calculated by the sum of 33,224 elementary actual-plan variances. Such a number alone is exotic. How do you explain that to him? It must be made clear to him that such large numbers occur in models of multi-stage production.²⁸⁷

In the case of the relatively simple Kilger model, as already mentioned, a RR-Min variance analysis was performed using the plan values of Kilger and fictitious actual values. With the help of the chain structure analysis of the RR-Min variance analysis, 52,654 cost chains were determined, the sum of which, when the (actual or planned) monthly values of their chain elements (basic parameters) are entered, results in the total (actual or planned) costs for a month (s.p.99)

The longest chains (5,780 in number) consisted of eight elements (basic parameters). The breakdown of the actual-plan chains with the RR-Min variance analysis into the partial variances described led to 1,962,412 elementary actual-plan variances, which were assigned to the corresponding columns of the actual-plan variance tableau of the operating result as fully responsible variances or co-responsibility variances.²⁸⁸

This variance analysis only refers to one month. However, if you want to perform a RR-Min variance analysis of the annual values of the operating result, you must perform this calculation twelve times. Depending on the actual and plan values, there are approximately $12 \cdot 1.9$ million actual-plan variances of a full or co-responsibility.

It is hardly to be expected that the above-mentioned answer that he is only fully responsible for an increase of € 1.000,- of the operating result will satisfy the area manager. Rather, he will come to the opinion that "*absurd calculations are made here by some withdrawn theorists*", for whose results he will then also be held responsible. There is no other meaningful procedure for assigning parts of the actual-plan variance of the operating result to certain area managers as "fully responsible" and thus to declare them as the only responsible persons for this variance.²⁸⁹

However, how is this to be made so clear to those affected by this calculation that they understand and thus accept this procedure? The best thing would probably be the following procedure. The area managers are only informed about their setpoint-actual variances. How these setpoint-actual variances of the basic targets ultimately affected the actual-plan variances of the operating result is a question that central controlling can determine using the RR-Min variance analysis if it is interested in answering these questions. The central controlling, in turn, should only be interested in answering such a question if it understands the RR-Min Variance Analysis procedure itself.

²⁸⁷ The ThyssenKrupp Steel model describes manufacturing processes that comprise up to 33 stages, resulting in cost chains with at least 33 chain links.

²⁸⁸ For more details, see: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 127, www.lnzpla.de/IN34-2007.pdf. (Text in German, title translated).

²⁸⁹ This is a refutable assertion, and I would be interested to know if one reader has a different view.

13. Activity-Based Costing as part of the Integrated Target Commitment Planning

In 1988, Cooper and Kaplan published an article in the Harvard Business Review entitled "*Measure Costs Right. Make the Right Decision*". This paper can be seen as the beginning of a movement propagating a new type of cost accounting in Germany under the name "Prozesskostenrechnung". From my point of view, this type of cost accounting was not so new. Various German-language authors have already described cost accounting systems that could be described as activity-based costing.²⁹⁰ For me, however, it was the occasion to reflect on the modeling of processes and the determination of their costs in the light of the Integrated Target Commitment Planning.²⁹¹

The term "process" is defined very differently. In the following, the term "process" is to be defined specifically for these activities, which you could subsume under the term "*Activity-Based Costing*". A process exists when several "activities" are linked by cause-effect relationships. Each activity results in the creation of an output, which is described by an output variable. The activity quantity of an activity A therefore corresponds in its amount to the order quantity of this activity quantity by an activity B, which requires this activity quantity A to create its own activity quantity B, which in turn is required by activity C and is ordered by B as an order quantity from C.

The output variable of an activity A can, therefore, be interpreted as the order quantity of activity B, which requires activity B to create its output variable. These order quantities are referred to as drivers in Activity-Based Costing. However, since the initial quantity drivers correspond to the order quantities used in the model tableaux of the Integrated Target Commitment Planning, these model tableaux can completely describe such processes and the costs caused by them.

In a mail room of a company, for example, the number of letters processed can be selected as the driver for the activity "process letters". The number of these letters results from the sum of the order quantities of the cost centers that have letters "processed" by the post office.

A process exists if certain activities are linked together. These links lead to a chain or a network of driver relationships (or of order quantity-price relationships). The network of driver relationships also describes relationships that go beyond a cost center. However, such a system of driver relationships (or of order quantity-price relationships) also exists if a product is produced as part of a multi-stage production process. Since the costs of the reference variable units (or production areas) of the production process are also recorded on the basis of these order quantity or driver relationships, this multi-stage production process can also be interpreted as an "activity-based costing".

²⁹⁰ Also refer to Seicht, G., *Die Prozeßkostenrechnung - Fortschritt oder Weg in die Sackgasse?* In: *Journal für Betriebswirtschaft* (JfB), H. 6, 1992, p. 246-267.

²⁹¹ See in detail: Zwicker, E., *Activity-based costing and its Use in the System of the Integrated Target Commitment Planning*, Berlin 2003 (99 pages), www.Inzpla.de/IN26-2003d.pdf. (Text in German, title translated).

Why should you then introduce your own process cost calculation? In both cases, these are reference objects (activities or production steps) that are linked to one another using order quantities (or drivers).

The only difference to a multi-stage production process is that the initial quantity driver (or the initial order quantity), that is, the driver (or the order quantity), which is not dependent on other drivers (or order quantities), does not form the sales quantity as in a production process.

In a mailroom, for example, this outgoing quantity driver (or the initial order quantity) can be the already mentioned number of letters to be processed. Since such initial quantity drivers can almost never be described (using hypothesis equations in the form of driver hypotheses) as quantities that depend on the sales quantity of a product or the sales quantities of several products, they form basic parameters in an Integrated Target Commitment Planning model. However, what planning logic status do have drivers that are not sales quantities? It would be desirable if they were basic targets for which someone could be held responsible.

If this is not possible, then it may be possible to hold at least one group of areas responsible for meeting their value. If this is the case, then these order quantities prove to be so-called collective basic targets. In addition to the four types of basic parameters described so far, these form a fifth type not yet mentioned. If this type occurs in a model, then an *"Integrated Target Commitment Planning with collective basic Targets"* must be carried out. This planning procedure works with regulations that differ in part from the planning regulations of the pure basic and pure area Target Commitment Planning discussed so far. The same applies to the control procedure following this planning.²⁹²

The activity-based costing systems described of Horváth and Kaplan are restricted in the light of the definition of a process given here to only two-stage processes, i.e., there is only a chain of at most two drivers with which a sequence of activities is described. In an analogous application of this procedure to production processes, only a sequence of no more than two production steps would have to be permitted for these.

There is no such limit in the system of the Integrated Target Commitment Planning. Rather, it is possible to model multi-stage process cost chains in the same way as multi-stage production chains. For example, an actual model of process cost accounting was developed for the Landesbank Berlin (as a third-party funded project) with the configuration system of the Integrated Target Commitment Planning.²⁹³ The model tableau system could be used for modeling exactly as described. A total of 1,223 element processes (activities) were recorded, which take place in 27 sales and administration cost centers. Since some cost centers were divided into several reference variable units, there are 65

²⁹² For more information, see: Zwicker, E., *Integrated Target Commitment Planning with collective basic Targets*, Berlin 2002, www.Inzpla.de/IN18-2002d.pdf. (Text in German, title translated). For the collective basic targets, see also p.192.

²⁹³ The Landesbank project managers were Dr. Hartmut Meinunger and Dr. Holger Lemcke.

reference variable units with their assigned cost element tableaux 202 main processes were identified, and 74 products were assigned.

This modeling explained actual costs of over DM 400 million.²⁹⁴ The actual cost rates determined for the main processes differed by up to 270 percent from the cost rates that were previously used as allocation cost rates for the main processes due to a 'global allocation'.

The development of this model showed that the activities represented by an "activity-based costing systems" could be modeled completely with the model tableau system of the Integrated Target Commitment Planning. It can be modeled in the form of an actual or a planning version. In the case of a planning the planning model of process costs calculation can also be interpreted in the categories of an Integrated Target Commitment Planning, that is, the processes can be planned in the form of a target commitment.

²⁹⁴ The exact figure was DM 418,905,380.

14. No Planning without a Target System

Integrated Target Commitment Planning also contributes to the theories of company target systems. It includes a model-based target theory with clearly defined target hierarchies and target relationships that can be formally and semantically described. On the one hand, this target theory provides information about the relationships between the basic and top targets and on the other hand about the relationships between the top targets if an Integrated Target Commitment Planning is carried out with several top targets. The target theory of the Integrated Target Commitment Planning is dealt with here only relatively briefly. A more detailed presentation is provided elsewhere.²⁹⁵

First, the relationships between the basic targets and a top target are discussed. Then the relationships between the top targets are considered.

On the foundation of the described target theory, the question is asked which quantitative target theories have been developed in the business literature so far.

Target-relationships in the system of the Integrated Target Commitment Planning

The relationship between a top target (TT) and a basic target (BT) of an Integrated Target Commitment Planning can be studied using a reduced equation in which only the top target (TT) and one basic target (BT) influencing the top target occur as symbolic variables, i.e.,

$$TT = f(BT) \quad (73)$$

In the following, we will assume a cost-performance model that has the operating result (OR) as the sole top target. Thus, the reduced equation of the top target TT in (73) becomes

$$OR = f(BT) \quad (74)$$

The exogenous and endogenous variables of an Integrated Target Commitment Planning model must have certain characteristics that are necessary to be used as targets of this planning procedure.

Each top target in an Integrated Target Commitment Planning model must have a direction of utility increase of the corporate management. For the operating result, this is an increase of its initial value. However, the direction of a utility increase does not always have to be associated with an increase in the value of a top target. For example, the direction in which the "gearing rate" increases utility of the corporate management in a comprehensive company planning model consists in a reduction of its value.

As already mentioned (s.p. 37 and 160), all basic targets must be characterized by a burden increase direction of the area manager and thus also by a burden decrease direction. The burden decrease direction for basic targets of an area manager corresponds with the

²⁹⁵ See: Zwicker, E., *Operational Target Systems of the Company in the Light of the Integrated Target Commitment Planning and Control*, op. cit., www.Inzpla.de/IN36-2008b.pdf. (Text in German, title translated).

decrease of basic targets like cost values, consumption quantities, proportional cost rates or consumption quantity rates. In the case of basic sales quantity targets, on the other hand, an increase in sales quantity leads to an increase of the burden of a sales area manager. On the basis of these two terms (burden and utility), three types of target relationship can be defined operationally as follows:

Change the initial value of a basic target by ten (or one) percent in its decreasing direction:

- If, therefore, the operating result changes (i.e., decreases) against its direction of utility increase, then there is a targets conflict.
- If, therefore, the operating result changes (i.e., increases) in its direction of utility increase, then there is a targets complementarity.
- If the operating result does not change, then there is a targets neutrality.

The examination which of the three possible types of target relationship exists between a basic target (BT) in question and the operating result (OR) as a top target is based on a cost-performance model in which the operating result (as the top target) and the basic target are included as model variables.

The value of the operating result caused for a ten percent change of a basic target in its decreasing direction can be used to calculate the percentage change of the value of the operating result against his initial value. As already mentioned (s.p.160), this percentage change is referred to as the variator of the basic target. If this variator is negative, there is always a targets conflict, whereas a positive variator indicates a complementarity of targets. If the variator is zero, then there is a target neutrality.

				Operating Result
Current Value :				328.000,-
Bottom- Up-Value :				279.500,-
Variance :				48.500,-
Basic Target	Direction of decreased Burden	Current Top- Down Value Basic Target	Change 1 Percent	Variator
Sales Quantity SO	-	243	- 2,43	- 0,386
Sales Quantity BD	-	1.523	- 15,23	- 1,668
Salaries Sales	+	144.000	1.440	- 0,439

Fig. 46: If-then-calculation tableau of the sales area of the furniture model

Except for two very rare numerical constellations of the basic target "sales quantity", a standard cost-performance model always contains a conflict between the operating result and each basic target contained in the model.²⁹⁶

²⁹⁶ For these two exceptions, see Zwicker, E., *Operational Target Systems of the Company in the Light of the Integrated Target Commitment Planning and Control*, op. cit., p. 12f. www.Inzpla.de/IN36-2008b.pdf.

In the if-then-calculation tableau of an Integrated Target Commitment Planning, the direction of burden decrease of each basic target and its variator is specified in a special column.

Fig. 46 shows the if-then-calculation tableau of the furniture model of the basic targets of the sales area.²⁹⁷ The negative values of the variators show that the change in all basic targets in their direction of a decreased burden leads to a reduction of the operating result. This is the typical situation of an Integrated Target Commitment Planning, i.e., there exists a targets conflict between the responsibility areas (change of the basic targets in their direction of a decreased burden) and the corporate management (change of the basic targets in their direction of an increased burden). Since a change of the basic targets in their direction of an increased burden leads to an increase in the operating result and thus to an increase in the utility of the corporate management.

Relationship Between the top targets of an Integrated Target Commitment Planning

First of all, it is considered that two top targets have been selected by the corporate management to carry out an Integrated Target Commitment Planning. Then we will consider the case that the corporate management wants to use more than two top targets for its upcoming annual planning. In the following, we will assume that a pure Integrated Target Commitment Planning is practiced, i.e., the models used have only basic targets and no decision variables.

Top target relationships in the case of two top targets

If you want to study the relationships between two top targets (TT_1 and TT_2) of an Integrated Target Commitment Planning, then you should be aware that both top targets depend on certain basic targets. If both top targets assume different values during the planning process, this is due to the fact that this is done by changing one or more basic targets.

The influence of the basic targets (BT_1 to BT_n) on two top targets in question (TT_1 and TT_2) can be described by the following equations²⁹⁸

$$TT_1 = F(BT_1, \dots, BT_n) \quad (75)$$

$$TT_2 = F(BT_1, \dots, BT_n) \quad (76)$$

If we now want to study which "relationships" exist between these two top targets, then such a statement can be made in relation to the variation of one or more basic targets that influence TT_1 and TT_2 . In such a case, the relationships between two top targets can, therefore, only be identified with regard to the variation of one or more basic targets.

We turn first to the variation of one basic target. This is followed by an analysis of the case, which target relationships can occur if several basic targets are varied.

²⁹⁷ The change rate of the variators are selected here with only one and not with ten percent.

²⁹⁸ The operating result as a top target must be influenced by all basic targets. This does not have to be the case for additional top targets such as the market share. Nevertheless, all basic targets for the top targets TT_1 and TT_2 are assumed here as influencing variables.

Top target relationships when varying one basic target.

It was pointed out that basic targets always have a direction of burden decrease and thus a corresponding direction of burden increase. If two top targets TT_1 and TT_2 are to be used, then the if-then-calculation tableau contains two columns that correspond with these top targets.

Case	Target Relationship between Basic Target BT and		Type of Relationship between TT_1 and TT_2
	Top Target TT_1	Top Target TT_2	
1	Conflict	Conflict	Targets Complementarity
2	Conflict	Complementarity	Targets Conflict
3	Complementarity	Complementarity	Targets Complementarity
4	Complementarity	Conflict	Targets Conflict
5	Neutrality	Neutrality	Targets Neutrality

Fig. 47: Type of target relationship between the top targets TT_1 and TT_2 depending on the basic-top target relationships $BT-TT_1$ and $BT-TT_2$.

In such a case, a statement can be made about the relationship between TT_1 and TT_2 with regard to the basic target (BT) corresponding to a line of the if-then-calculation tableau.

This is to be demonstrated by means of Fig. 47. If the target relationships of a basic target (BT) are conflicting (case 1) or complementary (case 3) with regard to the two top targets TT_1 and TT_2 , then a target complementarity exists between the two top targets. If one of the relationships between the basic targets in question and the two top targets is complementary and the other is conflicting (cases 2 and 4), then there is a targets conflict between the two top targets.

The following example is given here. In a cost-performance model, the operating result (TT_1) and the market share (TT_2) are to be used as top targets. A top target relationship analysis is to be carried out with regard to the basic target (BT) "sales quantity" of a particular article.

A complementary (top target) relationship between the top targets TT_1 and TT_2 (case 1 in Fig. 47) exists, as mentioned if a conflicting relationship exists both between BT and TT_1 and between BT and TT_2 . This is the case if the unit contribution margin of the article in question is positive. In this case, a decrease in the sales quantity, i.e., a change in its direction of a decreased burden, leads both to a decrease in the operating result (TT_1) and to a decrease in the market share (TT_2), i.e., a change of both top targets in their "direction of utility reduction".

If the unit contribution margin of the article in question is negative, then there is a complementary relationship between the basic target "sales quantity" (SQ) and the operating result (TT_1). This is because if the sales quantity is reduced, i.e., if it is changed in its direction of a decreased burden, then the operating result increases, i.e., the utility of the corporate management increases.

However, there is a conflict between the sales quantity (SQ) and the market share (TT_2). If the sales quantity is reduced, i.e., it is changed in its direction of a decreased burden the

burden on the sales area is decreased and the utility of the corporate management is decreased by a decreasing market share (TT_2).

As a result, there is a conflicting (top target) relationship between the operating result (TT_1) and the market share (TT_2). The case 4 described in Fig. 47 is present here.

Top target relationships when several basic targets are varied

If several basic targets are varied, then it raises the question whether one can in such a case say something about the influence of their variation on the relationship between the top targets TT_1 and TT_2 .

The so-called clustered top target relationship analysis can be used for this purpose. It can answer a planner's question as to whether the number of top targets originally intended for carrying out an operational planning can be reduced without significantly changing the planner's idea of utility generation.

To describe this procedure, we start from the two reduced equations of the top targets TT_1 and TT_2 , i.e., (75) and (76). It is further assumed that the two top targets are the operating result and the return on sales. The basic targets BT_1 to BT_n , which influence the two top targets, are varied during the planning triad as required by the planning procedure. To carry out a clustered top target relationship analysis, the variation area of these basic targets during the planning process must be known.

This variation area determined by the burden areas of the responsibility areas. The burden area of a responsibility area is determined as follows:

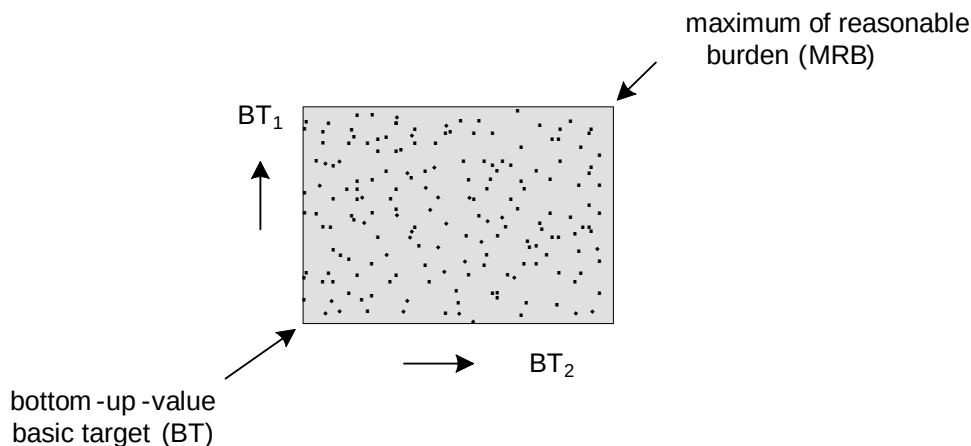


Fig. 48: Burden area of a responsibility area manager with two basic targets BT_1 and BT_2

One starts from the bottom-up values of all basic targets of an area and then considers by what percentage a basic target must be increased or decreased for the assumed case of a maximum reasonable burden for the areas. For a sales quantity, it is an increase, for cost values, consumption quantities and consumption quantity rates a decrease. Let us say there are s basic targets. In this case, the burden evaluation leads to basic target values that describe the maximum of a reasonable burden for the area. You define with this procedure an s -dimensional "basic target space" with the bottom-up values of the s basic targets. This is the burden area of the responsibility area in question. Such a burden area

should be specified for each responsibility area. By means of a stochastic simulation, a series of samples can be drawn from the burden areas of all responsibility areas.²⁹⁹ The cost-performance model is calculated once for each sample and the values of the two top targets "operating result" and "return on sales" are determined.

Fig. 48 shows the burden area for two basic targets BT_1 and BT_2 , assuming that the manager of a responsibility area in question has only two basic targets whose increase, as in the case of a sales quantity, is associated with an increase in burden. Furthermore, it is assumed that there is only one responsibility area in the company and, therefore, only two basic targets. The point BT describes the coordinates of the bottom-up values of the two basic targets BT_1 and BT_2 . The point MRB indicates the basic target values of the maximum reasonable burden of the responsibility area. In other words, the item MRB describes the values of the basic targets, which the corporate management believes can in the extreme case be "expected" of the area as target commitments.

The points in the gray-colored burden area describe the values of the basic targets of BT_1 and BT_2 selected using a random sampling procedure (stochastic simulation), for each of which a value of the operating result and the return on sales is calculated.

If one had three basic targets, the result would be a cube containing these sample values. However, since a model almost always has more than three basic targets, the samples are drawn from an "n-dimensional cube" (with $n > 3$).

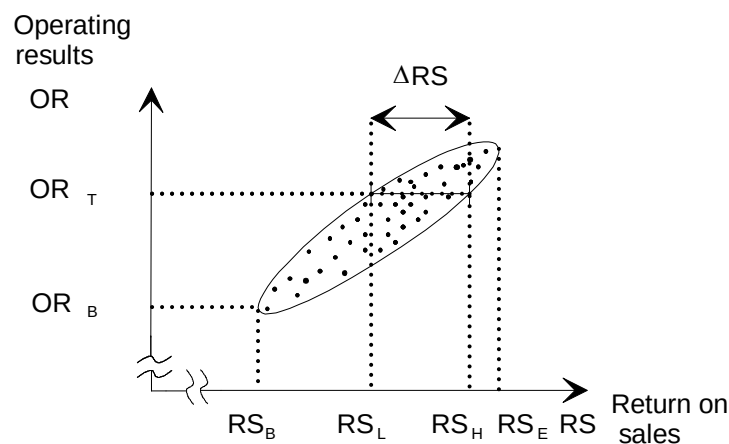


Fig. 49: Target relationship diagram of a clustered top target relationship analysis

Each sample that leads to the calculation of the cost-performance model yields two top target values for TT_1 and TT_2 . The coordinates determined are entered into a coordinate system, as shown in Fig. 49. This results in a point cloud (cluster), which can be delimited by an envelope curve. If such a cluster (as in Fig. 49) shows a monotonously upward trend direction and the direction of utility increase for both top targets is either positive or

²⁹⁹ For example, the number of samples can be 20,000 and all basic targets for a sample are selected from their burden interval with equal probability. See: Zwicker, E., *Operational Target Systems of the Company in the Light of the Integrated Target Commitment Planning and Control*. (49 pages), Berlin 2015, p.13f., www.Inzpla.de/IN36-2008b.pdf. (Text in German, title translated).

negative, then a clustered target complementarity is present. Accordingly, a clustered target conflict can also be identified. And a clustered target neutrality can also exist. No sharp definition of the presence or absence of these classifying terms depending on the "point cloud distribution" should be made. This is because the corporate management does not need this concept formation in order to make a useful decision for them based on such a target relationship diagram of a clustered top target relationship analysis. This useful decision may be to provide management with information whether to forego one of the two top objectives envisaged.

As a basis of information for a decision, which of the top targets in question should finally be used, serves only the point cloud mentioned in the target relationship diagram.

If the corporate management selects the operating result as the main top target (this should always be the case), then it must formulate at the beginning of the top-down planning a top target requirement " $OR \geq OR_T$ ". OR_T is entered as an ordinate value in the target relationship diagram. Using Fig. 49, management can determine the maximum amount by which ΔRS the return on sales (RS) in question as the second top target can vary if the threshold value of the top target requirement with regard to the operating result (i.e., OR_T) is precisely met.

In this example, the lowest value that the return on sales can assume is RS_L , while the highest possible value is identified by RS_H .³⁰⁰ If the corporate management is prepared to accept this fluctuation range of the return on sales, then it is not necessary to use the return on sales as a further top target in addition to the operating result.

This shows the following procedure: As described above, after developing a standard cost-performance model with the operating result as the top target, corporate management can define variables that could be considered as further top targets.³⁰¹ With these potential top targets, a clustered top target relationship analysis can be carried out in relation to the operating result as the main top target. Depending on the resulting findings, it is possible to make a decision as to whether or not one of the "top target candidates" should finally be included in the planning as a further top target. It should always be tried to get along with as few top targets as possible. This makes the planning process all the simpler.

Follow-up top target planning as a special case of a clustered top target relationship analysis

After the general procedure of a clustered top target relationship analysis has been dealt with, the case of a follow-up top target planning should be discussed. Such a follow-up top target planning is possible as a special planning procedure of the Integrated Target Commitment Planning if a top target relationship analysis shows that a fixed functional target relationship exists between TT_1 and TT_2 .

³⁰⁰ These considerations only apply if the actual values of the other basic parameters, i.e., the uncontrollable basic parameters and the decision parameters, agree with the final plan values.

³⁰¹ The corresponding definition equations of the top targets in question can be entered via connection tableaux. For further information, see: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 34f. www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated).

Such a target relationship between TT_1 and TT_2 exists if a top target TT_1 is influenced by the changes to certain basic targets exclusively by influencing a top target TT_2 . This type of influencing is described by

$$TT_1 = F(TT_2, UP_1, \dots, UP_n, DP_1, \dots, DP_m) \quad (77)$$

UP - uncontrollable basic parameters, DP - decision parameters

All basic targets influence the top target TT_1 only via the top target TT_2 , which means that a fixed functional target relationship described by (78) exists during the entire planning process. Therefore, (77) is a top target equation with a fixed functional target relationship.

Whether a fixed functional target relationship exists between TT_1 and TT_2 can be determined using the clustered top target relationship analysis. If a clustered top target relationship analysis is performed in such a case, the point cloud "shrinks" to a functional relationship and this relationship is described by function (77). The clustered top target relationship analysis, therefore, determines the fixed functional target relationship between TT_1 and TT_2 by simulation.

Since a follow-up top target planning leads to a much better assessment of the impact of changes to the basic targets on the two top targets TT_1 and TT_2 , it should always be practiced if it is applicable, i.e., condition (77) exists.³⁰² However, the clustered top target relationship analysis described only provides the graphical course of the function (77). It would be desirable to describe this course by a structural equation. Because such a structural equation makes it possible to recognize how the top targets TT_2 and TT_1 are linked together by certain endogenous variables and basic parameters as explanatory variables of the top target relationship equation. In many cases, the top target relationship equation may have the following form³⁰³

$$TT_1 = \Delta_1 + \Delta_2 + \dots + \Delta_n + TT_2 \quad (78)$$

In opposite to the top target equation (77) the Δ -components in (79) can be not only a basic parameters but also endogenous variables. However, in this case it is not possible to recognize whether a fixed functional target relationship exists between TT_1 and TT_2 , because an endogenous Δ -component can also depend on basic targets.

A top target relationship equation is almost never explicitly present in a model. It is, therefore, necessary to determine it using certain algebraic transformations. Such an approach will be demonstrated by an example.

Let us assume that the planner has developed a planning model and has chosen the return on investment (RoI) and the operating result (OR) as top targets. He wonders whether there is a fixed functional target relationship between the two top targets. The RoI definition equation given in the model is

$$RoI = CR/IA \quad (79)$$

³⁰² To the consequences that a follow-up top target planning is possible but not applied, see page 370.

³⁰³ See the example of a top target relationship equation between the EVA and the US GAAP profit in: Zwicker, E., *Development of normative Management Accounting Theories in the Light of the Integrated Target Commitment Planning*, (47 pages), Berlin 2016, p. 12f., www.Inzpla.de/IN50-2016.pdf. (Text in German, title translated).

CR - company result, IA - imputed assets

The planner must now consider which transformations and extensions could enable him to use the RoI definition equation (79) as a starting point for transferring the operating result (OR) to the right side of the equation as a definition component. It is assumed that the planner, therefore, considers the definition equation of company result (CR) as a definition component of RoI. He recognizes, what is further assumed, that the company result (CR) differs from the definition equation of the operating result only in that it does not contain any imputed interest (IPI). This shows him that the company result (CR) can be represented as follows, depending on the operating result (OR)³⁰⁴

$$CR = OR + IPI \quad (80)$$

With (80) he thus obtains the following top target relationship equation between the two selected top targets Return on Investment (RoI) and Operating Result (OR)

$$RoI = (OR + IPI) \cdot 100 / IA \quad (\%) \quad (81)$$

However, this top target relationship equation does not yet show whether a fixed functional target relationship exists between the RoI and the OR. This is only the case if the remaining definition components of RoI on the right side of the top target relationship equation, i.e., IPI and IA, do not depend on basic targets of the planning model.

The imputed interest (IPI) depends on the imputed interest rate (IIR) and the imputed assets (IA). The imputed interest rate is always a decision parameter. The imputed assets, on the other hand, could be influenced by a target commitment via the capital tied up in inventories if, for example, the inventory turnovers serve as basic targets.

If it turns out that a fixed functional target relationship exists between two top targets, then it is recommended, but not mandatory, to carry out a follow-up top target planning.

Such a follow-up top target planning with the operating result (OR) and the return on investment (RoI) as top targets is to be demonstrated using the furniture model.³⁰⁵

For reasons of simplification, the furniture model does not include any imputed interest. For example, with an imputed asset's value (IA) of € 3,881.944, equation (81) shows the top target relationship in the form of a fixed functional target relationship.

$$RoI = OR \cdot 100 / 3,881,944 \quad (\%) \quad (82)$$

The follow-up top target planning now consists of one of the two top targets being declared as a prime top target (PTT). The prime top target is the top target that one considers most important. The second top target is called the follow-up top target (FTT). Its planned value is a compelling result from the value of the prime top target. However, why is it still used if it depends only on the operating result?

If it is declared as a top target by the corporate management, then it functions as an explanatory variable of the utility function of the corporate management, i.e., it applies

$$U = F(PTT, FTT)$$

³⁰⁴ This presupposes the definition of the operating result customary in Germany, in whose definition equation the imputed interest is always included as a negative component. Zwicker, E., *Alternative Definitions of the Operating Result in Cost-Performance Models of the Integrated Target Commitment Planning*, Berlin 2016, (19 pages), www.Inzpla.de/IN49-2016.pdf. (In German, title translated)

³⁰⁵ For information on the structure of the furniture model, see page 41.

In this case, both the planned value of the prime top target and the follow-up top target play a role in the corporate management's assessment whether or not a certain planning alternative is preferable. Based on the fixed functional target relationship between the two top targets, the corporate management recognizes the dependency between the two variables influencing their utility function. This increases the clarity of the planning process.

In the example discussed, the operating result (OR) should be the prime top target, where the return on investment (RoI) becomes the follow-up top target. In this case, during all planning steps that involve a variation in the values of the basic targets, only the prime top target, i.e., the operating result, is driven by a variation of the basic targets. The value of the follow up top target on the other hand, i.e., the value of the RoI, is determined as a compelling result of the fixed functional relationship (82). Both values are used by the corporate management to assess the utility of a planning alternative in question. If this dependency were not determined, then the variator values between the RoI and the basic targets (BT_1 to BT_n) would also be determined in the if-then-calculation tableau and the corporate management would be left in the dark about the fact that this dependency exists in its planning of the two top targets.

		Prime -Top Target	Follow up- Top Target
		(1)	(2) = (1) • 100 / 3.881.944
Basic Target	Value Basic Target	OR (€)	RoI (%)
		279.500	7,2
BT_1	nW_1	VAR_1	
•	•	•	
•	•	•	
•	•	•	
BT_n	nW_n	VAR_n	

VAR_i - Variator (sensitivity coefficient) of the basic target i with respect to OR

nW_i - Numerical value of the basic target i ($i = 1, \dots, n$)

Fig. 50: Example of an if-then-calculation tableau with the operating result (OR) as the prime top target and the return on investment (RoI) as the follow-up top target

Fig. 50 shows the if-then-calculation tableau that was generated for this follow-up top target planning. You can see that the top target relationship equation (82) for the follow-up top target, i.e., the RoI, is specified in the header of column (2). The numerical value of the RoI is also specified in column (2). This enables the planner to recognize the plan value of the RoI that must result from the plan value of operation result (OR). So he can assess whether this planning alternative is acceptable in view of the two top target values. The determination of an equation with a fixed functional target relationship between TT_1 and TT_2 should be the more successful, the greater the number of common definition

components of both top targets.³⁰⁶ For the higher the number of not-joint definition components in both reduced definition equations, the higher the probability that these are themselves basic targets or are influenced by certain basic targets. If the not-joint definition components Δ_1 to Δ_n in (78) contain only one basic target, then it can only be assessed with the help of a clustered top target relationship analysis whether one of the two top targets can be dispensed with.

So far it has been described how certain considerations and the associated algebraic transformations lead to a top target relationship equation between the operating result (OR) and the return on investment (RoI).

In my opinion, it is desirable to determine a top target relationship equation with the help of computer algebraic methods. In the case of a fixed functional target relationship, the program system can be instructed to determine the numerically concrete functional relationship. When the if-then-calculation tableau of a follow-up top target planning is generated, this relationship is then inserted by the system in the column header of the follow-up top target. In the case of the if-then-calculation tableau in Fig. 50, this is the formula expression "(2) = (1) - 100/ 3,881,944". If a top target relationship is determined, then the endogenous model variables acting as explanatory definition components can be represented in symbolic form. In the case of an often existing linear relationship between the two top targets, the already mentioned top target relationship equation (78) is obtained, in which the Δ -components correspond to certain variables defined in the model. Such a presentation shows which semantically interpretable Δ -components are used to distinguish the top targets from each other. Such Δ -components, for example, form the imputed and balance sheet depreciation in a top target relationship equation between the operating result and the company result.

If the Δ -components depend on basic targets, then top-level planning cannot be carried out as described. In such a case, however, the planner can determine which Δ -components depend on which basic targets that do not allow a follow-up top target planning to be carried out.

Top target relationships in the case of more than two top targets

If a planner intends to use three or more top targets, then, as in the case of two top targets he can use the if-then-calculation tableau, to find out which target relationships occur between two of his selected top targets with regard to the variation of the basic targets. In the same way, the described clustered top target relationship analysis between two selected top targets is also possible. Starting from a prime top target, the analyst can check by selecting different combinations whether he can dispense of some of the other top targets envisaged by him. If the point cloud "shrinks" to a curve when checking two top targets, then he knows that there is a fixed functional target relationship between the two top targets. A case of a follow-up top target planning with three top targets will be described later (s.p.368).

³⁰⁶ See for a comprehensive treatment of the relationship between top targets: Zwicker, E., *Operational Target Systems of the Company in the Light of the Integrated Target Commitment Planning and Control*, op. cit., p. 30f., www.Inzpla.de/IN36-2008b.pdf. (Text in German, title translated).

Target theories of company planning in the literature

After the description of the "target theory" of the Integrated Target Commitment Planning, it makes sense to evaluate the "target theories" developed so far in the business literature in the light of the Integrated Target Commitment Planning. Two contributions could be described as "target theories". The first contribution is Heinen's theory of targets, which he described in his book "Das Zielsystem der Unternehmung". (*The target system of the company*).³⁰⁷ His target theory is only briefly discussed here. A detailed look at Heine's approach is given in a separate text.³⁰⁸

Another contribution to "target theory" concerns the so-called "target hierarchies with definition extensions" developed by various authors. I refer to them as pseudo-target hierarchies because of certain defects. They are only briefly described elsewhere in this text (s.p.366f.). A detailed discussion of these types of target hierarchies, of which the DuPont hierarchy (or the RoI hierarchy) is the best known, takes place in a separate text, as Heinen's target theory does.³⁰⁹ Therefore, only Heinen's contribution is discussed below.

Heinen's theory of targets

Heinen has not discussed his theory of targets, although it deals with quantitative targets and their relationships, based on an equation model that describes these target relationships.

In a detailed investigation, I conclude that Heinen's target theory does not allow a model-based reconstruction of his almost only verbal statements.³¹⁰ The following is only to give an impression of Heinen's definition of a "hierarchy of targets" within the framework of his theory of targets.

A target hierarchy is identified by Heinen using the example of the "RoI ratio system". This opens up the possibility of analyzing Heinen's "example definition" of a target hierarchy based on a model.

The RoI ratio system is a hierarchical definition equation system and a pure definition equation model with the RoI at the top.³¹¹ Heinen is of the opinion that all variables in this definition hierarchy form the targets of a target hierarchy. They are related to each other in the relationship of *sub-targets* to *above-targets*. However, with regard to an equation model, this means that the explanatory variables (on the right side) of a structural equation forms the sub-target of the above-target, which is the explained variable (on the left side) of this equation.

An example of the planning model of CBW (Chemie GmbH Bitterfeld-Wolfen) will be used to demonstrate the consequences of this definition. This company uses the operating result as the top target of its annual operational planning, but it could just as well use the RoI as a top target for its planning. The RoI target hierarchy would then be extended downwards to a "super target hierarchy" in accordance with Heinen's definition of targets

³⁰⁷ Heinen, E., *Grundlagen der betriebswirtschaftlichen Entscheidung - Das Zielsystem der Unternehmung*, Wiesbaden 1966.

³⁰⁸ See: Zwicker, E., *Operational Target Systems of the Company in the Light of the Integrated Target Commitment Planning and Control*, op. cit., p. 7f., www.Inzpla.de/IN36-2008b.pdf.

³⁰⁹ See: Zwicker, E., *The RoI Target System and other Target Systems in the Light of the Integrated Target Commitment Planning*, op. cit., www.Inzpla.de/IN44-2014.pdf. (Text in German, title translated).

³¹⁰ See for this consideration: Zwicker, E., *Operational Target Systems ...*, op. cit., p. 37f.

³¹¹ For more information on the structure of the RoI ratio system, see page 366.

because all variables of the CBW model could be arranged in such a way that they function as elements of such a hierarchy. The Integrated Target Commitment Planning model used by CBW for its planning has 78,085 endogenous variables and 9,832 basic parameters.³¹²

If Heinen's definition were applied to this model, CBW would have a target hierarchy with 78,084 elements, which are, depending on the perspective, sub-targets, and above-targets. Furthermore, one would have one target (the RoI), which is only an above target, and 9,832 targets in the form of the basic parameters of the model, which are only sub-targets.³¹³

Everyone can choose his definitions as he wants. The only question is which procedure should be used to plan the targets in this target hierarchy with $1 + 78,084 + 9,832 = 87,917$ targets. Heinen does not comment on this.

In contrast to Heinen's definition, there are only two categories of targets in the CBW model. On the one hand, the top target (here as assumed the RoI) and on the other hand the basic targets. They form a subgroup of the 9,832 basic parameters that have been declared by the company as basic targets.

Contrary to Heinen's considerations, the concept of the target hierarchy of an Integrated Target Commitment Planning is clearly defined on the basis of models for both types of planning namely the basic Target and the area Target Commitment Planning. And these target hierarchies are consistently linked to their corresponding planning procedures.

This criticism is not intended to diminish Heine's contribution. He was the first to point out more than fifty years ago in his work "*The target system of the company*" (1966) that business administration as a normative science requires a theory of targets. To this end, he has described the "state of the art" and made some further considerations about it. For decades thereafter, no one has made any significant contributions to this topic. This is evident from the fact that Heinen's references are still referred to as "state of the art" in the relevant manuals such as the handbook on corporate accounting and controlling. Only this "fifty-year gap" is the reason why Heinen will be quoted and thus criticized.³¹⁴ For his definition of a "*target hierarchy*", which is still current today, is untenable in the light of the Integrated Target Commitment Planning.³¹⁵

If one would prefer the target theory of the Integrated Target Commitment Planning to the still valid considerations and assertions of Heinen about the structure of target systems, then it would also make sense to accept the Integrated Target Commitment Planning as an applicable normative theory of operational company planning and control.

³¹² For a description of the structural features of the CBW model, see Fig. 40 on page 150.

³¹³ In the case of ThyssenKrupp Steel's model, there would even be 2.6 million targets that would function as sub and above targets in Heinen's target hierarchy. The 231,994 basic parameters, on the other hand, would only have the status of a sub-target.

³¹⁴ For an appreciation of Heinen's approach and also today's authoritative target theory of companies see: Zwicker, E., *Operational Target Systems of the Company in the Light of the Integrated Target Commitment Planning and Control*, p. 44, www.Inzpla.de/IN36-2008b.pdf. (Text in German, title translated).

³¹⁵ This also applies to other of his definitions, such as the concepts of *target complementarity* or *target conflict*, which are not dealt with here. See for this: Zwicker, E., *Operational Target Systems...*, op. cit., p. 8f. www.Inzpla.de/IN36-2008b.pdf.

15. Kaplan's new Management Accounting Systems in the Light of the Integrated Target Commitment Planning

In 1987, Kaplan and Johnson published a book entitled *"Relevance Lost - The Rise and Fall of Management Accounting"*, which was emphatically welcomed by English-speaking experts.³¹⁶ The comments of these experts were on the same level as, this book *"has been greeted as one of the most significant monographs on the history of accounting published to date."*³¹⁷

I was very excited to read this book, because Kaplan, with his work "Advanced Management Accounting" and as a professor at the renowned Harvard Business School, is considered the most important American representative in the field of management accounting (controlling), some also call him the Pope of management accounting. Therefore, I purchased the book immediately. As soon as I held it in my hands, I read it all at once.

In the introduction, the authors announce that they will present an *"entirely new management accounting system"* with the aim of *"provide a conceptual framework for the development of managerially relevant procedures to enhance process control, compute product costs and evaluate periodic performance"*.

These sentences worried me the most. Because developing a *"conceptual framework"* for the area of management accounting (or controlling) was a goal of mine too. Should Kaplan have already developed a comprehensive planning and control system with this work, exactly what I was working on?

However, soon Kaplan seemed to me like a theatre director, announcing *Hamlet*, but then only *"The Cousin from Nowhere"* is played. Because of this polemical comparison, I would like to briefly explain why this *"entirely new management accounting system"* is not very convincing.³¹⁸

At the beginning of his discussion, Kaplan points out that the cost accounting systems in American companies are in a catastrophic state.³¹⁹ The costs of the service cost centers are not allocated to one another but are allocated to the main cost centers according to rough keys (for example, the labor costs) and their costs to the products are also allocated using rough keys again. This would not even allow a *"crude separation"* between fixed and variable costs.

This type of cost accounting does not allow the determination of prime costs, and if mul-

³¹⁶ Johnson, H. T., Kaplan, R. S., *Relevance Lost - The Rise and Fall of Management Accounting*, Boston 1987.

³¹⁷ Ezzamel, M. et al. Managing it all by Numbers: *A Review of Johnson and Kaplan's "Relevance Lost"*, in: *Accounting and Business Research*, 20 (1990), p. 153.

³¹⁸ See a detailed analysis of Kaplan's system in: Zwicker, E., *The Johnson and Kaplan Management Accounting System in the Light of the Integrated Target Commitment Planning*, Berlin 2003, www.Inzpla.de/IN27-2003e.pdf. (Text in German, title translated). See also the extended English version: Zwicker, E., *The operational Management Accounting System of Johnson and Kaplan in the Light of the Integrated Target Commitment Planning System*, Berlin 2004, www.Inzpla.de/IN28-2003f.pdf.

³¹⁹ In the following, it is only referenced to Kaplan because Johnson, as an expert in the history of accounting, was exclusively concerned with the chapters on the history of "Management Accounting" which are not discussed here.

ti-stage production processes are described by this simplified cost accounting, companies are not in a position “to understand the 'value added' of their production process.”³²⁰

Kaplan's demand to improve what he considers to be such a desolate American cost accounting is nothing other than the demand for the introduction of a marginal costing, which also includes multi-stage production processes. However, this is not an innovation. Many such systems are in use in Germany that meet these requirements. The Kilger model also describes a multi-stage production process.³²¹

Beyond this requirement, however, Kaplan develops a concept that can actually be described as new. He believes that cost accounting in a company should be described by three separate cost accounting systems (in my view "models").³²² These systems are “*process control, product costing and financial reporting*”. (Preface, p. XIII)

With regard to financial reporting, one does not have the impression that it is a cost accounting system, but financial reporting is to be “served” by a separate cost accounting system. On these systems, Kaplan notes, “*While all three systems may process information from a common, integrated data base, it seems unlikely that a single system can be designed, at least in the near future, to serve these three diverse functions*” (p.250). If Kaplan's explanations are analyzed in more detail, then there are even four systems whose parallel use he requires. He also distinguishes product costing into “*short-term*” and “*long-term product costing*”.

In a separate text, I have analyzed and criticized Kaplan's comments in detail in the light of the Integrated Target Commitment Planning.³²³ This critique explains why the division into four systems is unnecessary. The Integrated Target Commitment Planning would be able to replace these four systems. Kaplan's proposals for the development of an “*entirely new management accounting system*” do not affect the Integrated Target Commitment Planning and Control as a planning and control system, since Kaplan did not formulate such a proposals. Therefore, no comparison is possible at all.³²⁴

Among Kaplan's four systems, only one is worthy of discussion, and Kaplan focuses also primarily on this system in his remarks. This is the *long-term product cost system* to be developed.

Instead of a model with a period interval and a planning horizon of one year, Kaplan would like to use a model to describe product cost systems whose period interval and planning horizon is longer than one year. Kaplan does not specify which period interval and which planning horizon (in years) should be selected. He believes that such a “1+X-

³²⁰ Johnson, H. T., Kaplan, R. S., *Relevance Lost - The Rise and Fall of Management Accounting*, Boston 1987, p. 187.

³²¹ For the number of production stages and other structural features of the Kilger model, see the information in Fig. 40 on page 150.

³²² These cost accounting systems also influence external accounting (in my view by transferring the information from a cost-performance model to a CRFI model) and lead to the formulation of the plan balance sheet and the plan P&L. But this text only deals with cost accounting systems.

³²³ Zwicker, E., *The Johnson and Kaplan Management Accounting System in the Light of the Integrated Target Commitment Planning*, Berlin 2003, www.Inzpla.de/IN27-2003e.pdf. (Text in German, title translated).

³²⁴ Kaplan's demands are also somewhat incomprehensible in this respect since the widely used SAP-CO system only needs one cost accounting system.

annual model" results that many of the costs shown as fixed in the "1-annual model" (in relation to certain sales quantities) prove in a "1+X-annual model" to be variable costs in relation to certain sales quantities.

However, according to Kaplan's argumentation, if the variable plan costs of certain articles are determined in the "1+X-annual model", then they are often higher than those in the original "1-annual model". According to Kaplan, the transition from the "1-annual model" to the "1+X-annual model" can convert many fixed costs of the "1-annual model" into variable costs of the "1+X-annual model" (with regard to the sales quantity of certain articles). However, this leads to an increase in the variable unit costs of these articles, which are definition components of the article contribution margin₁. Companies that did so found that products that had a positive contribution margin₁ in the "1-annual model" now had *"gross margins of -400 percent"* in the 1+X-annual model. This showed: *"Products that had been previously thought to have been the most profitable were actually bleeding the division to death through the heavy demands they were making on the plant's support departments"* (p.240). Kaplan's goal is, therefore, to *"eliminate all unprofitable products"* (p.240).

With regard to Kaplan's claim to eliminate 'unprofitable products', it should be pointed out below that it is based on an inadequate definition of an 'unprofitable product' or article. The article contribution margin₁ of an article has already been defined (s.p.116) with

$$ACM_1 = (SP - VUC) \cdot SQ \quad (83)$$

ACM₁ - article contribution margin₂

SP - sales price article

VUC - variable unit costs article

SQ - sales quantity

The term "SP - VUC" corresponds unit contribution margin₁ of the article. The requirement to eliminate articles with a negative article contribution margin₁ or at least to check their elimination is not entirely new. Kilger already raised it in the first edition of his book *"Flexible Plan Cost and Contribution Margin Accounting"* in 1961.³²⁵ Such elimination planning of articles with negative article contribution margins₁, which arise during the transition from a planning with a planning horizon of one year to a planning with a planning horizon of 1+X years, is the only planning procedure that Kaplan describes in his work.

While it may make sense to eliminate unprofitable products, the planning process propagated by Kaplan is unsuitable for this because it bases on false empirical assertions.

Assuming that the planning period of a model would be extended from one to two years, then the fixed costs planned in the previous annual model would not all at once be variable, that is, dependent on the sales quantity of a certain article.

For this, the following example: A sales quantity of 1,000 units of an article is planned

³²⁵ Bernd Zirkler, who wrote a very informative dissertation on management accounting in the USA, also visited Kaplan in Boston. During a conversation with him, Kaplan moved his hand and pointed to Kilger's *"Flexible Plan Cost and Contribution Margin Accounting"*, which was standing behind his desk on a shelf, and said with a smile, *"All that I know about flexible cost accounting, I know from this book"*. To my knowledge, there is no English translation of this work.

for the next planning year with a unit contribution margin₁ of 5 €/unit. This order results from a price of 20 €/unit and variable unit costs of 15 €/unit. Kaplan's argumentation for eliminating an item would apply in this case if, for example, assuming a planning period of two years and a planned sales quantity of 2,000 units and the same sales price of 20 €/unit would result in a planned variable unit costs of 22 €/unit. Because then (so Kaplan's demand) the article would have to be eliminated already now because of the resulting negative planned contribution margin₁ of $20 - 22 = -2$ €/unit. However, costs that are fixed plan costs for a planning year, that is, that do not depend on the sales quantity of an article, cannot now at once depend on the sales quantity of the same article if the planning horizon is extended to two years. What costs does this apply to? Kaplan does not provide an example of such a transformation.

There is another aspect of cost reduction. If you increase the planning period, certain individual fixed costs of an article can be reduced more. An elimination policy for an article must, therefore, examine a completely different size as elimination criteria, namely the already defined contribution margin₂ of an article, i.e., the size (s.p.116).

$$ACM_2 = (SP - VUC) \cdot SQ - IAFK \quad (84)$$

ACM₂ - article contribution margin₂

SP - sales price article

VUC - variable unit costs article

SQ - sales quantity

IAFK - individual article fixed costs

Individual article fixed costs are those fixed costs that can only be allocated to one article. Examples are the fixed costs of a product manager who is only responsible for this article or the fixed costs of a production area that only processes this article. Like all fixed costs, these fixed costs for a single article can be reduced more in a plan over two years than in the case of a plan that is only valid for one year.

In the following example, the contribution margin₁ determined according to (83) of an article should amount to € 5,000. It is determined by the calculation

$$5,000 = (20 - 15) \cdot 1.000 \text{ [€]}$$

Since this contribution margin₁ is positive, there seems to be no argument for eliminating this article. However, assuming that his individual article fixed costs amount to 6,000 €, then the following results according to

$$-1.000 = (20 - 15) \cdot 1.000 - 6.000 \text{ [€]}$$

And this result is, a negative article contribution margin₂ of € -1,000. If it should be possible to decrease these individual article fixed costs for € 6,000 within two years, then the question arises already whether the article is to be eliminated now. However, Kaplan does not make such considerations. For him, only a negative contribution margin₁, which is caused by the increase in the variable article costs, counts as an elimination criterion for an article.

Even if individual articles have a positive contribution margin₂ and should, therefore, not be eliminated according to the criterion just described, there are cases where they should still be eliminated (for good reasons). Article groups can also be assigned certain individ-

ual article group fixed costs (for example, the fixed costs of a product manager responsible only for a specific article group).³²⁶

If the article group contribution margin₂ of an article group is negative, all articles of the group should be eliminated (unless strategic considerations argue against this), even if each article of this article group has a positive contribution margin₂.

If one sells n articles, then $2^n - 1$ possible combinations of articles result, which offer themselves as "elimination candidates". Only article combinations with a negative contribution margin₂ are considered for elimination. Among these, however, only the article combination with the largest negative contribution margin₂ is of interest, as its elimination would (under, otherwise, identical circumstances) maximize the operating result.

As already mentioned, an optimization procedure (the so-called optimal elimination planning) has been developed within the INZPLA program system, with which the article combination is determined, whose elimination (if article combinations with a negative contribution margin₂ exist) leads to a maximization of the operating result (s.p.188). Once this article combination has been determined, you can consider its elimination.

It is technically very complex process because the optimization must be preceded by a comprehensive model structure analysis, the results of which are reflected in the constraints of the optimization. The selection of article groups or articles whose elimination maximizes the operating result is carried out using a binary optimization procedure.³²⁷

What remains of Kaplan's "*entirely new management accounting system*"? Actually only the request to develop a multi-stage flexible plan cost accounting. However, this demand can only be derived from Kaplan's demand that the contribution margins₁ (and not the contribution margins₂) of all articles for the period $1+X$ are to be determined. If you want to determine the planned contribution margins for the articles of a company, you need their variable planned unit costs, and these can only be determined using the flexible plan cost accounting.

As mentioned above, Kaplan complains that US companies are unable "*to understand the value added of their production process*" with their existing cost accounting systems. From this, it can be concluded that they should use planning systems that describe the cost relationships of multi-stage production processes. This can only be achieved by means of a multi-stage flexible plan cost accounting, which records the entire quantity flow in a company and the costs associated with it, from the purchased quantities to the intermediate products about the inventories to the finished products.³²⁸

³²⁶ See page 136 for these costs.

³²⁷ See: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., p. 60f., www.lnzpla.de/IN11-2001a.pdf. (Text in German, title translated).

³²⁸ There is a series of synonyms for the term "*flexible plan cost accounting*", used in the literature but it is not clear to what extent they encompass what is meant by the definition of this term used in this text. What all definitions have in common is that certain (variable) costs are planned as a function of sales quantities. However, this is not sufficient to mark a flexible plan cost accounting system as it is described here. The following terms can be found in the literature for a sales quantity dependent cost planning: *flexible budgeting*, *flexible plan costing*, *variable budgeting*, *marginal costing*, *flexible*

It is remarkable that Kaplan in no way refers to the procedure of a multi-stage flexible plan cost accounting and references literature on it, not even citing the name of the procedure. However, the flexible plan cost accounting is hardly used in the USA and, US cost accounting practitioners are urgently calling for its introduction.³²⁹

Kaplan's book had worried me quite a bit because I suspected he might have developed a planning process that would prove to be a planning through target commitment, but I could sit back and relax. Apart from the failed elimination planning, he does not describe any planning procedure. Even terms such as "bottom-up-planning", "top-down planning" or "responsibility accounting" (standard terms in every planning work) cannot be found in his paper.

The work, which was supposed to lift the world of management accounting off the hinges, could no longer impress me.

16. Balanced-Scorecard and the Integrated Target Commitment Planning

However, Kaplan would not let me rest. In 1996, he published together with Norton, a work entitled *"Balanced Scorecard: Translating Strategy into Action."*³³⁰ It received as emphatic a welcome as his just treated work. For example, the Balanced Scorecard System was described in an article in the Harvard Business Review as *"as one of the most important management practice of the past 75 years"*.³³¹

The Balanced Scorecard is a planning procedure that claims according to their authors to seamlessly combine strategic planning and budgeting (one-year operational planning). That was another topic for me. My question was according to which prescriptions should the strategic planning of the Balanced Scorecard be translated into the operational planning of this planning procedure? And, what kind of an operational planning is used for this?

Kaplan claims, *"The Balanced Scorecard also enables an organization to integrate its strategic planning with its annual budgeting process"* (p.14). And he is of the opinion that the Balanced Scorecard *„expands the traditional budgeting process to incorporate strategic as well as operational targets“* (p.239). However, beyond these remarks, Kaplan does not say a word about how this integration should take place by using a planning model. Since Balanced Scorecard Planning was and still is a current topic at that

standard cost accounting.

³²⁹ See: *An American Perspective on German Controlling, Unexpected Praise for German Controlling Practice, Interview with Paul Sharman, ACMA, President CEO, IMA.* In: Controlling & Management, 49 (2005) Issue 5: For a detailed discussion of the fact that the flexible plan cost accounting is very rarely used in the USA, see: Zwicker, E., *Management Control Systems in the Light of the Integrated Target Commitment Planning*, Berlin 2016, p.32f. www.Inzpla.de/IN52-2016.pdf. (Text in German, title translated).

³³⁰ Kaplan, R. S., Norton, D. P., *Balanced Scorecard: Translating Strategy into Action*, Boston 1996.

³³¹ For the commendatory remarks of the experts, see: Zwicker, E., *Integrated Target Commitment Planning and Balanced Scorecard*, Berlin 2003, p. 30, www.Inzpla.de/IN29-2003g.pdf. (Text in German, title translated)

time, it is important for the development history of the Integrated Target Commitment Planning whether and how the system of Balanced Scorecard Planning can be linked with the Integrated Target Commitment Planning or not. This will be briefly explained.³³²

Kaplan requires that a company's Balanced Scorecard planning should be carried out for a maximum of five years and that no more than 25 setpoint ratios should be used as planning targets. These are the Balanced Scorecard ratios. We will not discuss here which considerations have led Kaplan to achieve these target values.

In order to illustrate the "gap between strategic and operational planning" that actually exists in many companies somewhat drastically, the following is assumed. At the beginning of the planning for the next year (for example, in October of the previous year), the head of the strategic planning visits the head of the operational planning and informs him that the target values of the Balanced Scorecard key ratios R_1 to R_n (with n not greater than 25) must be realized for the upcoming annual planning at the request of the corporate management.

In order to consider such a demand in a general way in the system of the Integrated Target Commitment Planning, it would be necessary to know whether Kaplan prescribes certain key ratios as obligatory. If this would be the case, you could check whether they appear in the model tableaux of a standard cost-performance model and a CRFI model as well. If they were variables that appear in the INZPLA-model tableaux, then you could immediately recognize their planning logical status, which they would have in the system of an Integrated Target Commitment Planning.

In fact, however, Kaplan does not provide such mandatory key ratios. The Balanced Scorecard key ratios should be selected from four areas (*perspectives*), but that is not mandatory. Kaplan requires only that both financial and non-financial ratios have to be used. The non-financial ratios are ratios in whose unit definitions no monetary units (such as "€" or "€/unit") occur.

However, such non-financial key ratios can also be found (which Kaplan is apparently not entirely clear) in as he calls it "*traditional budgeting processes*", which are operated by using a cost-performance model.³³³

These are consumption quantity rates, scrap rates, inventory turnover and production coefficients, market share or global productivity coefficients (such as vehicles produced per worker). They all do not include monetary values in the definitions of their units.

It is well known that the reciprocal value of an inventory turnover is the average storage period. Therefore, lead times such as the average storage period can also serve as non-financial key ratios of a cost-performance model and its unit would be "month".

The question arises as to how far the target specifications of Balanced Scorecard planning can be included in the "*traditional budgeting process*" of an Integrated Target Commitment Planning.

³³² See for a more detailed treatment Zwicker, E., *Integrated Target Commitment Planning and Control...*, op. cit., p. 109f., www.lnzpla.de/IN37-2008c.pdf. For an even more detailed treatment see: Zwicker, E., *Integrated Target Commitment Planning and Balanced Scorecard*, op. cit.

³³³ However, not in these simple models, which, according to his description, are used in U.S. companies.

This question is to be answered by continuing the already mentioned story that the head of strategic planning informs the head of the operational planning of a series of key ratios and demands that certain setpoint values are to be considered in the upcoming operational planning. The question arises as to whether the setpoint values of these key ratios can also be "planned" as setpoint values for an upcoming Integrated Target Commitment Planning. The question is, however, which key ratios to choose if Kaplan does not set any binding targets.

To go further, it should be assumed that the head of strategic planning proposes exactly the nineteen Balanced Scorecard ratios that Deyhle has cited in an example for carrying out a Balanced Scorecard planning.³³⁴

The result is that all but three of the remaining sixteen ratios can be formulated as endogenous variables or basic parameters of a cost-performance model and a CRFI model, i.e., described as variables of a company model as a whole.³³⁵

If we consider the cost-performance model alone, the following results: seven key ratios are top targets, three are basic targets, and one ratio (training costs/employee) is a decision parameter. If the cost-performance model is supplemented by a CRFI model to form a comprehensive company model, six additional ratios are added, which are defined as endogenous variables in the CRFI model and are thus top targets. This results in twelve top targets for the comprehensive company model.³³⁶

The planning of these sixteen target values can, therefore, be carried out "seamlessly" in the system of an Integrated Target Commitment Planning.

However, planning twelve top targets with a comprehensive company model (if you really take this seriously) is almost impossible, because the values of the basic targets in the responsibility areas must be chosen in such a way that (if it were up to Kaplan) all twelve setpoint values of the top targets must be "precisely" fulfilled. The if-then-calculation tableau described must then have twelve top target columns..³³⁷

Most interesting, however, are the three Balanced Scorecard ratios from Deyhle's list, which cannot be used as endogenous variables or basic parameters of a comprehensive company model. These are the key ratios which belong according to Kaplan to the "*customer perspective*". Deyhle selected for this field the following ratios; "customer satisfaction", "number of cancellations" and "regular customer ratio". The ratios of the "*customer satisfaction*" plays a not insignificant role in Kaplan's approach, since, "*the customer perspective enables business unit managers to articulate the customer and market-based strategy that will deliver superior future financial returns*".

Let us assume that "customer satisfaction" is a top target. Then the Integrated Target Commitment Planning requires that it should be traced back via disaggregating structural

³³⁴ For a detailed treatment, see Zwicker, E., *Integrated Target Commitment Planning and Control*,..., op. cit., p. 109f. and for an even more detailed treatment: Zwicker, E. *Integrated Target Commitment Planning and Balanced Scorecard*, op. cit., p. 19f.

³³⁵ For a more detailed description of the 19 BSC ratios and their status in an Integrated Target Commitment Planning model see: Zwicker, E., *Integrated Target Commitment Planning and Balanced Scorecard*, Berlin 2003, p.17f. www.Inzpla.de/IN29-2003g.pdf. (Text in German, title translated)

³³⁶ For the structure of a comprehensive company model, see page 68.

³³⁷ See pages 172, 180 and 370 for the construction of such if-then-calculation tableau.

equations to the basic targets of certain areas, for which these areas can be made responsible. If such a reduction can only be made to a quantity for which no one area (which would actually be desirable) but only several areas can be made responsible, then this quantity is a collective basic target (s.p.169). For such a collective basic target a person in the management hierarchy who is directly superior to this group (e.g., the head of the entire production for all production areas) could be held responsible. The reason for this is that he can influence the subordinate areas to realize the setpoint ratios of the basic targets "jointly".³³⁸

However, since "customer satisfaction" appears to be the responsibility of all primary responsibility areas of the company, it is a collective basic target for which, in accordance with the allocation rule described, the corporate management itself is responsible. However, this collective basic target is in this case also a top target of the planning procedure. Therefore, in addition to the comprehensive company model, a second model of the Integrated Target Commitment Planning is obtained, which consists of a single model parameter that is both a top target and a collective basic target with a responsibility by the corporate management.

Such single-parameter models of the Integrated Target Commitment Planning is a borderline case in which the actual purpose of this planning procedure is removed, namely the delegation of a task to a subordinate responsible person. Since in the present case it is assumed that only the corporate management itself is responsible for the achievement of the three key ratios "customer satisfaction", "number of cancellations" and "regular customer ratio" due to an impossible delegation, one also receives three additional single-parameter models of the Integrated Target Commitment Planning in addition to the "main" model.

After studying various Balanced Scorecard ratios recommended in the literature, I have gained the impression that a great number of them can be interpreted in the light of the Integrated Target Commitment Planning as single-parameter models of an Integrated Target Commitment Planning.

Actually, there should not be any such types of target commitment models since Kaplan and Norton demand that the non-financial ratios in a Balanced Scorecard model should be directly or indirectly linked with financial ratios.³³⁹ However, if this requirement were met, almost all previously developed Balanced Scorecard planning applications would most probably not be permissible.

The same arguments apply with regard to the application of a multi-level area Integrated Target Commitment Planning. You can also find ratios that are an area target for an area manager but also his collective basic target. The area manager (e.g., the head of the production as a whole) cannot formally delegate compliance with these targets to the areas

³³⁸ This is the maxim according to which a responsible person in the management hierarchy is to be held responsible for the setpoint-actual variance of a collective basic target. See also: Zwicker, E., *Integrated Target Commitment Planning with collective basic Targets* Berlin 2002, p. 7, www.lnz-pla.de/IN18-2002d.pdf. (Text in German, title translated)

³³⁹ The following quoted text was highlighted by Kaplan and Norton in italics "*The causal chain of the scorecard ratios should be linked to financial targets*". Kaplan, R. S., Norton, D. P., *Balanced Scorecard...*, op. cit., p. 145.

reporting to him. One should be aware of these "delegation deficits" if one wants to try to integrate the target ratios of a strategic Balanced Scorecard planning into the (as Kaplan and Norton puts it) "*annual budgeting process*". Kaplan and Norton quote the company Rockwater and point out that Rockwater's "*objectives and measures*" of an operational planning "*could only be derived from a top down procedure that translated strategy into operational objectives*". That sounds good. But what general procedure do Kaplan and Norton postulate that shows how to move from certain strategic goals to the Balanced Scorecard ratios they postulate? We don't learn anything about this.

However, Kaplan and Norton do not describe even a vague procedure how the setpoints of the Balanced Scorecard ratios determined from such a "strategic top-down planning" can be incorporated into an comprehensive operational company model in order to be taken into account within the framework of the top-down planning to be carried out with such a model.

Such a case has been discussed for the first time with the considerations of how the setpoints of the Balanced Scorecard ratios cited by Deyhle could be integrated into an operational comprehensive company model of an upcoming annual planning. The result is that this is almost impossible.

A final comment on the Balanced Scorecard. No word in the discussion about company planning with figures is more strained than the word "Balanced Scorecard". I cannot hear that word anymore. The most abstruse concepts are propagated under this name. And this also applies to the academic area. A model-based reconstruction of this concept carried out by me showed that it has no in-depth regulations on the structure of a "Balanced Scorecard model" and on its procedural use. This allows each author to develop his own planning concept under the banner of the Balanced Scorecard with his own definitions and regulations. Plenty of use is made of this.³⁴⁰

It may sound harsh, but I have never read a book by a professor of business administration that is so suspect in its claims and at the same time propagates them in an extreme uncritical way. It is more an advertising brochure of a management consulting firm. But these brochures are often more serious. However, it is also a problem that a professional group of university teachers in the field of business administration accepts and even praise such stuff. Not to be completely alone with my opinion I will quote in unusual length a text by Hanne Nørreklit, with which I unreservedly agree.

She analyzed the concept of the Balanced Scorecard from the standards of an acceptable and scientific argumentation. She asks whether the concept of the Balanced Scorecard is a "*new and convincing theory*" or whether it is "*merely the result of persuasive rhetoric*". And she comes to the following conclusion.³⁴¹

"The Balanced Scorecard makes extensive use of analogies and metaphors... The effect of this is that, given the broad and imprecise concepts, which make it difficult to talk in

³⁴⁰ To justify this critical judgment, see in detail: Zwicker, E., *Integrated Target Commitment Planning and Balanced Scorecard*, op. cit., p. 29f., www.Inzpla.de/IN29-2003g.pdf. (Text in German, title translated).

³⁴¹ Nørreklit, H., *The Balanced Scorecard: What is the Score?*, Department of International Business, Aarhus Scholl of Business, Working Paper 00-4, March 2000.

detail about the model, it is impossible to have a real discussion on the logics of the model. Consequently, the readers will receive no set of concepts, which simulates coherent thinking and management, but possibly a set of concepts which provides inspiration for the readers' own theories. Managers will have wide scope for their interpretation of the concepts and theories of the BSC. When readers read their own intentionality into the theory, the result is likely to be their own theories rather than that of Kaplan and Norton. This offers plenty of freedom and countless sources of error". (p.22)

She continues to carry out, "What we found was a genre with alluring analogies, metaphors and lexis and unsound argumentation. We found something closely resembling propaganda. Propaganda is characterised by the recipient's being persuaded of something due to the sender's use of heavily loaded words, metaphors, irony, exaggerations, a climax, incoherence and variation as well as paratactic ordering (Cassirer 1979). Such devices have been used by the authors to realise their intention: creating enthusiasm for and discussion of the new ideas among a wide management audience. The authors use this form of argumentation successfully because their audience has great confidence in the Harvard Business School (p.23)... The results found in the present paper match those of other investigations of a number of so-called management gurus... Other features which are typical for a great deal of management literature include banal and optimistic propositions; postulates; and the authors' lack of discussion of and critical attitude forward their own theories and limitations of these. (p.24).

There's no better way to put it.

In 2001, the German Research Foundation (DFG) rejected a proposal from me. It concerned the development of a computer-aided program system to perform a variance analysis for cost-performance models. At that time (for reasons I could not understand) one was not allowed to see the complete expert opinions (one received only a short justification with excerpts), but I could persuade the referend to read me the complete justification of the refusing expert on the phone. In my opinion, the expert had no idea of the methods of variance analysis. I only mention this, however, because the report concluded with the remark that the procedures of a variance analysis are no longer up-to-date. According to the expert, the German Research Foundation should better support current topics such as the Balanced Scorecard.³⁴²

Kaplan, Kaplan again and again. In this text I have dealt with three concepts, which were propagated as innovation by Kaplan: *Activity-based Costing*, his concept of an "entirely new management accounting system" and the *Balanced Scorecard*. The study of these concepts has strengthened my conviction of being on the right way with the model-based approach of Integrated Target Commitment Planning and Control. However, it has also led to reject the whole style of Kaplan's working in the field of management accounting. There is no trace to a model-based representation, although all three "innovations" he propagates are approaches that I believe could be treated completely and precisely on the basis of a model.

342 But I was also able to realize this project without funding from the DFG.

When I was in Boston (s.p.527), it would probably have been possible to meet Kaplan for a conversation. However, I have always said to myself that it is not enough to meet a "famous man". You also have to be able to exchange information with each other professionally. And such a professional exchange did not seem to me to be given with Kaplan. We simply moved on other levels, even though we were dealing with the same subject area. That is just the way it is. Kaplan is a celebrated star, while my name recognition is not exactly high. But, believe me, I don't care. I enjoy working in my model-based field and think having created something constructive.

17. Management Accounting in the Light of the Integrated Target Commitment Planning

In July 2013 I participated in a conference of the ERMAC in Vienna with the title "Empirical Research in Management, Accounting & Control". The most important reason to attend this conference was that Teemu Malmi was to give a lecture on "*management control systems*". Teemu Malmi is one of the most important experts in the field of "*management control systems*" and has also worked intensively on the methodological foundations of theory formation in the field of management accounting". This is also reflected in the two publications referred to below.

Teemu Malmi has, together with David Brown, published a highly acclaimed paper in which he developed a typological classification system for management control systems. Following this typology, the title of Malmi's lecture in Vienna was "*Management Control Systems as a package: Research agenda*".

Another equally important article by him entitled "*In Search of Management Accounting Theory*" is no less important. In this paper he and Granlund analyse the status quo of the current "*management accounting theory*" and develop "*suggestions on how management accounting research could proceed to produce better theories*".

It was clear that I was very interested in attending the lecture on *Management Control Systems* announced in the program. The conference ended with this lecture as the crowning highlight. In this lecture, Teemu Malmi pointed out that there are no applicable normative theories in the field of management accounting and that there is an urgent need to develop such theories. This would be particularly true in the area of management control systems. This area would be a starting point for developing a normative theory. His lecture ended with the appeal: "*Let us try to develop MCS theories...*" ³⁴³

This appeal was followed by the usual invitation to the audience to ask if anyone else had a question. I asked to speak, but my contribution was hardly a "question". I pointed out that such a theory already exists in the form of so-called Integrated Target Commitment Planning and Control. Then I described the procedure in brief: Creation of an equation model with "*profit*" as the top target. The parameters of this model are quantities for which certain areas can be made responsible. With this model a procedure could be real-

³⁴³ So also on his lecture slide „*Concluding Comments*”.

ized which fulfills the requirement "*make people responsible for numbers*" and these "numbers" would be presented by certain parameters of the model. Then followed the description of the three planning steps. The result of the planning steps would ultimately be a negotiation of the "commitment targets" or the model parameters with the areas. The setpoint values of these "commitment targets" are then compared with the actual values at the end of the planning period, and that is the control.

I also referred to the application at ThyssenKrupp Steel and the size of this model in order to highlight the empirical relevance and testing of this process. For a contribution to the discussion, the duration of the request to speak was at the limit of what could reasonably be expected.

Teemu Malmi listened to all this and then said without hesitation, "*This is not a normative theory*". I asked him, "*What is it then?*" To this, he replied "*a procedure*". I then replied to him whether he could give me a tip as to what I should do to develop this "procedure" into a "normative theory". I had the laughs on my side, but of course, he did not answer this "provocative" question but turned to the next request to speak. His remark that the Integrated Target Commitment Planning was not a "normative theory" was the occasion to deal intensively with his two texts and thus also with the "*theory of management accounting*" and the "*theory of management control systems*" discussed in the English language literature. Teemu Malmi's and his coauthors contributions describe the "*state of the art*" of these two areas and try to point out new development opportunities. The result of my engagement with his two texts (and that of his co-authors) is reflected in four contributions, which can be called up here online. These are the texts:

1. *Typology of Setpoint-Actual Control Systems with special Consideration of the INZPLA Control System*, Berlin 2015, www.Inzpla.de/IN51-2015.pdf (Text in German, title translated).
2. *Management Control Systems in the Light of the Integrated Target Commitment Planning*, Berlin 2016, www.Inzpla.de/IN52-2016.pdf (Text in German, title translated).
3. *Development of normative Management Accounting Theories in the Light of the Integrated Target Commitment Planning*, Berlin 2016, www.Inzpla.de/IN50-2016.pdf (Text in German, title translated).

and

4. *Is the Integrated Target Commitment Planning a Procedure or a normative Theory?* Berlin 2016, www.Inzpla.de/IN48-2016.pdf (Text in German, title translated).

These texts are described in summary below. They are not insignificant in terms of clarifying the planning logic status of the Integrated Target Commitment Planning and Control. They are based on Malmi's description of the "state of the art" of the theories of "*management accounting*" recognized in the literature as relevant. To put it bluntly, these texts show that in almost all cases of a "*preliminary*" and "*uncompleted theory of normative management accounting*" described by Malmi, the Integrated Target Commitment Planning and Control can be regarded as a model-based further development of these approaches to a "*complete normative theory*". If this were to be true, then the assertion

that the Integrated Target Commitment Planning and Control is a comprehensive normative theory of operational planning and control of companies would be supported. Whether these arguments are mandatory, however, requires a more detailed study of the quoted texts.

On the typology of management control systems

In their article *"Management Control Systems as a Package"* Teemu Malmi and David Brown develop a typology of what they understand by a management control system. In their opinion, this typology is a reappraisal and order of the *"state of the art"*. This is shown by their remark *"The typology was developed by analyzing and synthesizing nearly four decades of MCS research."* They describe the typology they developed using the structure scheme in Fig. 51.

Cultural Controls							
Clans		Values			Symbols		
Planning		Cybernetic Controls				Re-ward and Com-pensa-tion	
Long range plan-ning	Ac-tion plan-ning	Bud-gets	Financial Measure-ment Systems	Non Fi-nancial Measure-ment Systems	Hybrid Measure-ment Systems		
Administrative Controls							
Governance Structure		Organization Structure			Policies and Proce-dures		

Fig. 51: Schematic representation of the types of a "management control system" by Malmi and Brown.

With regard to the use of the terms *"Kontrolle"* in German and *"control"* in English, a significant difference must be pointed out. In English, the term *"control"* corresponds mainly to expressions such as *"to master"* or *"to be completely influenceable"*. In German-speaking business administration, on the other hand, the word *"Kontrolle"* (*control*) is mainly understood to be the performance of a subsequent setpoint-actual comparison. This is based on the assumption that a *"setpoint"* has been specified in some way and that it is now checked afterwards whether the actual situation that occurred corresponds to the required setpoint. This designation of the word *"Kontrolle"* applies to the term *"control"* in the frame of the Integrated Target Commitment Planning and Control. It is a setpoint-actual control.

The term *"management control system"*, in the English literature includes, also a setpoint-actual comparison or more general a *"reviewing"* but additional the planning process that preceded it. Therefore, the *"management control systems"* systematized by Malmi and Brown in Fig. 51 are control and planning systems. Malmi and Brown's article about

management control systems, therefore, proves to be a systematization (typologization) of the planning and control procedures discussed in the English-speaking areas, which differs from the German "setpoint-actual comparison view" of a "control".

The planning and control systems (or "*management control systems*") listed in Fig. 51 are assessed in the light of the Integrated Target Commitment Planning and Control. Therefore, they are only insofar analyzed as they are quantitative "management control systems". The question I asked myself was: Is it possible to reconstruct some of the management control systems described as procedures of an Integrated Target Commitment Planning and Control.

The results, which are discussed in detail in the article "*Management Control Systems....*", should be briefly described below in order to recognize how the research findings of Malmi and Brown and systematized by them, can be assessed on the basis of the Integrated Target Commitment Planning.

Malmi and Brown discuss the different types of management control systems in the following order: 1. *reward and compensation controls*, 2. *cultural controls*, 3. *administrative controls*, 4. *planning controls*, and 5. *cybernetic controls*.

"*Reward and compensation controls*" and "*cultural controls*" are areas that are not suitable for a model-based reconstruction of such "control systems". The descriptions of these areas are so general that it is difficult to recognize only one concrete regulation at all, which shows how such "control systems" should be designed.

The same applies to the third area, "*administrative control*". Malmi and Brown refer to the "*administrative control systems*" as "*those (systems E.Z) that direct employee behavior through the organizing of individuals (organization design and structure), the monitoring of behavior and who employees are made accountable to for their behavior (governance); and through the process of specifying how tasks or behaviors are to be performed or not performed.*"

There is nothing wrong with this labeling, but if you say no more than that, then not model-based control system can be developed from it. According to Malmi and Brown, the "*action controls constitute only part of what we have labelled administrative controls*" (p.294). This focuses on *action control* as an essential element of a planning control system, i.e., the fourth type of a management control system.

However, Malmi and Brown's statements on the structural features of "*planning control systems*" are rather sparse. The only sentence that could even be used to carry out a model-based reconstruction is: "*activity planning*"... "*enables congruence by aligning goals across the functional areas of an organization, thereby controlling the activities of groups and individuals*".

Malmi and Brown do not provide the slightest information on how "*activity planning*" could be carried out in a model-based way. Therefore, the model of a comprehensive company planning described in this text (s.p.68) was used to show in detail what is un-

derstood in this model as "*activity planning*", i.e., planning with the parameters of this model that can be fully influenced.

It turns out that the planning of the action variables of a company's comprehensive planning is not oriented to how Malmi and Brown demand it to enable "*congruence by aligning goals across the functional areas of an organization*". In a comprehensive company planning model of the Integrated Target Commitment Planning (but also in other comprehensive company models) there are no "*goals of the functional areas*" at all that could be influenced by the action variables of the model. The choice for values for the action variables is only oriented towards the top target of a comprehensive planning, for example, (s.p.71) the return on equity.

Malmi and Brown do not mention "target commitment variables" as elements of a planning procedure in their considerations of the topic "planning control systems". However, just these are the decisive "driver variables" of a planning in the concept of the Integrated Target Commitment Planning. Apparently, there exists no target commitment planning for them.

I do not think that such general reflections on planning and control systems are very useful. Malmi and Brown should show on the basis of a concrete planning model (e.g., the mentioned comprehensive company planning model) how their "activity planning" should be carried out in individual cases. They could be certain of my attention.

Malmi and Brown then turn to the "*cybernetic control systems*". They formulate six characteristics of such systems.

Malmi and Brown then turn to the "*cybernetic control systems*". They formulate six characteristics of such systems. However, the examples they have selected do not meet these criteria at all. They are not even mentioned in the discussion of these examples. Two of their examples of a "*cybernetic control system*", are budget planning and the Balanced Scorecard.

In discussing the first example of a "*cybernetic control system*", i.e. budget planning, Malmi and Brown refer to two contributions by Bunce and Hansen (and co-authors), which according to them represent the "state of the art" in the area of budgeting and thus also in the area of planning and control.

the "*state of the art*" in the area of budgeting and thus also in the area of planning and control.³⁴⁴ Their discussions on this, but also the contributions of the cited authors themselves, are extremely vague.

The topic of "*control*" is not addressed at all in these texts and the topic of "*planning of advanced budgets*" is exhausted in such generalities that it is not possible to reconstruct a single one of the demands made there for the design of such "advanced budgets" in the light of model-based planning.

For example, the development of "*value chains*" is required as part of budgeting. Howev-

³⁴⁴ Bunce, P., Fraser, R., Woodcock, L., *Advanced Budgeting: A Journey to advanced Management Systems*. In: Management Accounting Research 6.3 (1995), p. 253-265. Hansen, S. C., Otley, D. T., Van der Stede, W. A. *Practice Developments in Budgeting: An Overview and Research Perspective*. In: Journal of Management Accounting Research, 15-1 (2003), p. 95-116.

er, a definition of a "*value chain*" is not given and how to model it, one does not learn. Following on from these remarks, it is pointed out how budget planning and control could be carried out in the System of the Integrated Target Commitment Planning and Control. As a second application example of a "*cybernetic control system*" Malmi and Brown cite the concept of the Balanced Scorecard. As in the case of the use of budgets, they do not justify which indicators they use to classify the concept of the Balanced Scorecard as a management control system of the type "*cybernetic controls*". In contrast, Kaplan and Norton explicitly point out that that "*the Balanced Scorecard should be used, not (as) a control system*".³⁴⁵

This text shows how the concept of the Balanced Scorecard could be reconstructed as an application of the Integrated Target Commitment Planning and Control and thus also how a control of the "Balanced Scorecard Planning" could be achieved. The Balanced Scorecard figures compiled by Deyhle (s.p.191) which in his opinion could be relevant for a company, serve as a starting point for this reconstruction.³⁴⁶

Malmi and Brown's plan to classify the different types management control systems described in the literature cannot be successful because the "definitions" of this term to be found there are so unclear that it is hardly possible to establish a satisfactory order and demarcation.

This does not change if one assumes that Malmi and Brown do not aim at a classification but only at a typologization. With the (unclear) concept of a typologization it is allowed that the types to be distinguished from each other may have a small number of characteristics that correspond to each other. But which characteristics of the different management control systems overlap here and which are only type-specific? I consider it almost impossible to create a satisfactory systematization at this level. This is not due to Malmi and Brown, but to the vague and inadequate descriptions of management control systems in the literature. Others are unlikely to succeed with this either.

Nevertheless, I think it is very welcome that Malmi and Brown have provided a first overview with their contribution, which covers everything that is found in the literature under the name "management control system". And this overview also shows on which vague level such systems are treated in the literature.

Malmi and Brown's contribution has finally convinced me that a systematization of management control systems based on clear criteria will only be successful if it is done on the foundation of a model-based operational planning and control system. Malmi and Brown stress that their contribution "*will stimulate discussion and research in this area*". As far as I am concerned, they have fully achieved this goal (see also p.580).

³⁴⁵ Kaplan, R. S., Norton D.P., *Balanced Scorecard*, Boston 1996, p.25. The highlighting of "not" was done by the authors.

³⁴⁶ For more information, see: Zwicker, E., *Management Control Systems in the Light of the Integrated Target Commitment Planning*, Berlin 2016, p. 44f., www.lnzpla.de/IN52-2016.pdf. (Text in German, title translated).

Classification and description of a setpoint-actual control system

Malmi and Brown's text on "*Management Control Systems*" (MCS) shows that the term "control" does not play a role for them as it is practiced in the context of the Integrated Target Commitment Planning and Control as a setpoint-actual comparison. Malmi and Brown constantly talk about "control" (317 times) in their 12-page text (205 times as "control" and 112 times in "MCS"). However, in this context, it's not stated that a setpoint value of a target (however it may be determined) should be compared with the actual value of this target and that the variance as a result of such a "setpoint-actual control" (der Soll-Ist-Kontrolle) gives rise to certain conclusions. After reading Malmi and Brown's text, I turned to the two relevant works by Merchant and Anthony about "management control" in the hope of learning more about the topic "setpoint-actual control".³⁴⁷

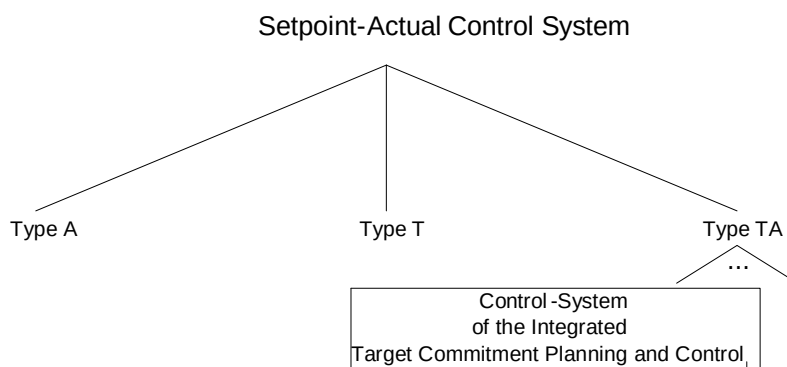


Fig. 52: Types of a setpoint-actual control system

After finding virtually nothing about it, I came up with the idea to describe and differentiate a control procedure (or control theory) based exclusively on the concept of a setpoint-actual control. One condition for this was that the setpoint-actual control of the Integrated Target Commitment Planning should appear in this system as a clearly delimitable subgroup of these setpoint-actual control systems.³⁴⁸ Such a system was developed by me and is described in the article "*Claasification of Setpoint-Actual Control Systems...*" already mentioned above. Here only a short overview is given.

There is quite a lot to be said about the design of a setpoint-actual control as a control procedure following a model-based operational planning, which in my opinion is of great practical relevance.³⁴⁹ In the system of the Integrated Target Commitment Planning, the

³⁴⁷ Merchant, K.A., van der Stede, W.A., *Management Control Systems, Performance Measurement, Evaluation and Incentives*, 3rd Ed., New Jersey 2011, and: Anthony, R.A., Govindarajan, V. *Management Control Systems*, 12. Ed., Boston 2007.

³⁴⁸ As already mentioned (s.p.78) in the frame of the INZPLA control system, an "actual-setpoint variance" is carried out for profit sizes and a setpoint-actual variance for cost sizes as a standard. But this is only a convention. Since the term "setpoint-actual" is used more than "actual-setpoint" in the literature, the control system here described is referred to as "setpoint-actual control system".

³⁴⁹ The importance of a setpoint-actual control within the framework of an operational planning and control system is also shown in a contribution in which the chapter "Control calculation" from Ewert and Wagenhofer's "Interne Unternehmensrechnung" (*Internal corporate accounting*) was massively criticized by me. In my opinion, Ewert-Wagenhofer's "control calculation", which also assumes a "setpoint-actual comparison", is completely misleading. To show this, I wrote more than 120 pages about it. See: Zwicker, E., *Control Calculations in the Light of the Integrated Target Commitment Planning*

determination of a “responsibility-related“ setpoint-actual variance of a target commitment quantity is the core of the entire control procedure of this planning and control system.

A setpoint-actual control system is characterized by certain control objects for whose setpoint-actual variance someone is made responsible. The objects to be controlled are either actions (A) or the targets (T) to be achieved by certain actions. Targets and actions can thus be objects of a setpoint-actual control. Therefore (s. Fig 52) a distinction can be made between setpoint-actual control systems of type T and A.

In a type T setpoint-actual control system, only a setpoint-actual control of the agreed or ordered targets is carried out.

If certain actions are controlled by a setpoint-actual comparison alone, regardless of which target they have finally to achieve, then a setpoint-actual control system of type A is available. And with type A, there is also a type of a setpoint-actual control of an action that a responsible person promises to refrain from doing. In more differentiated setpoint-actual control systems, such as the Integrated Target Commitment and Control, setpoint-actual controls of targets and actions are carried out. This case is indicated by the type TA. The INZPLA-System always belongs to this type. As shown in Fig. 52, this makes it possible to distinguish between three types of a setpoint-actual control system.

The mentioned text “*Typology of Setpoint-Actual Control Systems..*” describes the four common features that characterize a setpoint-actual control system. For example, it is always necessary for a person or group of persons to make an (explicit or implicit) action or target fulfillment commitment, for whose setpoint-actual variance this person or group of persons is responsible.

Commitments for action and targets

1. Action commitments and commitments of action refraining

1.1 Action commitments

- a) Quantitative (= action commitment size) (*realize a sales price of 20 €/unit*)
- b) Non-quantitative (*press the time stamp at the end of work*)

1.2 Commitment of action refraining.

- a) Quantitative (*no hotel booking over 100 € per night*)
- b) Non quantitative (*non-business class flying*)

2. Target commitments

2.1 Quantitative (= target commitment size) (*sales quantity of 10,000 units*)

2.2 Non-quantitative (*introduce SAP FI according to requirements catalog*)

Fig. 53: *Commitment types of a setpoint-actual control*

As Fig. 53 shows that the target commitments, action commitments and commitments of action refraining, which form the basis for a setpoint-actual control can be differentiated according to whether they can be described quantitatively or not.

The quantitative size representing a quantitatively describable action commitment is referred to as action commitment size. The corresponding quantitative size used in the case of a quantitative target commitment is called target commitment size.

If quantitative action and target commitment sizes (1.1a and 2.1 in Fig. 53) are available, the result of a setpoint-actual comparison can be formulated more precisely than in the case of non-quantitative action and target commitments (1.1b and 2.2 in Fig. 53). In such a case, the "setpoint-actual variance" of the two types of a quantitative commitment size can be determined according to the calculation rule

$$\text{Setpoint-actual variance} = \text{setpoint commitment size} - \text{actual commitment size} \quad (85)$$

The setpoint-actual variance is a measure for the fulfillment or non-fulfillment of the quantitative action or target commitment in question. Depending on whether an action or target commitment size exists, the calculated amount of the setpoint-actual variance leads to different judgments with regard to the fulfillment of the commitment entered into.

An important point is the specification of the "interfaces" of a setpoint-actual control system with the preceding planning step that is the planning of the setpoint value and the following step, which consists in the evaluation of the determined setpoint-actual variance.

In the case of a setpoint-actual control system based on simple written management orders (like *non-business class flying*), there is no much help from the view of a model-based control. However, with regard to the Integrated Target Commitment Planning, a lot can be done. Therefore, the section "*The control system of the Integrated Target Commitment Planning as a setpoint-actual control system of type TA*" in the mentioned text "*Typology of Setpoint-Actual Control Systems...*" is especially long.

The definition of the setpoint and actual values of a quantitative target commitment is discussed there in detail. Depending on the planning procedure used, these setpoint and actual values are defined very differently because the principle of controllability of setpoint-actual variances must be observed in their definition. The consequence is that in some cases even "fictitious actual values" will be used in the setpoint-actual comparison.³⁵⁰

In addition to target commitments, action commitments are also dealt with. Like the target commitments in an Integrated Target Commitment Planning model, they are always described in quantitative terms. It turns out that in an Integrated Target Commitment Planning model up to three different types of action variables can occur that require a special form of a setpoint-actual comparison. And one type, namely the decision parameters, can be found in every realistic plan cost-performance model of an Integrated Target Commitment Planning.

From this perspective, it would actually be appropriate to describe this planning procedure as "*Integrated Target and Action Commitment Planning and their Control*". However, since target commitment planning predominates in such models due to the large num-

³⁵⁰ For the principle of controllability, see page 81 and 596.

ber of basic targets and these basic targets are the only "driver variables" of the planning procedure, such extended naming was dispensed with.³⁵¹

The described occupation with setpoint-actual control systems led me to a new view of the Integrated Target Commitment Planning and Control. So far I had only dealt with the setpoint-actual control system that should follow an Integrated Target Commitment Planning. The starting point was always the pure Integrated Target Commitment Planning and its setpoint-actual control system, which represents a further development and generalization of Kilger's approach of a setpoint-actual control. Then I developed the procedure of an area Target Commitment Planning and Control, i.e., a type of Target Commitment Planning in which an area manager is only responsible for the setpoint-actual variance of an area target (and no longer for the basic targets).³⁵²

This was followed by the hierarchical area Target Commitment Planning and Control, in which all managers in the management hierarchy are made responsible for adhering to the setpoint value of their area target and, in some cases also two area targets. Here, too, special circumstances must be taken into account when defining the setpoint and actual values of these area targets. However, all of this moved within the area of the Integrated Target Commitment Planning. With the development of this general system of setpoint-actual control systems, however, a systematization "from above" has now taken place, in which the control system of the Integrated Target Commitment Planning proves to be a subset of certain setpoint-actual control systems.

On the development of normative management accounting theories in the light of the Integrated Target Commitment Planning

This brings us to the discussion of Malmi and Granlund's article, by which I hoped to understand what Teemu Malmi meant by a "normative theory". After his remark in Vienna I studied this article called "*In Search of Management Accounting Theory*" again with great interest. A detailed discussion is given in the already mentioned (s.p.196) paper „*Development of normative Management Accounting Theories in the Light of the Integrated Target Commitment Planning*".³⁵³

Malmi's and Granlund's contribution will be discussed in detail below, not only because it deals with the question what they understand by a normative theory. Their article turned out to be even more interesting from another point of view. In their text, they describe certain "*preliminary normative theories*", be found in the field of management accounting. These "*preliminary normative theories*", so their demand, should be further developed into "complete theories", which also serve practical purposes. Based on three examples of such "*preliminary normative theories*" cited by Malmi and Granlund, I have

³⁵¹ However, if a plan cost-performance model of an Integrated Target Commitment Planning contains a decision variable that is one of the three types of action variables, then after each negotiation step in which certain basic targets are changed, the operating result is also maximized. In this case, this (optimizing) action planning is made recognizable by calling this procedure as "*mixed optimization basic Target Commitment Planning*". See page 49.

³⁵² Under certain circumstances, there may also be two area targets. See page 90.

³⁵³ www.Inzpla.de/IN50-2016.pdf.

shown that a further development of them into "*complete theories*" can and should take place using the Integrated Target Commitment Planning. In the following, a brief description is given in which way this assertion is justified. However the original question of what Teemu Malmi understands by a "*normative theory*" is discussed in the following.³⁵⁴ Overall, this text builds a bridge from the "state of the art" of current management accounting theories to the Integrated Target Commitment Planning and Control.

On the definition of normative theories.

Malmi and Granlund's work contains three definitions of a "normative theory" that have received special names from me. Following their optimization definition a normative theory is available when an "*objective function*" has been developed with which an optimization can be carried out. So they remark: "*We argue that researchers should assume objectives and objective functions, and build theories that support the attainment of these objectives.*" The demand to develop "*objective functions*" with the aim "*to support the attainment of these objectives*" can only be interpreted in such a way that the normative theories are represented by a decision model, whose "*objective function*" is extremized.

In this sense they also demand "*Research on management accounting would be better off if researchers would clearly assume and explicate an objective and objective function, and build theories to support that objective*". And they continue to demand: "*It appears that we need to assume an objective function to be able to build meaningful theories.*" However, whether a normative theory is only ever present when it is described by a decision model is for them not a necessary condition. This is shown by their second definition of a normative theory.

It is to be referred to as working definition. Thus they state: "*An important thing to realize is that when succeeding in producing a construct to solve a practical problem that is of theoretical interest, and if the construct is shown to be working, we have built a MA theory.*"

If you extend the object scope of the working definition to include any objects, then "*we have built*" with the formulation of a cooking recipe if "*it is shown to be working ...a ...theory*". However this is only valid if there is a "*theoretical interest*" in the recipe and if it tastes good (it is "*shown to be working*" successfully on your tastebuds).

According to the third definition, the organizational definition, a normative theory is always present if a "*set of propositions*" has been developed to prescribe how something should be organized under the given circumstances. Malmi and Granlund characterize this as follows: "*In a sense, what we are claiming is that MA theory should be a set of propositions of how to organize accounting and control practise under given circumstances*"

A certain similarity with the working definition cannot be denied. According to this, as in the case of the working definition, if the object area to which the requirement refers is

³⁵⁴ For a detailed justification see: Zwicker, E., *Management Control Systems in the Light of the Integrated Target Commitment Planning*, p. 9f., Berlin 2016, www.Inzpla.de/IN52-2016.pdf. (Text in German, title translated).

extended, a recipe would also have to be regarded as a normative theory, because what is it other than a "*set of propositions*", but the Integrated Target Commitment Planning is also included in this case.

In view of these definitions I felt compelled to think about it and also to look into the literature, whether there are not certain "reasonable" criteria for differentiating a "normative theory" from something "trivial" such as a cooking recipe. These considerations are made in the text "*Is the Integrated Target Commitment Planning a Procedure or a normative Theory*".³⁵⁵ In this text certain criteria for differentiation are discussed and even such renowned economists as Oskar Morgenstern are endeavored.³⁵⁶ The result is that in my opinion no "reasonable criterion" can be found according to which, for example, the so called "normative agency theory" is a normative theory, and this does not apply to a cooking recipe.³⁵⁷

After Teemu Malmi let me know in Vienna that the Integrated Target Commitment Planning is not a normative theory, I wanted to know more precisely what he meant by a normative theory.

His and Granlund's attempts to provide an appropriate definition of the term "normative theory" in general and then especially for the area of management accounting seem to me to not very successful. Therefore it is also problematic when Malmi and Granlund in their (still to be discussed) text contrast so-called "*preliminary normative theories*" with "*complete normative theory*". For which definitional characteristics of a "*complete normative theory*" should be chosen in view of their inadequate definition of this term?

Malmi and Granlund's contribution confirmed my view that a "*normative theory*", if one already uses this name, in the field of management accounting can only be articulated on the basis of an (equation) model, i.e. model-based, and should therefore only be formulated on this basis. Such a model-based definition of a normative theory of operational controlling is given elsewhere (s.p.565).

Whether the Integrated Target Commitment Planning is "*a normative theory*", "*a procedure*", "*a tool*", "*a technique*", "*a system*", "*an approach*", "*an application*", "*a construct*" or "*a conception*" is ultimately completely irrelevant. "*Normative theory*" naturally sounds more sophisticated and scientific. And who would not like to have developed a "*normative theory*" instead of just a simple "*procedure*". That I was irritated by Teemu Malmi's remark in Vienna was actually superfluous.

Preliminary theories. Malmi and Granlund point out that in the area of management accounting "*a number of 'normative' theories or constructs*" exist, which have the status

³⁵⁵ See Zwicker, E., *Is the Integrated Target Commitment Planning a Procedure or a normative Theory?*, Berlin 2016, www.lnzpla.de/IN48-2016.pdf. (Text in German, title translated).

³⁵⁶ Morgenstern, O., *Descriptive, predictive and normative Theory*. In: *Kyklos* 25.4 (1972), p. 699-714.

³⁵⁷ I would be very grateful for suggestions and counter-proposals on this point. Because the result was also somewhat amazing for me.

of *"preliminary normative theories"*. They are to be used as a *"starting point"* to *"produce theories that are eventually useful in practice"*. These *"preliminary normative theories"* include *"activity-based costing for assigning overheads, Balanced Scorecard for control system design, Quality Costing framework to manage and reduce quality costs and Value Based Management framework to guide decision-making and control to ensure shareholder returns"*. Three of these *"preliminary normative theories"* are discussed by them in terms of content. Their call to use these theories as a starting point for developing practical theories I took at their word.

The first of their *"preliminary normative theories"* is the Balanced Scorecard. I have shown that this "theory" can be reconstructed as a procedure of the Integrated Target Commitment Planning. In view of this reconstruction, I claim that the Balanced Scorecard can only be described as a normative theory if it is conceived as an Integrated Target Commitment Planning and Control.

Malmi and Granlund finally remark on the *"theory"* of the Balanced Scorecard: *"As a result, we might not have a theory of BSC at the end, but a theory of management control, where BSC is one option, or value, that some of the sub-constructs of that theory may take"*.

But when Kaplan and Norton explicitly point out (s.p.200) that the Balanced Scorecard is not a control system, it is problematic to classify it as a sub-theory of a general *"theory of management control"*.

In the reconstruction of the Balanced Scorecard as a procedure of Integrated Target Commitment Planning and Control (s.p.189), which I have carried out, it is shown that such a reconstruction is only meaningful if, contrary to the view of Kaplan and Norton, the planning of the Balanced Score indicators is followed by a control that shows who is responsible for their setpoint-actual variances. In my opinion, such a general *"theory of management control, where BSC is one option"*, is the Integrated Target Commitment Planning and Control.

And the concept of the Balanced Scorecard proves in the light of this model-based reconstruction to be a sub-theory of this normative theory. However, its application proves to be only more or less feasible depending on the balanced score indicators chosen as setpoint values for planning in the individual case of a company (s p.191).

The second *"preliminary theory"* discussed by Malmi and Granlund is *"value based management"* (VBM). They describe *"six managerial steps"*, which are *"forming the core of VBM."* These six steps are more than vague. Step 4, for example, one reads, *"Developing action plans, selecting performance measures, and setting targets based on the priorities identified in the value driver analysis."* What is the benefit of such general demands if you don't learn anything about how to design the *"action plans"* and which *"performance measures"* are to be used?

Malmi and Granlund emphasize that this six-step guide is no *"complete theory"* and that it is *"of limited value for practitioners"* (p.606). In the sense of Mattessich, an attempt

should be made to develop "*purpose oriented models*".³⁵⁸ And that is exactly what I describe in the text. It is shown how "*value based management*" (a value-oriented planning) can be realized with the Integrated Target Commitment Planning using a comprehensive company planning model with the "*economic value added*" (EVA) as the top target. And only in such cases (so my claim) one can speak of a true (model-based) normative theory of "*value based management*".

The third "*preliminary theory*" discussed by Malmi and Granlund is "*cost accounting*". Originally, they assume "*activity-based costing*" (ABC) as a "*preliminary theory*". However, then they come to the conclusion, "*We would think about ABC as a tool, not a theory.*" And from this they draw the further conclusion, "*Therefore, it might be better to refer to the theory of cost accounting, or theory of product costing, instead of the theory of ABC*".

The "*cost accounting*", i.e., the planning and control of costs with a plan cost-performance model, was described by me in such detail that it could hardly be more detailed. That is why nothing more is said here but only claimed: The development of a normative "*theory of cost accounting, or theory of product costing*" including "*activity-based costing*" demanded by Malmi and Granlund is no longer necessary. Because it already exists. This is the "Integrated Target Commitment Planning and Control". It has already proven itself in practice and also has a "*significantly broad range of specific instances*" as Malmi and Granlund demand. Using (s.p.333) the system INZPLA-Connect, all of the currently more than one hundred thousand applications of the SAP Controlling module (SAP-CO) can be transferred into an Integrated Target Commitment Planning model, with which the procedures of an Integrated Target Commitment Planning and Control can then always be carried out.

Management Accounting Theories. Malmi and Granlund, however, do not stop at describing the "*preliminary theories*" found in the field of "*management accounting*" and calling for their further development into "*complete theories*". They also complain that too many non-sector-specific theories are used in the field of "*management accounting*". On these theories they note, "*None of these theories is something we could build on if we wish to distinguish MA theory from other theories*". These non-sector-specific theories are characterized by the fact that they can be used as theories of other fields and not only for the field of management accounting (MA). They call for the development of sector-specific management accounting theories, i.e., theories that can only be applied in the field of management accounting.

In the mentioned text "*Development of normative Management Accounting Theories...*" four different normative theories (or normative concepts) discussed in the literature are examined with regard to the "sector specificity" that Malmi and Granlund missed and demanded.

The argument is as follows: If these four "normative theories" (or normative concepts), which are regarded as non sector-specific, could successfully be presented as procedures

³⁵⁸ For Mattessich's demand, see page 212.

of the Integrated Target Commitment Planning and Control through certain concretizations, then these previously non sector-specific normative theories (normative concepts) would have been translated into sector-specific normative sub-theories of the Integrated Target Commitment Planning and Control.

This is due to the fact that the hypotheses used in the models of these "sub-theories" are always sector-specific, namely company-specific. However, also the normative procedures with which these sub-theories work, namely the normative procedures of the Integrated Target Commitment Planning and Control, are sector-specific.

This also applies to the complete "normative theory" of an Integrated Target Commitment Planning and Control, which contains these as normative sub-theories. It is always a real sector-specific normative theory of "*management accounting*", as it can only be used for the annual operational planning and control of companies.

The study of these four non-sector-specific theories cannot be described here because it is too costly.³⁵⁹ Reference can only be made to the text. The following non-sector-specific normative theories (concepts) are examined: 1. the optimization theory, 2. Tinbergen's "*fixed-target-policy*", 3. the normative concept of management-by-objectives, 4. the normative "*principal-agent theory*". The *principal-agent theory* is cited by Malmi and Granlund themselves as an example of a non-sector-specific normative theory.

In all four cases, it is shown that these normative theories can be applied in the system of the Integrated Target Commitment Planning and are concretized there into sector-specific normative theories. They are as Malmi and Granlund demand sector-specific because they work with a sector-specific hypothesis system that can only be applied to companies and whose alternatives are described by the INZPLA hyperstructure model. And they are furthermore sector-specific because they use sector-specific planning and control procedures.³⁶⁰

Just one more comment should be made about the normative agency theory. It is explained in detail (s.p.399) why the established hidden-action agency theory which is discussed in the literature on management accounting is not suitable to be used as a sector-specific theory of an operational planning in a company. Therefore, I (s.p.381) developed the so-called multi-agent hidden-effort agency theory, which is a special normative agency theory that only applies to the annual operational planning of companies.³⁶¹ And this theory is identical with the Integrated Target Commitment Planning. It is thus "the" sector-specific normative agency theory that is demanded by Malmi and Granlund.

The four non-sector-specific normative theories discussed prove therefore to be sector-specific planning and control procedures in the context of the Integrated Target Commitment Planning.

³⁵⁹ Zwicker, E., *Development of normative Management Accounting Theories in the Light of the Integrated Target Commitment Planning*, Berlin 2016, p. 22f., www.Inzpla.de/IN50-2016.pdf. (Text in German, title translated).

³⁶⁰ See on hyperstructure models p. 498

³⁶¹ See p. 387 and in detail: Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative the Agency Theory*, op. cit., www.Inzpla.de/IN46-2015.pdf. (Text in German, title translated).

Malmi and Granlund's proposals for developing normative management accounting theories.

Malmi and Granlund now submit seven proposals to the "*community of academic management accounting*" on "*to produce better management accounting theories*". These proposals were considered and commented by me in the light of the Integrated Target Commitment Planning and Control.³⁶² With this approach the question was pursued as to whether the Integrated Target Commitment Planning and Control can benefit from these proposals, has already taken them into account or is not compatible with them. These proposals cannot be discussed in detail here. I fully agree with them. But why? As I have explained in the text "*Development of normative Management Accounting Theories...*", these proposals which should according to Malmi and Granlund be realized in future have already been taken into account in the system of the Integrated Target Commitment Planning and, above all, have also been implemented in a concrete application system, the INZPLA-System.

The Integrated Target Commitment Planning and Control as an applicable normative theory of Management Accounting.³⁶³

Malmi and Granlund raise as mentioned the question, "*What should be the core of MA Theory?*" Their answer is, a "*theory should consist of assertions of what accounting and control methods we should apply, how, and in what circumstances*".³⁶⁴ This requirement is fully met by the normative theory of Integrated Target Commitment Planning and Control, The "*circumstances*" are the circumstances of the pending annual operational planning of a company. And the "*how*" is provided by the texts that can be called up and by the application of the procedures implemented in the INZPLA-system.

Malmi and Granlund consider the development of a "*unique theory of management accounting*" to be the most important task of research in the field of management accounting.³⁶⁵ It almost sounds as if the well-being of the entire discipline depends on them noticing: "*The overall consequence of having own practice relevant and useful MA theories would be a stronger identity to MA as a discipline. This should significantly enhance the acknowledgement and respect of MA research inside and especially outside the academia. Furthermore, perhaps this would also attract new good quality students to our field*". Malmi and Granlund formulate this so drastically because they know that their claim that management accounting is above all a normative discipline is rejected by many professional representatives. They are among the few who hold this opinion. There are only two professional representatives left who, like Malmi and Granlund, emphasize the bizarre situation which has arisen as a result of the fact that, in the opinion of a large proportion

³⁶² These proposals will be dealt with in a different order from Malmi and Granlund.

³⁶³ The following text, up to the heading "Teemu Malmi and the consequences", is almost literally taken from the text "*Development of normative Management Accounting Theories...*".

³⁶⁴ The underscore of "should" is added afterward.

³⁶⁵ In the quotation from Malmi and Granlund "management accounting" is abbreviated as "MA".

of their experts, management accounting is to be regarded as a purely explanatory discipline. These two professional representatives who oppose the "mainstream" are Tom Lee and Richard Mattessich.

Tom Lee describes this "turning away from the normative" with drastic formulations: *"Several decades ago, research was concerned primarily with normative prescriptions to improve the quality of accounting and auditing practices. Different forms of accounting practice and audit technique were offered, explained, discussed, and criticized. Research projects arose from problems identified in practice. Research careers and reputations were made and broken by normative research. However, the 'publish or perish' culture and the emergence of computerized economic and financial databases changed this world. Research, especially in the U.S. where there was sufficient funding, was quickly dominated by empirical research projects based on economic or finance theories and the use of economic financial data."*³⁶⁶ (p.63)

The situation he describes is unacceptable to him. To illustrate this, he points to the absurd consequences that would result if medicine, as an application-oriented discipline, were to proceed in the same way as management accounting. *"To me, it is as if medical researchers were interested only in the behavior of doctors rather than the detection, prevention and cure of illnesses and diseases."*

Lee believes that in the "major research journals", the "editorial boards" are dominated by "empirical researchers". And he concludes, *"For those in influential roles in the research community in the U.S., normative research was unscientific and, therefore, not to be trusted."*

Richard Mattessich has spent his entire professional life dealing with methodical questions of accounting. Along with Hanns Martin Schoenfeld, he is one of the authors who, because of their German-speaking background and as a member of an English-speaking university (University of British Columbia), are at home in both English and German-language literature on accounting and has published in both areas.³⁶⁷ In his German-language work *"Die wissenschaftlichen Grundlagen des Rechnungswesens"* (The Scientific Foundations of Accounting) he was the first to describe the concept of an accounting matrix for the presentation of double-entry accounting.³⁶⁸ In my view, this is an essential contribution to the formalization of accounting.³⁶⁹

Richard Mattessich has published a book entitled *"Critique of accounting - Examination of the foundations and normative structure of accounting"* at the end of his academic ca-

³⁶⁶ Lee, T. A. *Accounting and Auditing Research in the United States*. In: *The Real Life Guide to Accounting Research*, Humphrey, C., Lee, D B. (Ed.), Amsterdam 2004, p. 57-71.

³⁶⁷ For Hanns Martin Schoenfeld, see page 524.

³⁶⁸ The exact title of his book is: *"Die wissenschaftlichen Grundlagen des Rechnungswesens: Eine analytische und erkenntniskritische Darstellung doppischer Informationssysteme für Betriebs- und Volkswirtschaft"*, Düsseldorf, 1970. English translation: *"The scientific foundations of accounting: An analytical and knowledge-critical presentation of double-entry information systems for business and economics"*.

³⁶⁹ For Mattessich's influence on the development of the Integrated Target Commitment Planning, see page 9.

reer. This work is how Archers judges *"sums up and brings together his work over four decades in accounting theory"*.³⁷⁰ This is an extremely readable document of about three hundred pages, and one can only fully agree with Archers' assessment of this work quoted below; *"Its publication is a significant event which constitutes a serious claim for him to be ranked among the preeminent accounting thinkers of this half-century"*.

Mattessich describes the current state of accounting in English-speaking academia as *"dilemma of academic accounting"*.³⁷¹ (p.222)

He asks the question; *"Why do so many prominent accounting theorists try to brand it (the normative and practice serving analysis) with the term unscientific?"* (p.184). In his opinion, we have to *"find a solution"* for this unsatisfactory situation. Mattessich sees such a solution in the following procedure: *"The hierarchy of accounting objectives must be clarified; norms must be incorporated as conditional premises into accounting models"*.

To this end, he calls for the development of *"purpose oriented models"* (p.190). Following on from this, he develops an *"ultimate vision"* for the further development of accounting. For him, this *"ultimate vision"* consists in *"the creation of a considerable number of accounting models, each with specific hypotheses tailor made to a specific accounting objective"...* *"yet offering a considerable choice to 'consumers'"* (p.190). In a kind of manifesto, Mattessich calls on the *"entire accounting community"* to develop such a *"normative theory"*. He concludes his appeal and these are also the two final sentences of his book with the statement: *"This (the development of a normative theory) will not come about without resistance. After all, many academics may resist an approach that scatters the illusion of a pure science of accounting; yet reality must be faced, as painful as it may be"*.

Richard Mattessich points out that his proposals for the further development of "accounting" in a more normative direction can only be understood as *"an architect's sketch"* and it is still open what the *"ultimate edifice"* should look like.

The Integrated Target Commitment Planning and Control should provide at least some components that could be included in the *"ultimate edifice"* of a normative accounting theory. In the light of the Integrated Target Commitment Planning, the *"hierarchy of accounting targets"* to be developed according to Mattessich corresponds to the single-level target hierarchy between the basic targets and the top target if a pure basic Target Commitment Planning is to be carried out. In the case of a hierarchical area Integrated Target Commitment Planning, on the other hand, it is a multi-level hierarchy of the area targets with the *"top target"* according to the name at the top of the hierarchy and the area targets at the individual management levels below, while the basic targets, as the name says, form the basis of this hierarchy (s.p.54).

³⁷⁰ Archer, S., *Mattessich's Critique of Accounting: A Review Article*. In: *Accounting and Business Research*, 28.4 (1998) p. 297-316.

³⁷¹ Mattessich, R., *Critique of Accounting - Examination of the Foundations and normative Structure of Accounting*, Westport 1995, p. 222.

If Mattessich demands "*norms must be incorporated as conditional premises into accounting models*", then this requirement is fully met by the Integrated Target Commitment Planning. An Integrated Target Commitment Planning model is certainly an accounting model. And this model is characterized by the fact that its top target (like the operating result) is purposefully influenced by "*incorporated norms*" in the form of certain planning rules. These planning rules refer as described to the execution of three types of an action planning and also to the target commitment planning with its planning triad for determining the target commitments.³⁷² These four planning procedures can be combined to an integrated planning procedure without contradictions. There also exists a self-contained system of "*incorporated norms*" for the following control.

Mattessich sees as an "*ultimate vision*" ... "*the creation of a considerable number of accounting models, each with specific hypotheses tailor made to a specific accounting objective*". As described above, an accounting model, if it is an Integrated Target Commitment Planning model, can be configured for a large number of companies with the help of the INZPLA hyperstructure modeling system developed. And as mentioned above, the term "*large number*" is justified by the fact that any SAP-CO application can be converted into an equation model of the Integrated Target Commitment Planning with the developed transfer program INZPLA-Connect (s.p.333). With regard to the adopted application, the parameters of this model always allow the decision as to whether they are to be classified as basic targets or uncontrollable basic parameters or decision parameters of an Integrated Target Commitment Planning if such a planning is to be practiced after the takeover.³⁷³

Since there are thousands of applications of the SAP-CO system, a large number of which use all modules up to the planning of the operating result (up to the SAP-PA module), this assertion is not absurd.

The hyperstructure modeling system makes it possible to generate a "*considerable number of accounting models*", "*with specific hypotheses tailor made*", precisely depending on the structures occurring in a company. These *specific hypotheses* are described by the hypothesis equations of the model in question, which precisely reflect the structural conditions of the company in question.

According to Mattessich, the hypotheses to be developed should be characterized by "*tailor made to a specific accounting objective*". This demand is met by the hypotheses (and also the definitions) of an Integrated Target Commitment Planning model. However, the "*accounting objective*" is not one specific objective, but rather includes several objectives (in the INZPLA terminology "targets"). These are one or more top targets and in most

³⁷² For a description of these three types of action planning possible in an Integrated Target Commitment Planning model, see: Zwicker, E., *Management Control Systems in the Light of the Integrated Target Commitment Planning*, p. 9f., Berlin 2016, www.inzpla.de/IN52-2016.pdf. (Text in German, title translated).

³⁷³ For example, the sales prices of an article whose semantics are known during readout are assigned by the system with the status of a decision parameter.

cases very many basic targets as elements of the "*hierarchy of accounting objectives*" (targets). They are specific because the top target (or targets) can be determined by the corporate management according to its own opinion and the basic targets are determined on the basis of the specific structural and semantic conditions of the company (but still as a concretization of the hyperstructure model). The planning model developed is "*tailor made*" in such a way that these "*accounting objectives*", i.e., the basic and top targets of the Integrated Target Commitment Planning, can be connected by means of the hypothesis and definition equations.

Teemu Malmi and the consequences

The system of the Integrated Target Commitment Planning can certainly be called a management accounting system. It is, therefore, obvious that at the beginning I was permanently interested in the English literature on the subject of accounting systems and above all, I thoroughly studied the articles on management accounting. Topics such as "*Balanced Scorecard*", "*value based management*", "*activity-based costing*" and Kaplan's "*entirely new Management Accounting System*", which can be described as normative concepts, were examined in detail by me, as this text illustrates.³⁷⁴

Over the years, however, it has become increasingly clear that the normative aspect of management accounting is considered to be completely irrelevant in English-language management accounting research. The subject is practically ignored. The contributions of Richard Mattessich and Tom Lee show that this statement is not false. That is why Malmi and Granlund's contribution is so remarkable because they clearly call for the development of normative and application-relevant theories.

Their message is: "*Let us try to build MA theories that are useful for accounting practice*", and then they come to the conclusion: "*We see the development and testing of normative theories as a fruitful avenue to produce more practice relevant research and theories of MA*".

However, Malmi and Granlund are obviously aware that they should not have much support in the "*MA community*". They complain: "*What we do not understand is why the academic MA community cannot be proud of practice-oriented MA theories*".

In view of the almost exclusively descriptive and explanatory considerations in the field of management accounting, it is justified in describing Teemu Malmi and Markus Granlund as forerunners of a new direction in management accounting. That was the reason for studying their contribution in such detail. Almost incantatory, they try to win over colleagues, who regard management accounting as an explanatory discipline, for their normative message.

Their seven proposals, already mentioned (s.p.210), serve the sole purpose of dragging these who work as university teachers in the field of explanatory management accounting (and that's are almost all) more into the "normative field", because they hope that these proposals will contribute "*to alter some current practices when conducting traditional research*".

³⁷⁴ See pages 168f., 184f. and 189f.

However, they do not overestimate the chances of luring those who represent *"traditional research"* into the *"normative field"*. They demand that a *"research paper"* should at least always contain a reference to *"how to implement MA, and how that is supposed to help in building a MA theory"*. And they continue to demand; *"The concluding sections of research papers should make both the theory trying or developed and its practical implications explicit"*. Teemu Malmi and Markus Granlund are not only to be seen as forerunners, one could already regard them in view of the present circumstances as a kind of revolutionaries and one can only ask oneself what their colleagues might think of it. Their demand is in my opinion not expected to meet with much approval.

If one looks back at Teemu Malmi's two contributions and then especially at his plea for the development of a *"normative MA theory"*, then he should actually be a proponent of the Integrated Target Commitment Planning and Control. After reading his two contributions, I came to the conclusion, which I have tried to support here, that almost all the features that he believes a *"normative management accounting theory"* should have can be found in the system of the Integrated Target Commitment Planning and Control.

Actually, we could act as a team at conferences. He would, as in his text, point out the deficits of the current *"normative MA theory"* and I would then explain how these deficits can be eliminated with the help of the Integrated Target Commitment Planning. Then we could appear together at one of the next ERMAC meetings in Vienna and I would not care if he then said whether the Integrated Target Commitment Planning is a normative theory or *"only"* a procedure.

Epilogue in Berlin

But there is also something personal to report. I was back in Berlin less than four hours after the end of Teemu Malmi's lecture. When I got home I was greeted by my wife:

How was it in Vienna? Fine, but I didn't see much of Vienna itself.

Were you once again the eldest? That's the way it is now. At seventy-four, you are no longer among the youngest.

And was it worth it? Yes, very.

What's the point of that? The star speaker of the conference said INZPLA was not a theory and I'm thinking about it now. I'm especially interested in his theories. Let's see what comes out.

When are you going to stop all this? If I can no longer distinguish *"Vienna"* from *"Berlin"*. When the time has come, we can ship off on a luxury steamer with six meals a day.

Then how do you find your way on board? Don't you know that? For seniors there are so-called on-board navis. They help you find your way from the cabin to the dining room and back.

And how do you know that meals start? Each cabin has a speaker. And when the time comes, the chief steward will call to the table. Seconds later, the cabin doors open everywhere and aged figures including mine stomp through the corridors like zombies with their navis in the direction of...

Before you let your imagination run wild, a practical question, how are you going to realize that you can no longer distinguish Vienna from Berlin? You can tell me that then. Oh, no, that's not possible.

Why not? Don't you know the story of the old couple at the beach?

No, I don't remember. So, an old married couple is sitting on the beach. The husband says I'll go get ice cream for us. Then she says, "Write it down; otherwise you'll forget it. He says, "Well, look, I'll still be able to keep it." He goes off and comes back with two pairs of sausages. Thereupon she says, "I told you to bring mustard with the sausages."

See, that's why I'm going to Vienna.

Management Accountants and Integrated Target Commitment Planning

My efforts in the English-speaking area of Management Accounting to present the system of the Integrated Target Commitment Planning to other colleagues went unsuccessfully. Two congress contributions (with a detailed description of the contents) were rejected without comment by the organizers already during the admission examination. One of these articles described the application of the INZPLA-System at Thyssen-Krupp Steel.

Another attempt to compare the concept of the Integrated Target Commitment Planning in a text with Kaplan's "*entirely new Management Accounting System*" was returned by the "editor-in-chief" of a renowned journal, without being included in the referee process, with the remark that I had not considered the relevant literature on this topic.³⁷⁵ Afterward I told myself, what should I deal with people, who don't like the whole direction. It only brings trouble and leads to nothing. It would be better to concentrate on the development of the INZPLA-System.

Model builders, system developers, and system users and their normative considerations of this approach are not so welcome in this discipline. Here one prefers to write "about" systems and "about" the behavior of their users rather than to deal with the question "how should".

However, it appealed to me to meet the relevant proponents who dominate the world of management accounting there. The editors of the relevant journals in the field of management accounting are the most powerful in this field. They're like bouncers in a disco, and if they won't let you in, you don't come in. And fame and honor (but also *tenure* and *salary increase*) depend on a publication in their journals.

Bédard and Gendron, for example, are reporting: "*For accounting researchers in North America institutional pressures to publish in accounting journals that are viewed generally as top-quality journals... are significant. For example, at the university of Alberta annual wage increases, promotions and tenure decisions are based largely on performance with regard to publications - especially in prestigious journals.*"³⁷⁶ A very well-

³⁷⁵ The text corresponds approximately to the chapter "*Kaplan's Management Accounting Systems and the Integrated Target Commitment Planning*" p.184., whereby the Integrated Target Commitment Planning is dealt in more detail since it is already assumed to be known in the chapter. I would have been very interested to know which "relevant literature" I had overlooked with regard to this topic.

³⁷⁶ Bédard, J., Gendron, Y., *Qualitative Research on Accounting: some Thoughts on what occurs behind*

known and fully qualified senior management accounting expert representative at one of the most renowned American universities told me in the presence of Gerhard Speckbacher that if he did not publish an article in at least one A-Journal every year, he would no longer receive an increase in salary.

However, despite my low chances in this field, I was already interested in getting to know the leading editors of the top journals.

Kari Lukka was editor-in-chief of the *European Accounting Review* from 2000 to 2005.³⁷⁷ One reason to participate in the conference held in 2002 by Kari Lukka and Michael Shields with the topic "*New directions in Management Accounting: Innovations in Practice and Research*" was to get to know him and Michael Shields personally. This conference takes place every two years in Brussels and is an important event in the scientific community of "*management accounting*". In agreement with Jürgen Weber, who organized the annual meetings of all German-speaking university teachers in the field of controlling in Vallendar, I invited Kari Lukka to give a lecture there as the main speaker at the conference in September 2004. He declined (on 26.01.2004) due to lack of time and expressed no interest in a different date.

More successful was the attempt to establish contact with **Robert Scapens**, editor-in-chief of the leading journal "*Management Accounting Research*". So I invited him to Berlin for a lecture (sponsored by Thyssen Krupp). He held this (on 25.11.2005) in my seminar with the topic "*Changing Times: Management Accounting Research and Practice from a UK Perspective*", which was very well received by the audience.³⁷⁸ Due to his many years as editor-in-chief of the leading research journal, he provided an excellent overview of developments in this field.

During his stay in Berlin, I showed him the sights of Berlin, and he also admired the beauty of Nefertiti. Besides, we had several good meals. We talked about a lot of things. But we have not spoken a word about the topic of "*management accounting*" and certainly not about the Integrated Target Commitment Planning. It didn't turn out; it just had other topics on the agenda. I would have liked to show him the INZPLA-System. There's something to see. However, he didn't ask me about it, so I didn't. All in all, we got along very well and are still in sporadic contact today. If he lived in Berlin, I would be happy to meet him more often.

Chris Chapman is Professor of Management Accounting at the University of Bristol. As President of the renowned European Institute for Advanced Studies in Management he is an influential personality. In his special field of management accounting he is just as influential. So he is editor-in-chief of the journal "*Accounting, Organizations and Society*". Together with Anthony Hopwood and Michael Shields, he is editor of the *Handbook of Management Accounting*, a standard work on management accounting in which all au-

the Scene. In: *The Real Life Guide to Accounting Research*, op. cit., p. 192.

³⁷⁷ For a report from Lukka on his work as editor-in chief, see: Lukka, K. *How do Accounting Research Journals function? Reflections from the Inside*. In: *The real Life Guide to Accounting Research*, op. cit., p. 433-447.

³⁷⁸ See www.Inzpla.de/Lecture-Scapens.pdf.

thors are gathered as subject area specialists who have a high reputation in this field.

I met him at the Annual Conference for Management Accounting Research (ACMAR) in Vallendar, organized by Utz Schäffer and Jürgen Weber in 2013. He gave a lecture on cost accounting in the hospital sector. Cost accounting, no matter in which area, is, of course, a topic that always interests me.

So far I had little idea of cost accounting and cost accounting procedures in hospitals. Chris Chapman's presentation clearly showed the difficulties involved in introducing a cost planning and cost control system in a hospital. The questions of attribution and identification of standard procedures are much more difficult than in an industrial company. The development of a meaningful hyperstructure model system for configuring the flow of quantities and costs in hospitals seems to me to be almost impossible. The INZPLA-System would not have worked if I had specialized in hospitals from the beginning. His presentation showed in an impressive way the immense difficulties that arise in cost and process modeling in the hospital sector. After the lecture, I approached him and said that he had chosen the most difficult area to choose in the area of cost accounting. An act of self-torment, so to speak. And he agreed with me. One can only wish him much success.

Anthony Hopwood. It is almost impossible to follow the entire literature in the field of controlling and accounting. However, one should stay up to date. One of my selection criteria for studying English literature is to look at texts about "accounting systems", because "systems" are my field. This selection criterion led me to look at Anthony Hopwood's article entitled "*The archeology of accounting systems*" in 1987. And this article immediately aroused my interest. In this text Anthony Hopwood shows in a clear and superior way, as in the area of "accounting systems" ... "*new bodies of knowledge, new specialists associated with their practice, government regulatory attempts, changing theoretical and practical conceptions of organizational governance and order, and even the development of a different accounting rhetoric can provide a basis for action and change*" (p.231).

I found this article so interesting and sophisticated that I decided to take a closer look at its author. That is why I took up his book "*Accounting and Human Behaviour*", which had already been published thirteen years earlier (1974).³⁷⁹ However, I was more interested in whether this work was as well written as the "*archeology of accounting systems*". The title did not seem to promise significant insights into the structure and construction of planning and budgeting systems. However, I was wrong.

When I first held Anthony Hopwood's book in my hand, the concept of the Integrated Target Commitment Planning was already largely developed, and its implementation in a prototype was already complete, but I found Anthony Hopwood's remarks on the development of accounting systems by accountants to be very progressive and groundbreaking compared to other literature.

Hopwood compares an accountant who develops a system with an architect, because "*both professional groups are concerned with designing and constructing structures...*"

³⁷⁹ Hopwood, A. *Accounting and Human Behaviour*, London, 1974.

and further, *"It is useful ... considering the resemblance which the accountant's task as a designer of information systems ... to that of an architect"* (p.202). This comparison between a developer of accounting systems and an architect is not only unique. Hopwood's work contains a whole series of passages in which he clearly emphasizes this "architectural view". This is also evident from the fact that he has devoted an entire chapter to the topic of *"Designing Accounting Systems"*.

This "architect's view", which naturally interested me very much, can hardly ever be found in both English and German literature. As already mentioned, there is always "talk about" systems but quite rarely about how systems should be constructed and what has to be considered in their development.

Anthony Hopwood's views and demands on the development of "accounting systems" were very accurate, and they confirmed exactly the direction I at least followed in developing the system of the Integrated Target Commitment Planning and Control.

Anthony Hopwood starts from the statement *"there has been a tendency for 'budgeting' to become 'budgetary control'"* (p.190). However, such control is only possible if targets are formulated for certain responsible persons, whose control is then pending. He sees this very clearly and, therefore, the targets and their determination play a very decisive role for him when it comes to developing a budgeting system. Thus he demands from an accountant (as a system architect) that his *"procedures should be designed to stimulate managers and employees to behave in a manner which is likely to contribute to the effectiveness of the enterprise as a whole"* (p.XII).

This is exactly the intention of the INZPLA-System. The *"enterprise as a whole"* is presented by the top target (or targets) of the corporate management. The contribution of the employees consists in the adherence to the basic targets, which have a direct influence on the top target.

With regard to the development of "accounting procedures", he notes, *"The effectiveness of any accounting procedure depends ultimately upon how it influences the behavior of people in the enterprise"* (p.1).

The Integrated Target Commitment Planning and Control must also meet this requirement if it is to have a chance of being accepted in practice. The "effectiveness" to achieve the desired top target, such as the operating result, is only guaranteed if the area managers are willing to actually meet their basic target commitments in case of a basic Target Commitment Planning (or their area target commitments in case of an area Target Commitment Planning).

The requirement that the "accounting procedure" to be developed must influence the behavior of the employees is a central requirement for Hopwood, which repeatedly appears in his text. For example, he states, *"The most sophisticated budgetary system may be of little practical consequence if it fails to elicit the achievement motivations of a significant number of managers and employees"* (p.35).

This means for the Integrated Target Commitment Planning: The entire process will fail if the area manager do not accept the basic targets. Therefore, the concept of target com-

mitment functions was introduced as described, which is intended to ensure that the target commitments that the area managers seek do not depend on variables (such as employment) that they definitely cannot influence.

Anthony Hopwood also emphasizes repeatedly that a budgeting system to be developed should include the goal setting process as an essential element. His demand is "*budgeting is viewed as a goal setting process*" (p.40). This is exactly what is (computer-aided) practiced in the three steps of the planning triad of an Integrated Target Commitment Planning. For him, the "*bargaining process*" is the central element of a budgeting process.

Budgets can be used "*to motivate the members of the organization by serving as targets and mechanism for gaining involvement and commitment.... To this end, a budget provides a mean for measuring accomplishment against goals and for comparing actual with planned outcomes*" (p.44). He describes the conclusion of this "*bargaining process*" as follows:

"Although the final budget almost inevitably reflects a compromise between expected future performance and the outcome of a political bargaining process, once set they are frequently used as a means for motivating individual managers and employees. In this sense, the budget becomes a target intended to induce an active and possibly pressured organizational atmosphere which it is believed will result in higher levels of performance within the organisation" (p.57). All this is attempted to be implemented in the system of the Integrated Target Commitment Planning and Control.

Anthony Hopwood's message, which runs through the entire book, he sums it up as follows, "*Like architects, accountants must never regard human beings as unsolicited intrusions of their technical activities. It should not be forgotten that these technical activities have of themselves no meaning. Accounting systems must always be directed towards fulfilling the needs of the managers and employees who are striving to control complex but purposeful enterprises, and accordingly, their design and operation always needs sensitivity to the attitudes, needs and even passions of the human members of the enterprise*"(p.202). This should be a credo for every system developer.

However, Anthony Hopwood also raises a question that no one has asked before. It is the question, "*If budgets are used as targets, how does this effect there uses for other possibly more decision oriented purposes?*" (p.58). He thus points out that a clarification is required as to how the "*goal setting*", i.e., in the light of the Integrated Target Commitment Planning, the definition of the basic and also the top targets, agrees with "*decision making*" as a further planning procedure. Anthony Hopwood understands "*decision making*" as the choice of the "*most preferred action*" based on a "*choice criteria*", i.e., the established planning method of the (optimizing) decision theory.³⁸⁰ Anthony Hopwood considers the question of this connection to be a question "*of fundamental importance*" (p.58).

³⁸⁰ See: Hopwood, A. *Accounting and Human Behaviour*, op. cit., p. 124, Fig. 6.1 "The decision process".

This question is answered for the first time on a model-based way by the Integrated Target Commitment Planning. In principle, the basic targets in an Integrated Target Commitment Planning model could be traced back by disaggregation with hypothesis and definition equations to decision variables and uncontrollable basic parameters, and if this succeeds, then these (completely controllable) decision variables can be used in the sense of the decision theory to optimize the selected top target (e.g., the operating result).

At another place in this text, in which this link between decision theory and the basic targets of an Integrated Target Commitment Planning is dealt with in much more detail, the model of a pure Integrated Target Commitment Planning is, therefore, also referred to from the point of view of the optimization theory as an "optimization model as a "downwards truncated optimization model" (s.p.492).

The influencing of the top target of an Integrated Target Commitment Planning model by negotiating the basic targets with the areas is, as has been pointed out several times, seamlessly reconciled with a simultaneous optimization of the same top target.³⁸¹ This optimization consists in the fact that after determining the values of the basic parameters, the decision variables in the model are determined in such a way that the top target (normally a profit size) is maximized.³⁸² There is then the case of a mixed optimization basic Target Commitment Planning.

In the case of a pure target commitment planning, that is, a planning with basic targets but without decision variables, it could be possible as already mentioned, that for the next planning period a basic target or several basic targets are to be disaggregated by the model builder to certain decision variables. If this is possible, then the originally realized pure basic Target Commitment Planning must be replaced by a mixed optimization basic Target Commitment Planning. And if it should be possible to disaggregate all basic targets in the model to certain decision variables (and also uncontrollable basic parameters), then one arrives at the case of a pure optimizing planning in the sense of the decision theory. You can then save yourself the "goal setting" (or target setting) and goal (or target) commitment". However, such disaggregation will almost never be possible. And that is why "goal setting" and goal commitment is such an important planning procedure.

Over the years, I have read an enormous number of texts on company planning. However, no author of these texts has pointed out that it is necessary to clarify how the more or less clearly described procedure of "planning by target commitment" can be reconciled with the rules of decision making in the form of an optimization. Anthony Hopwood is, to my knowledge, the only one who recognized and described this as a problem. The mixed optimization basic Target Commitment Planning showed how this problem could be solved in a consistent manner.

³⁸¹ See pages 4, 413, 431 and 493.

³⁸² See page 45. For an example of a mixed optimization basic target commitment planning, see page 70. For the model of a mixed optimization basic Target Commitment Planning that was developed by disaggregating a basic target from an original model of a pure basic target commitment planning, see: Zwicker, E., *Integrated Target Commitment Planning and Control- a Process of a comprehensive Company Planning and Control*, op. cit., p. 41f., www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated).

Anthony Hopwood in Berlin. The Association of University Teachers of Business Administration always holds its annual conference after Whitsun. The 2008 conference took place in Berlin. As I studied the program, I realized Anthony Hopwood would give a lecture. I attended the conference, but I only took part in his lecture.

After the lecture, I approached him and we left the lecture hall together to talk to each other in the foyer. I asked him if he had noticed anything special in Berlin compared to other cities, and he replied that the many greens were impressive, Berlin was probably a rather green city.

Then I told him that there were more than 400,000 trees in the urban area of Berlin and as a result, for every kilometer of road in Berlin there were on average more than 80 trees that were systematically maintained. For this purpose, a small metal plate with a number is attached to each tree (he could check it himself) at the height of about three meters. Therefore, there would be a real "*tree management control system*" here. This communication astounded and amused him at the same time.

Therefore, we talked about all kinds of things. When I realized what an interesting conversation partner I had met, I asked him if he would like to come to Berlin again, I would like to invite him to a lecture.

He said that he had already undergone several chemotherapies and would probably not be able to come to Berlin again. This he said very friendly and calmly yes almost casually.

Into the silence that has entered, he told me that he had just come from Weimar. He liked Weimar very much. It reminded him of Stratford-upon-Avon in the atmosphere and architecture. The city was dominated by Goethe, just as Stratford-upon-Avon was influenced by Shakespeare. It seems that Goethe was a kind of universal genius.

I replied that Goethe had succeeded a lot, but not everything. He saw himself as a poet and a scientist. However, his attempt to replace Newton's theory of colors with an alternative theory has failed completely. Goethe's "Theory of Colors", with more than a thousand pages, is by far his most extensive work and he has worked on it almost all his life. However, it did not succeed.

He asked me what the Germans particularly liked about Goethe. I replied that I could only speak for myself. Goethe had written (besides Faust his most famous work) enchanting love poems, which unfortunately could not be translated into English in their entire effect.³⁸³

However, he wasn't just a dreamy enthusiast. Thus, his biographers are still wondering whether he had only a platonic or a broader relationship with the Freifrau von Stein, a noblewoman from Weimar to whom he dedicated hundreds of letters and poems. The question to the point is: "Did he or did he not". There is even a poem about this, and it reads

Freifrau von Stein
went to bed at nine
if Goethe did too
nobody knew

³⁸³ See the thirty-four variants that try to translate a verse from Goethe's Faust into English, page 547.

He laughed heartily at this and did not hold back his surprise that these rhymes had been formulated in English. He was very interested in Goethe, and he had found the right one with me.³⁸⁴ However, we also talked about England and Germany, and he told me about his interest in urban planning. We did not talk about management accounting, and that was right because it would only have broken off the stimulating conversation.

I offered to drive him back to his hotel. When we said goodbye, and I stood in the second row beside my car opposite the entrance of the "Swissôtel" in the Augsburger Straße and looked after him, he turned around again before he disappeared in the hotel entrance and waved to me friendly. Then I received (on 26.5.2008) an E-Mail from him, in which he told me "I really enjoyed meeting you". I replied that I enjoyed our meeting just as much and wished him all the best.

Kari Lukka's obituary in the journal "Accounting, Organizations and Society" told me that he died on May 8, 2010. We only talked for about an hour, but for me, it was already clear that I had met a man with a sense of humor, education and cultivated manners. That is how I always imagined a gentleman. And I'm sure my impressions didn't mislead me.

³⁸⁴ On Goethe, see also page 543.

18. Little's Decision Calculus Modeling in the light of the Integrated Target Commitment Planning

After studying the English language literature on "*management accounting*" and "*management control*", I realized (s.p.8) that only publications dealing with "*financial planning models*" and "*company planning models*" could be useful for the development of a model-based planning and control system. This is because they move on the level of equation models. As further reported, I liked the model of Welsch best, and I decided to reconstruct the example described in the form of tableaux with my equation generator as an equation model.³⁸⁵

However, one area was still open, and that was the IT aspect of the entire project, i.e., the study of concepts and principles, which are useful for the implementation of company models by using an IT system. After reading the texts of the leading experts in this discipline, I found that the most important ones worked at the MIT-Sloan School. Talking to them about certain theses of their texts would, in my opinion, be an enrichment. However, it would be an even greater enrichment for me if I were able to present the concept of the Integrated Target Commitment Planning to them and learn their opinion about it. In Germany, there was no one better suited for this. However, I didn't get much hope for a conversation.

At MIT, there were two groups of scientists being suitable for such a meeting. The first group included the System Dynamics people and the second group consisted of the representatives of a direction whose goal was to develop so-called decision support systems. I have already reported on my discussions with Forrester and Meadows as the representatives of the System Dynamics concept (s.p.16 and 20).

The two decision support representatives at Sloan School who interested me were John D.C. Little and Michael Scott Morton. I will report on my meeting with Michael Scott Morton elsewhere (s.p.528).

In the following, I will deal with John D. C. Little.

John. D. C. Little. In 1970, John D.C. Little published an article entitled: *Models and Managers: The Concept of a Decision Calculus*.³⁸⁶ This was the contribution that drew my attention to Little because it dealt with exactly the topic that interested me. Little develops a methodical concept for the computer-aided development and application of models that managers should use for company planning. He called them "*managerial models*". The development of *managerial models* and their application in the context of planning was exactly the topic I was also concerned with.

In his contribution, which triggered a strong echo (s.p.283) in the entire operations research community, Little formulates six requirements for the development of such *managerial models*.

³⁸⁵ Welsch's representation could be described as a set of Excel tables whose number relationship can be recognized from the tables, but for which the underpinning of the formula is missing.

³⁸⁶ Little, John D.C., *Models and Managers: The Concept of a Decision Calculus*. In: Management Science, 16.8 (1970) B-466.

I will describe these requirements in the following as a first step and assess them in the light of the Integrated Target Commitment Planning (p. 226-240). Little calls the modelling concept described on the basis of these requirements as Decision Calculus Concept. Therefore, this chapter also has the title: "*Littles Decision Calculus Modelling in the Light of the Integrated Target Commitment Planning*".

However, Little does not stop at his six requirements. Rather, he develops two models that are intended to fulfil his six demands for the development of models (the *managerial models*) in the sense of his Decision Calculus Concept. From the way Little develops the hypothesis equations in these two models, I think having discovered a new heuristic method for developing hypothesis equations, which I call "Little's permission" (to proceed in a certain way).

In a second step (p. 240-244) called "*Littles Hypothesis Generation Procedure*" the logic of this procedure (called "Littles Permission") is worked out. This is to create the conditions for a better understanding of its application by Little in the development of the hypothesis equations in his GROOVY and BRANDAID models.

Afterwards, the two models (GROOVY and BRANDAID) developed by Little for planning sales quantities in companies are analyzed in detail in a third step (p. 244-272).

Then in a fourth step another sales-quantity-model is described (p. 273-282) and critically analysed. This model was developed by Sönke Albers, one of the "followers" of Little's modelling approach, and was called the SONAL model by him.

Afterwards in a fifth step (p. 283-289) a meeting with John D. C. Little at MIT is reported, in which I talked to him about his approach.

Justification for the unusual length of this text. The following text, in which Little's approach is described and critically analyzed (p. 224-305), is extremely extensive with over 80 pages. The reason for this is that it is not intended to serve the sole purpose of assessing Littles *Decision Calculus modelling* in the light of the Integrated Target Commitment Planning and thus possibly also to gain constructive suggestions for its further development.

As someone who is interested in methodological questions concerning the development of equation models, I believe I have recognized that Little, in the context of the development of his two *managerial models*, practices a procedure (not explicitly characterized by him) which consists in using so-called *non-observation hypothesis equations* to obtain the hypothesis equations of the sales quantities. This procedure is called Little's permission (to use non-observation hypotheses in *managerial planning models*). In my view, this is a new and debatable procedure for obtaining hypothesis equations that a manager can use to plan the sales quantity of an article for which he is "responsible". ³⁸⁷

³⁸⁷ The terms "*sales-quantity hypothesis equation*" or also "*price-sales-quantity hypothesis equation*", which are used 81 times in the following, seem to be over precise. They could also be described more briefly as a "*sales quantity function*", "*sales quantity equation*", "*price-sales function*" or "*sales quantity hypothesis*". However, the long name is used to make it clear that these are empirically verifiable

I was tempted to elaborate and comment on this procedure in more detail, because it can be seen as a novel heuristic procedure for generating not only the hypothesis equations of sales quantities but any hypothesis equations.

Little's Decision Calculus approach is still regarded by many experts as a breakthrough in the development of models in the field of corporate planning. There are no critical comments on its concept.

In contrast, the following discussion of Little's Decision Calculus Concept comes to an extremely critical conclusion. Since Little's approach is still euphorically praised to this day by many authors, and since he was awarded the highest honors for his work (s.p. 283, 289), it seemed appropriate to me to explain my criticism in detail and to deal with it completely in this text. Therefore, as is the case with almost all other topics dealt with in this text (such as activity-based costing or the balanced scorecard), it will not be briefly outlined and then referred to the more detailed treatment available online.

Little's observations are also considered from the perspective of whether it is possible to integrate the structural equations of the two models he developed (GROOVY and BRANDAID) into the configuration system of the Integrated Target Commitment Planning. This is because both models claim to provide sales quantity hypotheses that should be applicable to many companies in the context of a parametric adjustment of their structural equations. It would therefore make sense to include these structural equations for planning sales quantities in the configuration system of Integrated Target Commitment Planning. However, as will be shown, this does not make sense.

This does not end however the consideration. In a sixth step (p. 289-305), a contribution by Hermann Simon on the use of sales-quantity-models is considered, especially with regard to the question of how sales quantity planning could be carried out in a cost-performance model of the Integrated Target Commitment Planning. The result is that Simon has convinced me that the structural equation of a simple sales-quantity-model should be included in the configuration system of the Integrated Target Commitment Planning.

- **Little's requirements for the development of Decision Calculus models in the light of the Integrated Target Commitment Planning**

A special feature of Little's text should be pointed out immediately. Little formulates his six requirements for the development and application of arbitrary *managerial models*, i.e., for models used by managers in a company, but he demonstrates these requirements in his text exclusively on the basis of the so-called "*sales response models*" mentioned above, called GROOVY and BRANDAID.

A sales response model is a model whose hypothesis and definition equations serve to determine the sales quantity of an article. It is also referred to as a "*marketing-mix mod-*

el", because such a model is intended to describe the sales quantity of an article as a function of certain action variables, such as the sales price or advertising costs, i.e., a "mix" of action variables to perform a sales planning. Sales response models or marketing-mix models are from now on referred to as sales-quantity-models.

The simplest case is a one-equation model in the form of a sales-quantity hypothesis equation such as a linear price-sales-quantity hypothesis equation. However, Little's models consist of several equations. His contribution has led other authors to develop also such Decision Calculus models. Almost all are variants of these models are sales response model (or sales-quantity-models). With regard to the scope of an application, Little's "*Decision Calculus modeling*" is, therefore, a "*Decision Calculus modeling of sales response models*". A text that acknowledges his contribution says in this sense: Little "*demonstrated the relevance of the decision calculus by applying it to the complex problem of selecting the entire marketing mix*".³⁸⁸

To develop such *Decision Calculus models* Little propagates a concept of so-called "*mental modeling*", which is also interesting from a scientific-theoretical point of view, because it deals with the question, according to which principles one may or should also develop planning models. The maxims of this concept, which require that a manager wants to use such a *mental model* for his planning, should consequently apply to all managers who want to use planning models in a company. Therefore, Little's maxims apply not only to sales-quantity-models, i.e., the models used by Little alone as application examples but also for the formulation of a cost-performance model of the Integrated Target Commitment Planning.

In standard cost-performance models of an Integrated Target Commitment Planning, no sales-quantity hypothesis equations are used. In these models only the so-called singular price-sales-quantity commitment is practiced, i.e., on the (business) basis of a specified sales price, the sales manager undertakes not to fall below a certain amount of the sales quantity. However, planning using a sales-quantity hypothesis equation has already been dealt with in the frame of an Integrated Target Commitment Planning.

Such a sales-quantity hypothesis equation in the form of a linear price-sales-quantity hypothesis equation contains, for example, a variant of the furniture model described on page 39. It is described in another text.³⁸⁹ The planning of this modified model led to a mixed optimization Integrated Target Commitment Planning. The optimization was achieved by using the sales price in the sales-quantity hypothesis equation as a decision variable to maximize the operating result.

In principle, it can be regarded as a progress if sales-quantity hypothesis equations are used in cost-performance models instead of simple singular price-sales-quantity commit-

³⁸⁸ Hauser, John R., Urban, Glen L., Ed. *From Little's Law to Marketing Science: Essays in Honor of John DC Little*, MIT Press, 2016, p. 11.

³⁸⁹ See: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 43f. www.Inzpla.de/IN_37-2008c.pdf. (Text in German, title translated).

ments as they are consistently practiced today. However, according to Little's Decision Calculus Concept, the managers responsible for the planning must accept such sales-quantity hypothesis equations.

In the light of the Integrated Target Commitment Planning, this means that an agreement must be reached between the sales manager and the corporate management (represented by the controlling department) to use certain sales-quantity hypothesis equations as target commitment functions or only as uncontrollable hypothesis equations for the upcoming planning.

The question, therefore, arises whether the requirements propagated by Little for the development of *managerial models* cannot also be used for the development of sales-quantity-models as sub-models of a plan cost-performance model of the Integrated Target Commitment Planning. Little's six requirements that a Decision Calculus model should meet are now considered in the light of the Integrated Target Commitment Planning.

1. Requirement: use simple models.

This requirement can hardly be rejected. However, the question that arises is whether the models and procedures used in the Integrated Target Commitment Planning are "simple". How I have tried to meet the requirement for simplicity was discussed extensively elsewhere (s.p.146). The question is whether Little can contribute anything helpful to his proposal. His requirement, *"Important phenomena should be put in the model and unimportant ones left out"* is to be described as superfluous in view of the fact that he does not concretize it further. Whom does such a requirement help?

It would have been more desirable to describe a procedure with which "simple models" can be generated. However, that does pose a problem, because the "simplicity of a model" is not so "simple" to judge. Is the number of equations or the number of parameters a criterion for its simplicity? Or can the "link intensity" described by the structural matrix of a model be used judge the simplicity of a model? ³⁹⁰ Or should the structure of the equations (e.g., linear or non-linear) be such a criterion?

The "simplest" way to simplify an originally formulated model is to remove certain relationships recognized as "irrelevant" from the model. However, what is the criterion for "irrelevant relationships"?

To this end, reference is made to the procedure proposed by Karl Deutsch (s.p.539) to "simplify" an originally developed model by first determining which target variable the model should have. And on this basis, Deutsch believes that sensitivity analyses should be used to determine these endogenous variables that have the least influence on this target variable. These variables should then be removed from the model.

³⁹⁰ On the intensity of a relationship between the variables of a model see: Zwicker, E., *The Kilger Model - Structure and Configuration and its Connection with a CRFI Model in the Context of a two-stage Comprehensive Company Planning*, Berlin 2003, www.lnzpla.de/IN25-2003c.pdf. (Text in German, title translated).

I do not consider (s.p.542) this approach to be very promising and it is unclear too, but it is at least a simplification strategy and is not limited to the obvious demand to develop simple models.

The configuration system of the Integrated Target Commitment Planning is based on a simplification, which serves also as the basis of the flexible plan cost accounting system. It is assumed that the cost hypotheses used (cost functions) and also the consumption quantity hypotheses of a production area are linear functions of their employment.³⁹¹

This assumption is hardly acceptable if we look at the course of costs and consumption quantities with regard to an employment of a production area from zero to the limit of its capacity. The Integrated Target Commitment Planning and the flexible plan cost accounting, therefore, assume that the planning alternatives in question and the actual values realized are within a range (the commitment or forecast range) for which linearity can be assumed.

If a potential opponent were to object that this would be a "terrible simplification", then the answer is that the flexible plan cost accounting is used in thousands of companies that work with this assumption and are obviously satisfied with it. And the satisfied actors in this planning are the managers for whom Little wants to develop his *managerial models*. In addition to the simplicity of a model, which could be judged by its structure and thus, for example, by the number of its variables or their connection, it is also possible to use the "simplicity of its manageability" as a criterion of simplicity. This too is a criterion for the acceptance of a model by a manager.

Forrester's level-rate interpretation of empirical relationships (s.p.13) is a good example of this. It allows these relationships to be clearly represented using systems dynamics diagrams. The order quantity-price interpretation of model relationships between reference objects (s.p.24) practiced within the framework of INZPLA cost-performance models is also a method that leads to a clearer presentation of the model relationships.

A cost-performance model of the Integrated Target Commitment Planning is always described by a system of model tableaux that are linked to one another and lead to the "target quantity", namely the operating result (s.p.24). In my opinion, this model tableau system, which in principle is applicable for every company, represents the medium with which a large cost-performance model can be described in a clear manner. Without this model tableau system, the procedure of an Integrated Target Commitment Planning would not have been applicable in practice, i.e., it would not have been reasonable for a manager.

The links between the model tableaux are particularly easy to understand due to the order quantity-price interpretation of the relationships between them. In addition, the target commitment functions described in the model tableaux and also the hypothesis equations with uncontrollable basic parameters (such as the exchange rate hypothesis) are always linear with only one explanatory variable and at the highest two hypothesis parameters.

³⁹¹ See the cost element tableau in Fig. 2 on page 33 and the equations of the cost hypotheses listed there.

Little also demands that models should only be as detailed as "*the users demonstrate they are ready to assimilate it.*" However, it also applies, as is the case with the INZPLA tableau system that his models must have a certain degree of detail because in order to use his way of speaking, otherwise, no "*controlled variables*" can be explicated and these are needed by him for planning.

An "assimilation by the user" is achieved in Forrester System Dynamics models with the level-rate diagrams and in the INZPLA-System with the model tableaus in that a manager has a better overview of the interrelationships. Little, however, does not describe such an "*assimilation tool*" for his "*managerial models*".³⁹²

The willingness "to assimilate" a model, therefore, does not refer, as Little probably means, to the fact that the "user", i.e., the "manager" must understand and, therefore, accept all equations of the model.

Little can probably demand a marketing managers "assimilation" of his GROOVY model consisting of seven equations if this manager uses it only for himself (as a stand-alone model). With regard to the application of a comprehensive company planning models, in which sometimes hundreds of users (managers) are involved, such a requirement does not apply.

In the light of the Integrated Target Commitment Planning, Little's users or managers are the area managers and the corporate management. The *managerial model* of the area managers is a sub-model of the total model, namely their area model. For example, the furniture model contained four area models (s.p.49), namely the area models for assembly, woodworking, upholstery, and sales.

However, what about the other "user" of an INZPLA-model, i.e., the corporate management? Corporate management could also study the relationships between the model tableaus of the total model in order to understand them. However, this is completely utopian. How should the corporate management of Thyssen-Krupp Steel understand a model in detail (*assimilate*) consisting of 40,093 interlinked model tableaus in the 2009/2010 planning year? The "*assimilation*" of a model, as Little demands, therefore, does not apply to an INZPLA-model.

2. Requirement "Robustness"

Little comments: "*Here I mean that a user should find it difficult to make the model give bad answers. This can be done by a structure that inherently constrains answers to a meaningful range of values.*" This is an abundantly superfluous statement. Each hypothesis equation has a range of values, in which its explained variable (inherently) has certain values and thus provides an "answer" in the form of these values.

If this were not the case, no alternative forecasts could be made. In this range, the explained variable should provide acceptable forecast values. If a linear hypothesis such as a cost function with the employment as an explanatory variable does not achieve this, then it may be necessary to use a non-linear hypothesis.

Since Little only has his sales-quantity hypothesis equations in mind, this point is based

³⁹² The phrase "*assimilation tool*" does not originate from Little.

on the fact that the growth rate of the sales quantity decreases with the increasing use of resources in the form of advertising costs or sales promotion costs. Little takes this into account by using concave or s-shaped hypotheses in his GROOVY model (s.p.245). As mentioned above, only linear hypothesis equations are used in the standard cost-performance models of the Integrated Target Commitment Planning. “*Bad answers*” are thereby avoided by limiting the alternative range of variables that explain the hypotheses. It is, therefore, not an *inherently*, but a *none inherently* constraint. If the hypothesis equation is also a target commitment function, then the permissible alternative range of the explanatory variables corresponds to the commitment range of the area manager.

3. Requirement: “Ease to control.”

Little marks the property “*ease to control*” as follows: “A user should be able to make the model behave the way he wants it to”. In my view, that is a rather unfortunate formulation. It reminds of the possibility I described of changing the parameters of a dynamic model with a curve fitting procedure in such a way that the desired time course is achieved (s.p.19).

Little then concretizes his Ease-to-Control requirement in more detail: If no “*objective accuracy* (what is that?) is attainable”, to specify a hypothesis then “*the manager should be left in control*”. However, what kind of “*control*” is he supposed to have? Only one sentence gives an answer, and that reads, “*Thus, the goal of parameterization is to represent the operation as the manager sees it.*”

Little obviously means nothing other than that a manager should determine the parameter values of a hypothesis equation for which there is no “*objective accuracy*” and whose values he should, therefore, determine within the framework of the development of a planning model as he “*sees it.*” Little speaks only of a determination of the parameter values by a manager and not of the choice of the structure hypothesis on which this determination is based. Who is to determine them remains an open question.³⁹³

His demand for “*ease to control*” is rather unclear. What exactly is to be “controlled” here? This formulation should better be replaced by the requirement “use of judgmental parameter estimation”. It states that a manager should determine the parameters values of the hypothesis equations of his “*managerial model*” by subjective estimates (“*parameter setting by judgment*”) if no “*objective accuracy is attainable*”³⁹⁴

This indication implies the claim that there are situations in which hypothesis parameters can be determined with an “*objective accuracy*”. Such a formulation is somewhat strange, because “*objective accuracy*” is an empty concept. Even if the parameter values of a hypothesis equation are not subjectively estimated by a person, but are determined with the help of econometric estimation procedures, one cannot speak of “*objective accuracy*”. Little also associates this concept with an assertion of fact by stating; “*Wherever objective accuracy is attainable, I feel confident that the vast majority of managers will*

³⁹³ The numerical determination of the model parameters of a hypothesis equation is also referred to as “*calibration*”

³⁹⁴ That's a reformulated quote. Little speaks of “*parameters were set by judgment*”

seize it eagerly". Should this mean that a manager, if he has access to "*objective accurate*" parameter values of a hypothesis equation, will forgo a subjective estimation of the hypothesis parameters out of his own conviction. In this case, he would follow a methodological imperative of his own accord.

Does Little really believe that there are "objectively accurate" parameter values in the hypotheses of his quantitative sales hypotheses? This is probably not the case. What did he mean by this formulation?

Little can only mean something else with his objectively accurate parameter values, namely parameter values that are not falsified by the special interests of the manager. However, even with this interpretation difficulties are occurring. After all, how can one distinguish between falsified and not falsified parameter values? Contrary to Little's assumption, in my opinion, one may well assume that a manager (area manager) falsifies certain hypothesis parameters, the value of which he has to determine within the framework of a planning procedure, in a way that is favorable to him.

The Integrated Target Commitment Planning can be regarded as a procedure whose primary objective is to determine parameter values of hypothesis equations, which can be influenced by an area manager in a sense, which is favorable for him and unfavorable for the company. This determination is realized by a negotiation between this area manager and the corporate management and leads to binding specifications of these parameters. And these parameters are the basic targets of the areas. In the concept of the Integrated Target Commitment Planning, among the model parameters, only these basic targets will determine the burden on the area manager (s.p.321), and he is, therefore, basically only interested in influencing them (falsifying them?) in the sense of reducing his burden.

Little's demand that a manager should make "*judgmental estimates*" of the hypothesis equation of his *managerial model* should now be considered in the light of the Integrated Target Commitment Planning. The question arises which parameters in the hypothesis system of an Integrated Target Commitment Planning are among the parameters that can be considered for such a "*judgmental parameter estimation*". In an INZPLA-model, such a subjective estimation of the hypothesis parameters propagated by Little according to the ideas of a manager (here the area manager or the corporate management) is not acceptable as a procedure which applies to all hypothesis parameters. Rather, there are exact rules and procedures that lead to the determination of the final plan values of the different types of hypothesis parameters in an INZPLA-model.

In such a model, four types of hypothesis parameters can be distinguished (s.p.30).

1. Decision variables. They occur in the case of the price-sales-quantity hypothesis equation

$$SQ = P_1 - P_2 \cdot SP$$

Here, the sales price (SP) is a decision variable that is used in a cost-performance model to maximize the operating result.³⁹⁵

³⁹⁵ See such an application in the context of the furniture model in: Zwicker, E., *Integrated Target Com-*

2. Uncontrollable basic parameters (or uncontrollable model parameters)

As an example of a hypothesis equation, which contains an uncontrollable basic parameter, the following equation should be cited

$$EP = PCO \cdot PQ$$

Here, the employment of a production area (EP) is determined by multiplying the production coefficient (PCO) of an article to be produced exclusively there by its production quantity (PQ). If the production coefficient (PCO) is assumed to be uncontrollable, it gets the status of an uncontrollable basic parameter.

3. Basic targets

The basic targets are the hypothesis parameters of a target commitment functions. An example is the cost target commitment function:

$$CO = FC + VUC \cdot EP$$

Here employment (EP) is an endogenous variable, while the parameters fixed cost (FC) and variable unit costs (VUC) serve as basic targets.

4. Decision parameters

Decision parameters are hypothesis parameters of decision rules. An example from the sales area is the decision rule of a procyclical advertising policy, in which the advertising costs (AC) are defined as a relative proportion (RAS) of the planned value based sales (SV). This leads to the following decision rule

$$AC = RAS \cdot SV$$

where RAS is a decision parameter that could have been determined by the corporate management.

The question arises which of the methods prescribed by the Integrated Target Commitment Planning for determining the numerical values of these four types of hypothesis parameters correspond to Little's subjective parameter estimation method (*"as the manager sees it"*) of the numerical values. It should be noted that Little does not distinguish between certain types of hypothesis parameters in his text. For him, there is only the general type of a hypothesis parameter.

Within the framework of the Integrated Target Commitment Planning, the values of the basic targets are never determined based on the subjective estimate of a manager but are determined by a negotiation procedure. This does not solve the problem of a possible "falsification" of the parameter values in the sense of the interests of an area manager described by Little in a rather covert way but tries to solve it at least in a certain way.

The decision parameters occurring in certain decision rules (such as RAS in the above example) are also not subjectively estimated by a manager. Rather, the value of a decision parameter is determined by a decision of the corporate management, before the start of the three planning steps and can as a completely controllable variable be realized without difficulties (s.p.29).

The decision variables as another kind of model parameters are also not determined by the subjective estimation of a manager. Rather, it makes sense to carry out an optimization with them.³⁹⁶

From the point of view of the Integrated Target Commitment Planning, the model parameters to be determined by Little's procedure of "*parameters setting by judgment*" can only be the estimates of the values of the uncontrollable model parameters (uncontrollable basic parameters) of an INZPLA-model.

This determination of the values of these hypothesis parameters by a manager is, according to Little's conception, to be carried out using certain computer-supported, user-friendly parameter estimation procedures (*judgmental calibration mechanisms*). Such a method developed by Little to determine the parameter values of the so-called ADBUDG hypothesis equation will be described later (s.p.245).

The question is, therefore, whether the uncontrollable parameters in an INZPLA-model should be determined according to Little's suggestions using such a "*judgmental calibration mechanism*".

The numerical specification of the uncontrollable basic parameters is carried out as described as a substep of the bottom-up planning by a "responsible estimator". The estimation of the values of the uncontrollable basic parameters is quite simple because in a standard cost-performance model only linear hypothesis equations occur. A special procedure for the user-friendly determination of the values of the uncontrollable basic parameters (uncontrollable hypothesis parameters) in these hypothesis equations is that the "estimator" enters two coordinate points into a coordinate system on the screen, whereupon the "*calibration mechanisms*" calculates the two-parameter values of the linear hypothesis equation.³⁹⁷

Within the framework of the Integrated Target Commitment Planning, however, the estimation of the values of the uncontrollable basic parameters does not stop there. In contrast to Little, the estimation is followed by a further step in which the uncontrollable basic parameters play a role. Thus, the forecast-actual variance of an uncontrollable basic parameter in question is determined within the framework of the control following the planning. This variance is used to assess the "estimation competence" of the estimator (s.p.29).

Furthermore, an explorative variance analysis carried out after the end of the planning

³⁹⁶ With regard to the optimization of the decision variables occurring in his decision-calculus models, Little refrains from such an optimization and this can only be described as extremely strange, see page 286.

³⁹⁷ See page 300 and Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 129. www.Inzpla.de/IN06-2000a.pdf (Text in German, title translated).

process can determine the full and partial contribution of the variance of an uncontrollable basic parameter to the planned-actual variance of the operating result.³⁹⁸

Overall, it can be said that everything argued by Little with regard to the demand for "ease of control" should be regarded as irrelevant from the point of view of the Integrated Target Commitment Planning. In contrast, within the framework of the Integrated Target Commitment Planning, an established procedure is used to determine the parameter values of the individual types of model parameters. The negotiation of the values of the basic targets between the corporate management and the areas, which comprises three planning steps, is not only the most sophisticated but also the most important procedure of the entire planning process.

4. Requirement: Adaptive models

Little remarks, *"adaptive means that the model can be adjusted as new information is acquired."* And further; *"The model should be capable of being updated as new information becomes available. This is especially true of the parameters but to some extent of structure too"*.

Such a requirement would have been fulfilled if Little had developed a model configuration system for sales-quantity-models, as in the INZPLA-System for cost-performance models, in which both the parameters and the structure of the equations can be changed "comfortably". With the few equations, Little uses for his models to forecast the sales quantity of an article, such an extension of the existing INZPLA-model configuration system and also the numerical parameter specification would be a trifle.

To my knowledge, however, such a configuration system was not implemented by Little or by those who had followed his *"guidelines for building models for managers"* (Little). At least nothing about it can be found in the literature. In the INZPLA-System, such an "updating" of "new information" takes place in different ways.

First: During the three planning steps, new parameter values of the basic targets are continuously entered into the model, and the model variables are then calculated with these values. This means that you are always up to date with the latest planning status. During the planning procedure, the area models with which the area managers carry out their area Target Commitment Planning receive new information on the (automatic) change of the model parameters of the area model. This is always the case when the demand for their services (for intermediate or finished products) and also the transfer prices of their intermediate products required for the provision of services change (s.p.53).

Second: As part of the *"up-to-the year-forecasts"* following an annual planning, the monthly parameter values of the original planning model for the remaining planning period are continuously (e.g., monthly) determined by "latest estimates" of the "estimators" responsible for each of these parameters.

Furthermore, it must also be possible to change the structure of the last estimation model, which was at the beginning of the planning year structurally identical with the planning

³⁹⁸ This is realized with the so-called RR-Min variance analysis, see page 103. For a detailed discussion, see: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, Berlin 2007, p. 128f. www.Inzpla.de/IN34-2007.pdf.

model. For this purpose, a model configuration system must be available with which the required structural changes to the monthly models of the original annual planning model consisting of twelve monthly models can be implemented with as little effort as possible. This is with large models, more complicated than it sounds because new production facilities are often set up and old ones are dissolved, which also changes the original production flow. Furthermore, new products can be added, and "old" products (still included in the annual plan) can be removed, etc. (s.p.354). If the "last estimate" did not forecast a realistic operating result for the remaining planning period, the entire planning procedure would be obsolete.

5. Requirement: Completeness on important issues

Little notes at the beginning, *"completeness is in conflict with simplicity. Structures must be found that can handle many phenomena without bogging down."* This sentence, which concerns the conflict between *completeness* and *simplicity*, should best be deleted because there is no criterion for the completeness of a model. If you compare them with reality, models are always "incomplete".

With the text following the *"must-be-found"* assertion Little narrows his reflections on *"completeness"* down to an *"aid"* for achieving *"completeness"*. And this aid to achieve completeness will then only be pursued further by him. His advice on how to achieve completeness is; *"An important aid to completeness is the incorporation of subjective judgments."* His fifth demand should, therefore, have been better, "A manager should use subjective model parameters for the hypothesis equations of his model."

Little expresses this demand, however, as follows, if the generation of a *"totally empirical model"* (what is that?) is not possible, then the conclusion is that a *"model with subjective estimates may often be a good deal tougher because it is more complete and conforms more realistically to the world."*

Here Little formulates, but rather covertly, an important demand in my opinion, which states that a manager may or should formulate hypothesis equations in his area, in which also endogenous variables occur, which are not measurable. This demand is somewhat hidden in the following sentence: *"subjective estimates will be valuable for quantities that are currently difficult to measure."*

In a later statement (2004) on his *"guidelines"*, it becomes clear that he considers this "permission" to make subjective parameter estimates to be his most important recommendation. He sees this recommendation above all as a *"liberation"* from the previously valid maxim that the values of the parameters of hypothesis equations can only be determined by econometric methods. In this review (2004) he explains: *"One prominent liberation (of his "guidelines" E.Z.) was the potential acceptance of judgmentally estimated parameters when other data were not available."*³⁹⁹

However looking at his approach to modeling the GROOVY and BRANDAID models, he allows not only *"the acceptance of judgmentally estimated parameters"* but also of non-observation hypothesis equations, i.e., of hypothesis equations with unobservable explanatory and also unobservable explained variables. And this is the only novelty of his concept.

³⁹⁹ Little, John D.C., *Models and Managers: The Concept of a Decision Calculus. Managerial Models for Practice. In: Management Science*, 2004, 50, No. 12 supplement, p. 1855.

Primacy of an econometric parameter determination

The formulation "*not available*" reveals a maxim for the determination of model parameters in hypothesis equations, which is called as primacy of an econometric parameter determination. This is a priority claim with regard to the procedure to be carried out for the determination (*calibration*) of parameter values in equation models of companies, which I strictly reject. This shall be justified in the following.

Little speaks of the fact that a subjective determination of the parameter values of a hypothesis equation should only be carried out if no "*totally empirical model*" can be developed. The already mentioned unclear formulation that a subjective estimation of the model parameters should only be carried out if no "*objective accuracy is attainable*" goes in the same direction. Even more explicit (see above) is the recommendation (*guideline*) of an "*acceptance of judgmentally estimated parameters when other data were not available*". The question arises as to which "*other data*" of a parameter estimate must be "*available*" so that a "*judgmentally estimate(d)*" of hypothesis parameters is not necessary. Obviously Little has a reservation against an unrestricted subjective estimation of the model parameters.

The parameters in hypothesis equations such as the parameters P_1 and P_2 of the price-sales-quantity hypothesis equation (87) are variables whose numerical values are not known for an upcoming planning year. One can only try to estimate the future values of these two parameters with the help of certain procedures (e.g., the least squares estimation) based on the observed values of their explained variables (the actual sales quantities) and the explanatory variables (the actual prices) of the past periods.

If Little now assumes the case that "*other data were not available*", it wonders what kind of data these are if they would have been available and the question arises in which way the parameters of hypothesis equations should be determined with these "now available" data. In my opinion, this can only be the determination of model parameters according to an econometric estimation procedure, i.e., using observational data from the past. If this were the case, then an econometric method for determining the numerical values of the model parameters of a *managerial model* would be preferable to the use of "*judgmentally estimated parameters*". I think this view is fundamentally wrong.

However, it is not evident whether Little is advocating a priority of econometric estimation techniques over the determination of judgmentally estimated parameters, because he does not make a precise statement about it. In any case, the question remains as to what is meant by the "*available data*", which should be used in preference to determining the values of the hypothesis parameters and, therefore, are preferable to a subjective estimate of the parameter values? It remains unclear what Little actually wants.

The determination of the parameters of a hypothesis equation using econometric estimation methods is a method of parameter determination. However, relying on this method alone would be highly absurd. The econometricians have already recognized this. There is practically no macroeconomic model that has not been "fine-tuned" by its model de-

velopers after estimating its parameters.⁴⁰⁰

The model developers simulate the model for the intended forecast periods, and when they discover that "absurd forecast values" result, some of the parameter values are "trimmed down" in such a way that "reasonable forecast values" are achieved. The changed parameter values can be described as "*judgmentally revised parameters*" in Little's language. Therefore, in my opinion, the primacy of subjective-mental parameter determination is valid when determining the model parameters of the hypothesis equations in *managerial models*.

It cannot be excluded that a manager who is responsible as "estimator" for the parameter values of his *managerial model* may, if possible, have these determined by an econometric estimation. However, these values serve at most as a source of information. Elsewhere I have described the case where an estimator is responsible for estimating the US-€ exchange rate for the coming plan year. It is a simple proportional hypothesis in which the exchange rate is the single model parameter. On the basis of the development of the US-€ exchange rate, it was shown there that the person responsible for estimating would have been ill-advised to determine the exchange rate for the coming planning year on the basis of a least squares estimate (s.p.411).

Rather, taking into account all the information at its disposal on future economic development, he will estimate a value, which he "subjectively" considers "most likely". His exchange rate hypothesis is, therefore, a hypothesis with a "*judgmentally estimated parameter*". In my opinion, this should always be used to determine the parameter values of a *managerial model*, i.e., a model in which a "manager" has the estimation responsibility for the model parameters occurring in it. Therefore, the primacy of a subjective-mental parameter determination and by no means the primacy of an econometric parameter determination applies to all *managerial models* and thus also to every INZPLA-model.

It should be noted again that in an INZPLA-model the primacy of a subjective-mental parameter determination only applies for hypotheses with uncontrollable parameters. As already explained, the parameter values of the target commitment functions (= target commitment hypotheses) and decision rules are determined entirely differently.

Lodish, whose CALLPLAN model is one of the best-known and most frequently cited examples for the application of the Decision Calculus Concept in the field of sales force planning, has implemented a number of planning models in practice during his active time as a university lecturer. At the end of his career, he published an article, which is a kind of summary of his professional activities. There he notices:

"In 30+ years of building and parameterizing models and attempting to help managers use the models to make productive decisions, I've learned some lessons." The most important insight he gained is: "Models that will be used to improve productivity often rely on subjective estimates, regardless. Even if the data is perfect for estimating model pa-

⁴⁰⁰ See Boumans, Marcel, *How economists model the world into numbers*. Routl., 2004, p. 49

rameters, such estimates may still not be good enough. The reason is simple. Managers use decision models to help them determine what to do in the future. The best empirical data can do this help to describe what happened in the past. For the dynamic, fast-changing markets in which most marketing companies operate, that may not be good enough." ⁴⁰¹

The primacy of econometric parameter determination is, therefore, untenable if one wants to develop hypothesis equations that are used for planning and for whose parameters a manager is "responsible".

Little's (*liberating*) "guidelines" also include, as mentioned, a "permission" that a manager may use quantities in hypothesis equations "that are currently difficult to measure", but may nevertheless be used by him as non-observation variables in this hypothesis equations.

This permission to use non-observation variables in a hypothesis equation, which are not model parameters but act as explanatory and also explained variables, is quite a provocation from a scientific theory point of view. The use of such "non-observation hypothesis equations" is strictly rejected within the framework of contemporary theories of science. However, in my opinion, *Little's permission* to use such non-observation hypothesis equations is not to be rejected in principle. Their use can be interpreted as a procedural provision that can possibly lead to empirically verifiable (falsifiable) hypothesis equations.

To show this, some preliminary remarks on the identification of empirical hypotheses are necessary and also a justification why *Little's permission* to work with non-observation hypothesis equations can be interpreted as a method of obtaining empirically verifiable hypothesis equations. The considerations in this regard are dealt with in the following section.

6. Requirement: Easy to communicate with

Little demands: "The manager should be able to change inputs easily and obtain outputs quickly." He describes this requirement even more precisely: "It must be easy to put data into the computer, easy to find out what is in there, easy to change it, easy to make output runs, easy to search over control variables and make sensitivity analyses".

"Easy to put data" are in Little's sales-quantity-models the model parameters of the hypothesis equations. In his sales-quantity-model, named GROOVY, these are fifteen model parameters (s.p.252).

At the time of Little's publication, it was reasonable to point out the flexible change of model parameters. The first (IBM) PC, with which a manager could carry out such a planning and thus a change of the parameters of his model without using a decentralized data station with access to a mainframe computer, was only available from 1981. The spreadsheet Lotus 1-2-3 as a forerunner of Excel, which allows such modeling and parameter changes without difficulties at least for Little's seven-equation model GROOVY

⁴⁰¹ Lodish, L. M., *Building Marketing Models that make Money*. In: Interfaces, 2001, 31. Jg., No. 3 supplement, p. 45-55.

could have performed, appeared only in 1983. With Excel, it does not take more than half an hour to implement this GROOVY model today, and changing one of its model parameters is a trifle.⁴⁰² However, even today there are still dissuasive examples of completely inadequate communication between a manager and the computer-assisted *managerial planning models* available today.

As described elsewhere (s.p.330), communication between a planner and the SAP-CO system, which involves a plan cost-performance model, is a disaster. And the SAP-CO system is a computer-based system. As reported, this was one of the events to develop INZPLA-Connect.

In contrast, in the Thyssen-Krupp Steel model with its 2.6 million equations (slightly more than the seven equations of the GROOVY model), a sensitivity analysis could be performed within 15 seconds with respect to one of its 231,994 model parameters.

The demand "*easy to communicate*" should also address the point to which this "easy communication" should serve. Should the model be used to realize an optimization within the scope of this communication or should certain model explorations be carried out? Little's only indication that a sensitivity analysis is being carried out is somewhat sparse. It would have been appropriate to address such procedures in the sample calculations Little carries out with his GROOVY model. However, as we will see (s.p.256), he does not even perform a sensitivity analysis.

• Little's hypothesis generation method

Before describing Little's approach as a method for generating empirically verifiable hypothesis equations, it must be clarified what is meant by an empirically verifiable hypothesis equation (or shorter of an "empirical hypothesis equation"). In connection with this, hypothesis equations that are non-empirical hypothesis equations are also to be discussed. Based on this concept formation, a method for obtaining empirical hypothesis equations is then described, which is to be referred to as Little's hypothesis generation method.

Empirical vs. non-empirical equation hypotheses

As mentioned in his text, Little speaks of the "*objective accuracy*" of a model and a "*totally empirical model*". Since the empirical content of a model lies only in its hypothesis equations, one can also speak of the "empirical hypothesis equations" of a model, which lead to a "*totally empirical model*". These empirical hypothesis equations are contrasted by hypotheses which, according to Little, are characterized by the fact that their quantities "*can be determined subjectively*." These are according to Little "*intuitive models*", who apparently possess "intuitive hypothesis equations" that are characterized by "*subjective estimates of several quantities*". These intuitive hypothesis equations base on "*judgmental*" or "*subjective inputs*" and are the result of a "*subjective judgments*".

Apparently, there are two types of hypotheses for Little, namely empirical hypotheses and intuitive hypotheses, which thus count as an antonym to the non-empirical hypothe-

⁴⁰² To date, 460 million copies of Excel have been sold.

ses. It is anticipated that I do not consider such a delimitation criterion of hypotheses to be very expedient and that I will develop another delimitation in the following, on the basis of which Little's remarks will then be judged. The term of an empirical hypothesis used by Popper is applied hereby. According to Popper, an empirical hypothesis is an assertion that can be falsified. A falsifiability of a hypothesis exists if it is possible to indicate observable circumstances, by whose occurrence it is allowed to say that the hypothesis is false. For hypothesis equations, which are only under discussion here, this means that the explained variable of an equation in question must be an observation variable and the explanatory variables of this equation, which in this context are not regarded as (numerically unchangeable) model parameters, must also be observation variables. An example is the price-sales-quantity hypothesis equation of an operational planning model

$$SQ = P_1 - P_2 \cdot SP \quad (86)$$

(SQ - sales quantity, SP - sales price). P_1 and P_2 are model parameters to which a fixed numerical value is assigned in the planning model for an upcoming annual planning. In the model in question here, the parameters of the linear price-sales-quantity hypothesis equation (86) should be specified numerically as follows

$$SQ = 10.000 - 200 \cdot SP \quad (87)$$

In this case, the sales quantity (SQ) and the sales price (SP) are observation variables. The "ex-ante sales quantity claim" or sales quantity forecast (87) is an empirical hypothesis according to Popper's falsification criterion. If you chose a value of 2 €/unit for the sales price, a sales quantity of 9,600 pieces would be forecast. This means that there are not just one, but many values of the sales quantity that, if they would occur as actual values, would falsify the sales quantity forecast made. These are all values of the actual sales quantity that are not equal to 9,600 units.

It is, therefore, an empirical hypothesis. According to Popper, it does not matter (see also p.539) how one arrives at such a hypothesis. It can come to mind in a dream or can be won in any other way. The only decisive factor for its acceptance as an empirical hypothesis is that it must be falsifiable. The "quality" of this ex-ante hypothesis or forecast depends only on its forecast success, i.e., the difference between the forecast and the actual value.

But how do you arrive at an empirically verifiable sales-quantity hypothesis equation such as the above-mentioned hypothesis equation with numerically specified hypothesis parameters? As already mentioned, this is left to the model developer.

However, two methods of obtaining hypotheses are common. They are described using the sales-quantity hypothesis equation (86) as an example.

The first method of obtaining hypothesis equations is the econometric method. Here, the actual values of the prices realized in the past and their corresponding actual sales quantities of the article in question are used to determine the numerical values of the parame-

ters, for example, in the form of a minimum square estimate. The estimate is based, on a linear function of the form (86), which is referred to as the a-priori hypothesis.

The second method of obtaining hypothesis equations consists in the fact that the model developer determines both the structural form of the hypothesis equation (87) and the numerical values of its parameters purely subjectively based on his overall impression with or without knowledge of the historical values. If it is a new product, only this procedure is practicable anyway, because the historical values required for the econometric parameter estimation procedure do not exist.

Little's distinction between *subjective-judgment* hypotheses and *empirical* hypotheses, therefore, does not make sense. *Subjective-judgment* hypotheses are also empirical hypotheses, whenever they are falsifiable.

Subjective-judgment hypotheses are not Little's invention either. In microeconomics, the construct of a *conjectural price-demand function* was used long before Little's contribution. And this is nothing else than the course of the price-sales function of an article from the point of view of the corporate management (s.p.376).

The long established (deterministic) decision theory also requires that the decision maker assume a connection that describes the target value to be optimized with his action variables. If an equation is used that describe this relationship between the target variable and the action variables and both are observation variables (which is required by the decision theory), then from the point of view of the decision theory it is completely irrelevant how the decision maker arrived at this empirical hypothesis. However, what is then Little's innovative contribution, which was already mentioned in the previous chapter as a method for obtaining empirical hypothesis equations? In order to answer this question, further conceptual clarification is required.

Type of hypothesis equation	Explained variable is observation variable ?	All explanatory variables are observation variables ?	Name of the hypothesis equation
empirical hypothesis equation?	yes	yes	OO-hypothesis equation
non empirical hypothesis equation?	yes	no	ON- hypothesis equation
	no	yes	NO- hypothesis equation
	no	no	NN- hypothesis equation

Fig. 54: Classification of empirical and non-empirical hypotheses

A distinction is to be made between empirical and non-empirical hypothesis equations. Non-empirical hypothesis equations should be distinguished according to whether their explained variable or at least one of their explanatory variables is not an observation variable.⁴⁰³ Fig. 54 shows a classification that describes both the characteristics of an empiri-

⁴⁰³ The model parameters that are assumed to be unchangeable during the forecast do not count as ex-

cal hypothesis equation and the characteristics of three variants of a non-empirical hypothesis equation.

Of interest are the non-empirical ON-, NO- and NN-hypothesis equations. An ON-hypothesis equation, for example, is a non-empirical hypothesis in which the explained variable is an observation variable, and at least one of the explanatory variables proves to be a non-observation variable.

Little's approach can now be interpreted as a permission to use of non-empirical hypothesis equations in his sales-quantity-models as well as in other *managerial models*. As already mentioned, this approach stands in sharp contrast to the norms of an empirical science that rejects such hypotheses as pseudo-hypotheses because they cannot be falsified. But as we will see, if *managerial models* are generated, "Little's permission" can be justified as a method for generating empirically verifiable hypothesis equations.

Within the framework of his Decision Calculus Concept Little does not point out that his "permission" to use what he calls *mental modeling* is a certain hypothesis generation procedure, which is only acceptable if an empirically verifiable hypothesis equation (OO-hypothesis equation) of the selected target variables can be derived from the developed system of hypothesis equations. Using his GROOVY model, it is shown below that Little's approach can be reconstructed as such a hypothesis generation procedure.

The basic procedure for obtaining an empirically verifiable hypothesis equation is already described here. The selected target variable of Little's hypothesis generation method in his examples is always a sales quantity. For him, the empirically verifiable hypothesis equation to be determined is, therefore, always a hypothesis equation with the sales quantity as an explained variable. The goal of Little's hypothesis generation procedure is, therefore, to generate a sales-quantity hypothesis equation of the form

$$SQ = F(P_1, \dots, P_N, OV_1, \dots, OV_z) \quad (88)$$

(SQ - sales quantity, OV_j - observation variable, P_i - model parameter)

The developer of a sales-quantity-model has the permission (*Little's permission*) to formulate a series of non-observation hypothesis equation with numerically concretized parameter values, but they must be distinguished by the fact that a sales-quantity hypothesis equation can be derived from them, which, like (88), represents an empirical hypothesis, i.e., an OO-hypothesis equation. A simple example is the case of two hypothesis equations that form a sales-quantity-model. These are the two non-observation hypothesis equations

$$SQ = F_1(P_1, P_2, NO)$$

and

$$NO = F_2(P_3, OV)$$

SQ - sales quantity (= observation variable), NO - non-observation variable, P_1 to P_3

model parameters, OV - observation variable.

This sales-quantity-model, consisting of two equations, can be used to determine the reduced equation of the sales quantity and this is:

$$SQ = F_3(P_1, P_2, P_3, OV) \quad (89)$$

It is an empirically verifiable hypothesis whose acceptance can be assessed solely on the basis of its forecasting quality. How it came about, i.e., here through the practiced hypothesis generation procedure, plays no role in the assessment of its forecast quality.

Therefore, if Little formulates a sales-quantity-model such as the GROOVY model with seven hypothesis equations, of which (as will be shown) six are non-observation hypothesis equations, it must only be possible to derive from these an observation hypothesis equation of the sales quantity. That is a hypothesis equation which can be empirically verified and which, as Little intends, links the (observable) sales policy decision variables such as the sales price or the advertising costs with the (observable) sales quantity.

The parameter values of this empirically verifiable sales-quantity hypothesis equation originate almost exclusively from the non-observation hypothesis equations (s.p.252). In order to be able to make a forecast of the empirically verifiable sales-quantity hypothesis equation (88) derived from the sales-quantity-model, the numerical values of these parameters must, therefore, be estimated in the non-observation hypothesis equations of the *mental model*. Little demands that certain “*judgmental calibration mechanisms*” should be developed to make it easier for the manager to estimate these parameter values. An example of how such a calibration mechanism could be realized shows Little using a certain hypothesis equation, the so-called ADBUDG hypothesis equation. It will be described below.

- **Little’s sales planning models and their consequences for the Integrated Target Commitment Planning**

First, we discuss the GROOVY model. It is followed by a description of the BRANDAID model, regarded by Little as a further development of the GROOVY model.

The GROOVY model. First, the so-called ADBUDG hypothesis equation, which plays an essential role in the GROOVY model, is treated. We then turn to the description and analysis of the GROOVY model.

Little is probably the first to use the ADBUDG hypothesis equation to model sales-quantity hypothesis equations. It has, therefore, also been adopted in the literature with the name “*ADBUDG function*” or “*ADBUDG response function*” and is used by other authors in their models. The special feature of this hypothesis equation is that, as already mentioned, Little has developed a method with which the parameter values of this function can be determined by a “skillful questioning” of a manager.

Fig. 55 shows a scheme by Albers and Mantrala, in which the ADBUDG hypothesis equation and the determination of its model parameters propagated by Little are de-

scribed. The left area shows the course of an ADBUDG hypothesis equation and its structural equation.

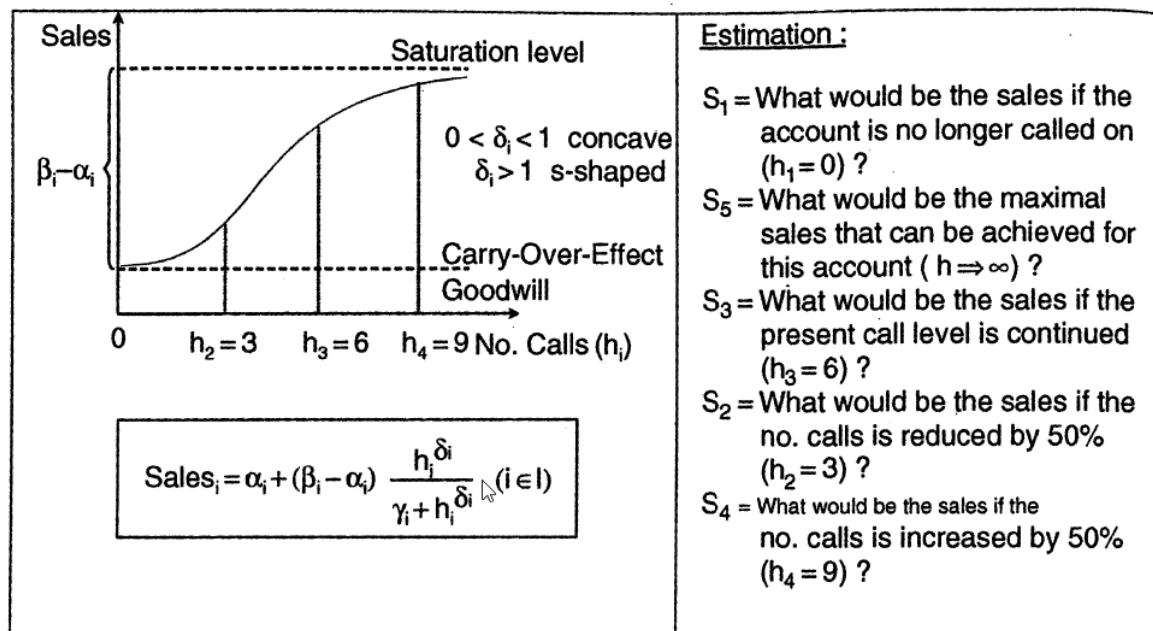


Fig. 55: Obtaining the parameter values of the ADBUDG hypothesis equation through five "specification questions" to a marketing manager.⁴⁰⁴

The "skillful questions" asked to a marketing manager are shown in the right part of the figure. Five coordinate values of the ADBUDG hypothesis equation can be determined based on the marketing manager's answers. These coordinates are then used to determine the numerical values of the four parameters α , β , γ and δ of an ADBUDG hypothesis equation by using a specific curve fitting procedure.

The entire "judgmental calibration mechanism" is computer-assisted. Little's ADBUDG hypothesis equation is, as Fig. 55 shows, a nonlinear function. Depending on the choice of the model parameter δ , it can have an s- or a concave shape. Such a non-linear course is necessary because one can expect that the marginal rate of the positive sales quantity change decreases with increasing values of the effort variables.⁴⁰⁵

The ADBUDG hypothesis equation is only one of the hypothesis equations described in the GROOVY model.⁴⁰⁶ But it plays an essential role in Little's contribution. In contrast to the ADBUDG hypothesis equation described by Albers and Mantrala in Fig. 55, whose dependent variable "sales" and whose independent variable "calls" are observation variables these variables in the ADBUDG hypothesis equation of GROOVY model will prove to be non-observation variables, as will still be shown.

⁴⁰⁴ Taken from: Albers, S., Mantrala, M. *Models for Sales Management Decisions*. In: *Handbook of Marketing Decision Models*, p.172, Wierenga, B., Ed., New York, 2008.

⁴⁰⁵ Thus, the "law of diminishing returns" applies.

⁴⁰⁶ Some authors who speak of Little's ADBUDG model overlook this. The model in which Little develops his seven structural equations mentioned here is the GROOVY model.

Structure of the GROOVY model. As already mentioned, the GROOVY model contains seven hypothesis equations. The following shows how to generate an empirically verifiable sales-quantity hypothesis equation using these hypothesis equations. First, these hypothesis equations are described and then it is shown how to arrive at the desired empirically verifiable sales-quantity hypothesis equation.

The first hypothesis equation (OO-H1) describes the sales quantity (brand-sales) of the product in question:

$$\text{brand-sales} = \text{reference-product-class-sales} \cdot \text{product-class-sales-index}(t) \cdot \text{brand-share}(t) \quad (\text{OO-H1})$$

The brand-sales (the sales quantity) is an observation quantity. If one assumes that the *reference-product-class-sales* is also an observation quantity, then (OO-H1) is an empirically verifiable OO-hypothesis equation with the parameters *product-class-sales-index* and *brand-share* (market share). However, the *brand share* is not a parameter in the planning model, but is traced back to an action variable that can be influenced by the company, namely the advertising costs (*adv-dollar*).

Thus, the *brand-share* is an endogenous variable of the model, which is influenced by the advertising costs (*adv-dollar*). This reduction of the *brand-share* to the advertising costs (*adv-dollar*) should result in an empirically verifiable hypothesis equation that connects the advertising costs (*adv-dollar*) as an explanatory observation variable with the sales quantity (*brand-sales*) as an explained observation variable, i.e., a hypothesis equation of the form

$$\text{brand-sales} = F(P_1, \dots, P_n, \text{adv-dollar}) \quad (90)$$

This connection between the market share (*brand-share*) and advertising costs (*adv-dollar*) is established by six non-observation hypothesis equations. The first one is:

$$\text{brand-share}(t) = \text{non-adv-effect-index}(t) \cdot \text{unadj-share}(t) \quad (\text{NN-H2})$$

The *brand-share* is the product of the *non-adv-effect index* and a variable, which is the explained variable of Little's ADBUDG hypothesis equation. Little calls it *unadj-share*.⁴⁰⁷

The *non-adv-effect index* is, in turn, the product of two or more indices that are to be (subjectively) numerically estimated by the marketing manager according to his mental model.

$$\text{non-adv-effect-index}(t) = \text{promotions-ind}(t) \cdot \text{price-ind}(t) \cdot \text{package-ind}(t) \cdot \text{competitive-section-ind}(t) \cdot \text{other-ind}(t) \quad (\text{NN-H3})$$

The *unadj-share(t)*, which describes the total influence of advertising costs in period *t* on the brand-share, is described according to Little by the following hypothesis equation

$$\begin{aligned} \text{unadj-share}(t) = & \text{long-run-min} + \text{persistence} \cdot [\text{unadj-share}(t-1) - \text{long-run-min}] + \\ & \dots + (\text{max} - \text{min}) \cdot \text{wtd-adv}(t)^{\gamma} / [(\delta + \text{wtd-adv}(t)^{\gamma}) / \text{reference-value-of-numerator}] \end{aligned} \quad (\text{NO-H4})$$

⁴⁰⁷ "undelayed advertising effect index" would be better.

This equation implies the ADBUDG hypothesis equation. In my opinion, this is an inappropriate presentation. The ADBUDG hypothesis equation plays such an essential role in Little's concept that it seems appropriate to make it explicit. The ADBUDG hypothesis equation was written by Little (p.5 formula no. 1) in the following form

$$\text{share} = \text{min} + (\text{max} - \text{min}) (\text{adv})^\gamma / [\delta + (\text{adv})^\gamma] \quad (\text{NO-H0})$$

This corresponds to the form given by Albers and Mantrala in Fig. 55.⁴⁰⁸ However, this ADBUDG hypothesis equation does not correspond to the equation implicitly contained in (NO-H4). Instead of the first expression of "min" in (NO-H0), i.e. "min +...", it contains the expression

$$\text{"long-run-min} + \text{persistence} \cdot [\text{unadj-share}(t-1) - \text{long-run-min}]" \quad (\text{NN-H5a})$$

and the size "reference-value-of-numerator", which also does not appear in (NO-H0) equation.

The "reference-value-of-numerator" in (NO-H4), which Little does not explain and whose meaning is not intuitively apparent, is omitted below. This is justified because Little does also not use it in his numerical example.

Instead of the (time-invariant) parameter "min" Little uses with (NN-H5a), a variable that changes over time and is to be referred to in the following as carry-over-ad-share(t). It is determined by the following hypothesis equation

$$\text{carry-over-ad-share}(t) = \text{long-run-min} + \text{persistence} \cdot [\text{unadj-share}(t-1) - \text{long-run-min}] \quad (\text{NN-H5b})$$

With (NN-H5b) in (NO-H4) you get the modified ADBUDG hypothesis equation equation

$$\text{unadj-share}(t) = \text{carry-over-ad-share}(t) + [\text{max} - \text{carry-over-ad-share}(t)] \cdot \text{wtd-adv}(t)^\gamma / (\delta + \text{wtd-adv}(t)^\gamma) \quad (\text{NN-H6})$$

With (NN-H6) it becomes clear that Little has changed his original ADBUDG hypothesis equation (NO-H0). This is because the *carry-over-ad-share(t)* changes over time, while the parameter "min" is assumed to be unchangeable in the ADBUDG hypothesis equation originally cited by Little. Since Little's GROOVY example runs over four quarters, the *carry-over-ad-share(t)* parameter "min" changes in this time-varying ADBUDG hypothesis equation in each quarter.

The marketing manager must, therefore, also subjectively estimate the parameter values of another hypothesis equation, namely the carry-over-ad-share hypothesis (NN-H5b).

What effect does this estimate have on the procedure for determining the parameters of the ADBUDG hypothesis, which Little pointed out to be manager-friendly? Since the *carry-over-ad-share(t)* changes from period to period, the marketing manager cannot de-

⁴⁰⁸ In Fig. 55 the coefficients of the ADBUDG hypothesis equation are described by Albers and Mantrala differently from Little. From this point on, Little's terms from (NO-H4) will continue to be used, i.e., min, max, δ and γ with: **min** instead of α , **max** instead of β , **δ** instead of γ and **γ** instead of δ .

termine it within the framework of determining the other parameters of the ADBUDG hypothesis equation. The carry-over-ad-share in (NN-H6) must be determined for each period using the carry-over-ad-share hypothesis (NN-H5B). The marketing manager can therefore only be asked the questions S2 to S5 within the framework of the determination of the ADBUDG hypothesis parameters (see Fig. 55), which lead to the determination of the parameters δ , γ and $\max$.

Since the parameter values of the ADBUDG hypothesis, i.e. the values of δ , γ and $\max$ determined by Little in a "*curve fitting procedure*" also depend on the value of the *carry-over-ad-share(t)* which changes in each period, they must be redetermined for each period in order to obtain the function curve which best describes the four coordinate values (determined using S2 to S4) and the value of the carry-over-ad-share as the fifth coordinate value in the case of $wtd-adv = 0$.

The *unadj-share(t)* as an explained variable of this time-varying ADBUDG hypothesis equation (NN-H6) is a non-observation variable. The same applies to the explanatory variable, i.e., the quantity *wtd-adv(t)*. It is determined according to the hypothesis equation.⁴⁰⁹

$$\mathbf{wtd-adv}(t) = \text{media-efficiency} \cdot \text{copy-effectiveness} \cdot \text{adv-dollars}(t) \quad (\text{NO-H7})$$

In order to connect the ADBUDG hypothesis equation with the observed value and the only decision variable of the sales-quantity-model, i.e., the advertising costs (*adv-dollars*), the marketing manager must, therefore, make a (subjective) numerical estimation of *media-efficiency* and *copy-effectiveness*.

The *carry-over-ad-share(t)*, which in the time-varying ADBUDG hypothesis equation changes from quarter to quarter and describes the ordinate value of the *unadj-share* (better: the advertising effect index) if the advertising costs would be selected in the period 0 under consideration, requires the acceptance of a series of structural hypotheses by the marketing manager and also his willingness to make the numerical specification of their parameters.

In the *carry-over-ad-share* hypothesis (NN-H5b) it is assumed that the value of the *carry-over-ad-share* corresponds to a value called "*long-run-min*" if the size called "*performance*" is zero. The *long-run-min* is the proportion to which the *carry-over-ad-share* would fall if the article were no longer advertised over a large number of periods in the future, i.e., the advertising costs would be zero. Little admits that this value would probably be zero, which one should assume.⁴¹⁰

The dynamic character of the *carry-over-ad-share* hypothesis (NN-H5b) results from the fact that the *carry-over-ad-share* in period t is influenced by the *unadj-share* (= advertising effect index) of the previous period $t-1$. At the beginning, of the first quarter of the annual planning, e.g., in 2017, the marketing manager would have to estimate the *unadj-share* for the last quarter in 2016. Not an easy task, because it is a non-observation quantity.

⁴⁰⁹ Little does not communicate the long name of the abbreviation "*wtd*."

⁴¹⁰ This is also assumed in Little's numerical example.

The influence of the *unadj-share* of the previous period $t-1$ on the *unadj-share* of period t depends on the parameter "*persistence*" in the hypothesis equation (NN-H5b). On persistence, Little notes: "*persistence denotes the fraction of the difference between share and longrun minimum that is retained*", i.e.,⁴¹¹

$$\text{persistence} = (\text{min} - \text{long-run-min}) / (\text{initial-share} - \text{long-run-min}) \quad (\text{NN-H8})$$

As can be seen from the hypothesis equation (NO-H4), the *unadj-share*(t) is explained by a dynamic hypothesis equation, and this is because it depends on its own previous period value *unadj-share*($t-1$).

The "dynamics" of this relationship depends on the value of the *persistence* parameter, which determines the course of the geometrically decreasing weight function of this dynamic hypothesis equation. It can move between 0 and 1. If the parameter "*long-run-min*" in (NN-H8) is zero, then the *persistence* is the ratio between the parameter *min* and the *initial share* of a reference period. But how is the *initial share* defined? This can only be the *unadj-share* of the last period before the start of planning.⁴¹²

A fundamental question that now arises is whether it is reasonable to use the parameter "*min*" in the equation (NN-H8) to determine *persistence*. It should be noted that in the multi-period case (NN-H5b) the *carry-over-ad-share* changes from period to period. In such a case, there is no parameter "*min*" that is unchanged over all periods. Each period has a different value of the *carry-over-ad-shares*, which describes the effect of the advertising costs of all previous periods if the "minimum advertising cost case" exists in the period in question, i.e., the advertising costs are selected as 0.

Since the constant parameter "*min*" does not exist in multi-period cases, Little's equation (NN-H8) for determining the persistence hypothesis parameter is somewhat incomprehensible.

In view of this situation, the determination equation of the *persistence* (NN-H8) should be considered once again. Since there is no parameter "*min*", it is plausible to use the "*unadj-share*" of the first period in the case that advertising costs are 0, and that is the *carry-over-ad-share*(1). However, the *initial share* is also an "*unadj-share*", namely the *unadj-share* of the period before the start of the planning period, i.e., the *unadj-share*(0). Little's parameter determination rule is therefore:⁴¹³

$$\text{persistence} = \text{unadj-share}(1) / \text{unadj-share}(0) \quad (\text{NN-H9})$$

Since both variables are not observable but must be subjectively estimated by the marketing manager, one has to ask oneself how he actually achieves such an estimate, because

⁴¹¹ The equation for determining "*persistence*" is no longer mentioned by Little in his summary of the GROOVY model, but discussed in the text.

⁴¹² This can be seen quite clearly from Fig. 1 in Little's text.

⁴¹³ Non-observation hypothesis equations in a model are all structural equations that are not empirically verifiable hypothesis equations. Therefore, as a negative demarcation, they are actually not "hypotheses", but model equations that cannot be empirically verifiable (falsifiable). This set sometimes contains equations such as, for example, a parameter estimation function (NN-H9) to be understood as a normative rule, which actually has no place in a "pure model".

there are no actual values of the past periods for the *unadj-share*, on which he could somehow orient himself.⁴¹⁴

With the provision (NN-H9) for determining the parameter value of *persistence*, Little seems to have found a way to "elicit" the value of this "delay parameter" from the mental model of the marketing manager that was previously only in his head.

This describes the structural equations of the GROOVY model. This description is a little different from what you can read with Little.

The question now arises as to how the GROOVY model can be assessed as the application example for implementing the Decision Calculus Concept.

Acceptance of the model structure and parameter estimation. Little demands that a marketing manager must accept the structural hypothesis equations of the GROOVY model. Here the question is allowed whether this should often be the case. In any case, I had some difficulties, and perhaps, despite my efforts, I did not understand some of them correctly. However, as soon as a marketing manager realizes that Little's seven structural hypothesis equations correspond to his "structural mental model" (he is "*ready to assimilate it*"), the actual work begins for him.⁴¹⁵

He has to estimate the seven parameter values occurring in the hypothesis equations and on top of that the four estimates of the coordinates of the ADBUDG hypothesis equation (NN-H6). It is also necessary to estimate a sales quantity (*reference-product-class-sales*).⁴¹⁶

Estimating the four coordinates using Little's "user-friendly questions" (see Fig. 55) is probably the most convenient method. However, it is not everybody's business to specify a function course in which both the independent variable (*wtd-adv*) and the dependent variable (*unadj-share*) in (NN-H6) are non-observable, and thus an orientation to their actual values is not possible. The *unadj-share* is also an index (rate size), which should not make estimating easier.

However, it should be more difficult for a manager to communicate the numerical values of the other hypothesis parameters of his mental GROOVY model. Everyone should try it for himself. You can imagine a fictitious product and then agree with yourself (Little says nothing about it) how you want to define the terms *promotion index*, *price index*, *package index* and possibly another index in your mental model, because these occur in the NN-hypothesis equation of the *non-adv-effect index* (NN-H3). When you are aware of what these indices mean, estimate their forecast values for your fictitious product. Suppose you made the following estimate: *promotion index* = 0.8, *price index* = 0.85 and *package index* = 0.7, then a computer calculates the *non-adv-effect index* of 0.476 for you from the product of these three indices. If you multiply this amount by the *unadj-share* that comes

⁴¹⁴ Personally, I would be completely helpless to make such an estimate.

⁴¹⁵ By replacing (NO-H4) with (NN-H5b) and (NN-H6), eight equations have resulted in this reconstruction.

⁴¹⁶ Actually, there were five. However, there are only four, if you follow my argumentation that the minimum value α_1 no longer needs to be estimated by the sales manager using the "*Estimation S1*" in Fig. 55. This is because this minimum value is determined for each period by the carry-over hypothesis equation (NN-H5b).

from your ADBUDG hypothesis equation, then you get the brand-share.

The example of a fictitious estimate is terminated here. However, if you continue it yourself, then after estimating further indices and the subjective estimation of a "*reference-product-class-sales*" (in units), whose definition is not quite clear, you will finally arrive at the planned sales quantity (*brand-sales*) of your product.

Empirically verifiable reduced sales-quantity hypothesis equation. The formulation of such non-observation hypothesis equations can as already claimed, serve only one purpose from the point of view of an empirical science, and that is the determination of an empirically verifiable reduced hypothesis equation of the sales quantity with the advertising costs (*adv-dollars*) as an observation variable. If such a sales-quantity hypothesis equation could not be generated, the entire GROOVY model would be useless from this point of view. It is shown that it is possible to derive an empirically verifiable OO-hypothesis equation of the sales quantity (*brand-sales*) from the five NN-hypothesis equations (H2, H3, H5b, H6, and H8), one OO-hypothesis equation (H1) and one NO-hypothesis equation (H7). This OO-hypothesis has the form ⁴¹⁷

Brand sales(t) =

$$\begin{aligned} & \text{RPCS} \cdot \text{PCSI} \cdot \text{PROI} \cdot \text{PRI} \cdot \text{PAI} \cdot \text{COSI} \cdot \text{OTI} + \text{RPCS} \cdot \text{PCSI} \cdot \text{PROI} \cdot \text{PRI} \cdot \text{PAI} \cdot \text{COSI} \cdot \text{OTI} \cdot \text{LRM} + \dots \\ & \dots + \text{RPCS} \cdot \text{PCSI} \cdot \text{PROI} \cdot \text{PRI} \cdot \text{PAI} \cdot \text{COSI} \cdot \text{OTI} \cdot (\text{MIN} - \text{LRM}) / \text{ISH} - \text{LRM} \cdot [\text{UASH}(t-1) - \text{LRM}] + \dots \\ & \dots + \text{RPCS} \cdot \text{PCSI} \cdot \text{PROI} \cdot \text{PRI} \cdot \text{PAI} \cdot \text{COSI} \cdot \text{OTI} \cdot (\text{MAX} - \text{MIN}) \cdot [\text{MEE} \cdot \text{COEF} \cdot \text{ADCO}(t) / \text{RVN}]^\gamma / \dots \\ & \dots / \{ \delta + [\text{MEE} \cdot \text{COEF} \cdot \text{ADCO}(t) / \text{RVN}]^\gamma \} \end{aligned} \quad (91)$$

Legend:

Number	Abbreviation	Name used by Little
1.	RPCS	reference-product-class-sales
2.	ADCO(t)	adv-dollars(t)
3.	COEF	copy-effectiveness
4.	ISH	initial share
5.	LRM	long-run-min
6.	Max	max
7.	MEE	media-efficiency
8.	Min	min
9.	OTI(t)	other-ind(t)
10.	PAI(t)	package-ind(t)
11.	PCSI(t)	product-class-sales-index(t)
12.	PRI	price-ind(t)
13.	PROI(t)	promotions-ind(t)
14.	RVN	reference-value-of-numerator
15.	UASH(t-1)	unadj-share(t-1)
16.	γ	γ
17.	δ	δ

⁴¹⁷ For the explanation of the "*persistence*" Little uses the hypothesis H8 and not the hypothesis of the "*persistence*" H9 considered as necessary in my reconstruction. Little uses the hypothesis H4 as described to explain the *unadj-share*. I divided it into two hypotheses H5b and H6 in a chain to explicate the ADBUDG hypothesis equation. The above list of hypotheses is based on this case. Otherwise the hypotheses NN-H5b and NN-H6 have to be replaced by the hypothesis NN-H4 which is a NN-hypothesis.

The empirically verifiable sales-quantity hypothesis equation can be described with its numerical parameter values NW1 to NW5 as follows

$$\text{Brand sales} = \text{NW1} + \text{NW2} \cdot \text{ADCO}(t)^{\text{NW3}} / (\text{NW4} + [\text{NW5} \cdot \text{ADCO}(t)^{\text{NW3}}]) \quad (92)$$

with

$$\text{NW1} = \text{RPCS} \cdot \text{PCSI} \cdot \text{PROI} \cdot \text{PRI} \cdot \text{PAI} \cdot \text{OTI} + \text{RPCS} \cdot \text{PCSI} \cdot \text{PROI} \cdot \text{PRI} \cdot \text{PAI} \cdot \text{OTI} \cdot \text{LRM} + \dots \\ \dots + \text{RPCS} \cdot \text{PCSI} \cdot \text{PROI} \cdot \text{PRI} \cdot \text{PAI} \cdot \text{OTI} \cdot (\text{MIN} - \text{LRM}) / (\text{ISH} - \text{LRM}) \cdot [\text{UASH}(t-1) - \text{LRM}]$$

$$\text{NW2} = \text{RPCS} \cdot \text{PCSI} \cdot \text{PROI} \cdot \text{PRI} \cdot \text{PAI} \cdot \text{OTI} \cdot [(\text{MAX} - \text{MIN}) \cdot [\text{MEE} \cdot \text{COEF} / \text{RVN}]]$$

$$\text{NW3} = \gamma$$

$$\text{NW4} = \delta$$

$$\text{NW5} = \text{MEE} \cdot \text{COEF} / \text{RVN}$$

The reduced empirically verifiable sales-quantity hypothesis equation (92) shows that in the case of the GROOVY model Little's hypothesis generation method using non-observation hypothesis equations was successful.

The numerical values of the parameters NW1 to NW5 of the reduced sales-quantity hypothesis equation (92) consist of thirteen primary parameters to be subjectively estimated by the marketing manager and one flow quantity to be estimated (*reference-product-class-sales*) as well as the two parameters γ and δ of the ADBUDG hypothesis equation. These are calculated as described using a calibration method from the estimates of the coordinates shown in Fig. 54. Therefore, there result a total of 15 parameters whose values are to be estimated by the marketing manager.

The question arises as to why the now completed description of the GROOVY model did not explain how Little's six requirements came into play in the development of this model. The reason is that Little doesn't respond to any of these requirements. In principle, if they are reviewed, they are superfluous except for a brief reference in one requirement.

This reference, which could be described as a novelty, "hides" in a sentence of his fifth requirement for the "*Completeness on important issues*" and it reads: "*An important aid to completeness is the incorporation of subjective judgments*". Here his already mentioned permission (*liberation*) to develop so-called "*mental models*", which work with non-observation hypothesis equations, is documented.

Little's rather unclear formulation of this permission becomes clearer if one studies the GROOVY model. The structure of the GROOVY model shows that the "*mental modeling*" carried out with it is not only limited to the subjective estimation of the parameters of empirically verifiable (OO-hypothesis equations) but also allows the use of non-observation hypothesis equations (NO-hypothesis equations). A manager is thus granted the "permission" to formulate structural non-observation hypothesis equations within the framework of his *managerial model*, the parameter values of which have to be subjectively estimated by him.

An explicit permission to carry out this procedure of modeling cannot be taken from Little's text, but he practices it. If one agrees with the thesis presented here that Little's permission is a procedure for generating empirically verifiable hypothesis equations, then one can also agree with the following assertion:

Little's permission is the permission to develop a numerically specified mental model of a manager (*mental managerial model*) with non-observation hypothesis equations, which must, however, lead to the derivation of an empirically verifiable (sales quantity) hypothesis equation.

This derivability is necessary to accept *Little's permission* as a method of model generation that agrees with the requirement of empirical science to use only empirical hypotheses, i.e., hypotheses that must be falsifiable (empirically verifiable).

However, the method for obtaining empirical hypotheses implicitly propagated by Little is only as good as it has proven itself, i.e., how it is possible to generate empirically proven hypotheses with such a method.

The question arises, how would such a probation come about, if the described GROOVY model would be used?

To answer this question, we assume that a marketing manager has assimilated Little's seven structural hypothesis equations as "his" and has also performed the fifteen estimates of parameters to generate the five parameter values NW1 to NW5 in (92).⁴¹⁸ Furthermore, it is assumed that the marketing manager has completed the planning of the sales quantity for an upcoming period with the numerically concretized reduced hypothesis equation thus obtained. His planning consisted of choosing a certain value for the advertising costs (*adv-dollars*). And it should also apply that this value was not only planned but also realized by him.

Only at the end of the planning period does the actual "probation question" arise and this is: "What was the actual-plan variance of the sales quantity of the article in question? (the forecast success question). Since Little does not answer the question of whether the GROOVY model has ever been accepted by a marketing manager as his mental model in his text, the question of its success in forecasting cannot be answered.

- **Little's numerical example of the GROOVY model.**

In my opinion, in order to correctly understand a model developed by another person, one needs not only its structural equations but also a numerical example that is as plausible as possible.

This demand was and is indispensable for me. This was the case with the Welsch model (s.p.8) and was especially true for the Kilger model (s.p.23). In each of my doctoral and diploma theses, in which an equation model was developed, I always insisted that a numerical example should be provided and commented on.

Therefore, I thought it was very good that Little also provided a numerical example with his GROOVY model. My wish for a numerical example seemed to be fulfilled. In the case of the GROOVY model, however, there was a special interest behind this wish.

The GROOVY model does not only include the seven hypothesis equations required to derive the empirically verifiable reduced sales-quantity hypothesis equation (91). As an

⁴¹⁸ For the definition of these estimated values, see page 252.

additional equation, it also contains the definition equation of the contribution margin of the article, whose sales-quantity hypothesis equation was the main point up to now.

Since the advertising costs "*adv-dollars*" in (92) are a decision variable, it makes sense to determine the planned advertising costs in the four quarters in such a way that the quarterly contribution margin cumulated over four quarters, i.e., the annual contribution margin, is maximized.

However, Little didn't mention anything about maximization in his text, and I found that somewhat strange in view of his OR background.

Therefore, I decided to enter the seven structural hypothesis equations of the GROOVY model into my "equation computation system" (s.p.477). However my goal was not only to develop a "better feeling" for the model-based variation of its model parameters. I had also a specific goal in mind, and that was to determine whether the *cumulative contribution after advertising* of \$13.1 million calculated by Little in his example was achieved by maximizing the four quarterly advertising costs (*adv-dollars*).

Little also sees this variable as a target for planning, pointing out that after the development of the GROOVY model a planner will ask "*Which way should I change advertising to increase profit?*". And his answer is that this *profit* should be the "*cumulative contribution after advertising in the last period of the calculation*". However, to follow "*which way,*" he does not say.

Therefore, I started to look for the values of the hypothesis parameters of the GROOVY model given by Little in his example in order to enter them into my GROOVY model. It turned out that the parameter "*reference-value-of-numerator*" which Little used in the hypothesis equation NO-H4 of the GROOVY model no longer occurs. However, that was no problem it just goes unnoticed. The numerical reconstruction, however, failed because of the following: I was not able to access the numerical values of the parameters δ and γ that occur in the ADBUDG hypothesis equation (NN-H6).

Little gives the four estimated values of the ADBUDG hypothesis equation, which are determined using his survey procedure (see Fig. 55). However, as mentioned above, δ and γ must be determined using a curve-fitting procedure. There are different procedures available here. Since Little does not tell which of these methods he used, the numerical value of δ and γ cannot be determined with certainty. Even if one would try through the possible procedures, one could not reconstruct the correct values of δ and γ , because Little does not give the plan value of the explained variable of the ADBUDG hypothesis equation, i.e., the plan value of the *unadj-share* of his example.

And if one would know δ and γ , then at least my reconstruction attempt would fail because of the fact that also the other numerical reconstruction is associated with difficulties.⁴¹⁹

⁴¹⁹ According to Little, *brand-sales* (the sales quantity) are expected to amount to 5.98 million units in the first quarter. However, from the product of *reference-product-class-sales* = 90 million, *product-class-sales-index* = 0.934 and *brand-share* = 0.01868 formed in accordance with (OO-H1), the value is 505,966.48. The value described in equation (OO-H1) as "*brand-share*" is also called "*brand market share*" in the text and in Little's result list "*market share*."

All in all, a reconstruction of Little's application example was not possible. Therefore, the question remained open to me at the time whether he had maximized the annual contribution margin or not. The final answer to this was first provided by the conversation with him, which I will report on later (s.p.285). However, a few years later there was a statement from him suggesting that he deliberately refrained from optimization in the case of the GROOVY model.

Eleven years after its publication, in 1981, he and Lodish summed up the concept of the Decision Calculus Concept.⁴²⁰ There Little and Lodish agree "*on the issue of optimizing the model vs. showing the direction of improvement*", with the view of Chakravarti, Mitchel, and Staelin that in the case of "*mental models*" no optimization should be performed.

However, why does Little think that an optimization is inappropriate? He endorses his cited view of Chakravarti, Mitchel and Staelin, which reads: "*Since judgmental inputs and consequently model recommendations outside the normal operating of the firm may be invalid it may not be advisable to use judgment based models to determine the optimal level of the decision variables*".⁴²¹

This view is somewhat strange in view of Little's second demand that a model generated by a model builder should possess "*a structure that inherently constraints answers to a meaningful range of values.*" What is the purpose of asking a marketing manager to generate certain s-shaped or concave "*sales response functions*" such as the ADBUDG function (see Fig. 55)?

It remains unclear whether Little has optimized the GROOVY model and the BRANDAID model still to be discussed. The GROOVY model is no longer mentioned in the text, and to the BRANDAID model, he only says "*Little in BRANDAID rarely does*" an optimization.

However, it is already anticipated (s.p.257) that in the entire text on the BRANDAID model there is not one word about whether and how an optimization was carried out with this model. We can, therefore, not speak of "*rarely*".

An optimization can by the way also be used for the plausibility check of the model hypotheses, as it is also the case with the "fine tuning" of econometric models in the form of a "forecast check". For example, if the case of optimality shows values of the article contribution margin that lie outside a subjectively plausible range, the model developer can change the subjectively determined parameters of his hypotheses so that the article contribution margin lies within a "subjectively" acceptable range. This is a procedure for determining the parameter values of a "*judgmental model*" in the form of a coordination of the subjective credibility of a premise with its implications. This coordination should

⁴²⁰ Little, J., Lodish, L., Commentary on "Judgment Based Marketing Decision Models." In: The Journal of Marketing, 1981, p. 24-29.

⁴²¹ Chakravarti, D., Mitchel, A., Staelin, R., Judgment based Marketing Decision Models: Problems and possible Solutions. In: The Journal of Marketing, 1981, p. 13-23.

lead to the same degree of credibility being assigned to this premise and its implications at the end of the coordination process due to an iteratively operated modification of the original premise.

Little does not describe such a coordination procedure, which could or in my opinion should also be a requirement for the development of a mental model. It could be described as judgmental balancing (of premises and conclusions).

Analyses with the GROOVY model. With Little's formulation that the analysis of a model can lie in the "*understanding of a problem*", he characterizes a procedure that is called in the INZPLA terminology as model exploration. This includes (s.p.143) analysis procedures that cannot be assigned to the actual planning and control procedures of an Integrated Target Commitment Planning but provide the model user with additional valuable information.

Just an example: As reported (s.p.339), the management of Thyssen-Krupp Steel was very interested in finding out what costs were spent on energy and various input materials for certain finished products. For production chains of a product, which run over up to 33 production steps, this cannot be determined with a pocket calculator. The model exploration carried out for this purpose using the planning model, known as primary cost analysis, led to an "*understanding of a problem*" in Little's sense or, to put it more precisely, to the supply of information which the corporate management considers useful in order to perhaps identify a "problem". Which "*problems*" can be studied on the basis of his GROOVY model, is not revealed in Little's text. However, even with a seven-equation model that has fifteen parameters, certain explorations can be made to understand it better.⁴²²

Little points out as the only example of "*understanding of a problem*" the possibility of carrying out a sensitivity analysis with the developed *managerial model*. With his GROOVY model, however, he carries out neither a sensitivity analysis nor any other analyses. Based on the GROOVY model, for example, a target value analysis could be carried out that would be much more informative from a normative point of view than the sensitivity analysis mentioned by Little.⁴²³ For example, a target value analysis could be used to determine which equal percentage change of Little's originally planned advertising costs in the four quarters changes the planned contribution margin resulting from the four quarters from \$13,1 to 15 million.⁴²⁴

It would also be of interest to examine how the advertising expenses spent in one period affect the sales quantity of this and all subsequent periods. This leads to the question which changes in sales (*ceteris paribus*) exert the increase in advertising costs in period t by \$ 10,000 on period t and all subsequent periods $t+1$, $t+2$

⁴²² Parameters here are the sizes which, in contrast to the decision variable "*adv-dollars*", are not changed during the planning procedure.

⁴²³ See: Zwicker, E., *Target Value Analyses as a Method of operational Company Planning*, Berlin 2001, (16 pages) www.lnzpla.de/TN12-2001b.pdf. (Text in German, title translated)

⁴²⁴ The total profit for a quarter is defined as "quarterly contribution margin - advertising expenses".

In the control theory, the so-called impulse response of a system is determined to describe such a relationship. For this purpose, a dynamic model of this system is put into a state of equilibrium by a corresponding selection of its initial values. Under these circumstances, the time course of a reference variable is determined, which results when a certain input value is applied to the system in the form of a pulse. The time course of the reference variable caused by the pulse is referred to as the impulse response. Such an impulse response could also be determined for the GROOVY model. The reference size would be the sales quantity, and the input size would be the advertising costs. The impulse response would then be the course of the resulting sales, which is caused by an impulse of the advertising costs of, e.g., 10,000 \$. The impulse response is an informative indicator of the dynamic behavior of a system. The so-called dynamic multiplier of advertising costs on sales would also be of interest here. It is obtained by dividing the sum of the impulse response of the sales quantity by the amount of the impulse.

Little's Decision Calculus Concept consists, as he himself emphasizes, in the development of a planning model that is linked to a "*set of numerical procedures*".... "*to assist decision making*". Even if, according to Little's view, one refrains from an optimization (what I consider as unacceptable), the GROOVY model could be used to perform at least some useful (computer-aided) analyses, such as determining the impulse response.

The BRANDAID model

Little's sensational 1970 article "*Models and Manager...*" was supplemented by a contribution of him in 1975, which is divided into two parts. The title of these two parts is:⁴²⁵ *BRANDAID: A Marketing-Mix Model, Part 1: Structure and Part 2: Implementation, Calibration, and Case Study*. According to Little BRANDAID is "*a flexible on-line model*" that allows "*marketing managers*" ... to "*make decisions about price, advertising, promotion and other marketing variables on the basis of factual data, judgments and assumptions about how the market works.*"

While Little developed a sales-quantity-model with the GROOVY model, which contains advertising costs as the only decision variable (*controlled variable*), he now presents a sales-quantity-model, which can contain more than one decision variable and is regarded by him as a further development of the GROOVY model.

As it turned out in retrospect, this contribution has by no means generated the resonance that his first text did.⁴²⁶ However, I did not know that at the time, and it wouldn't have touched me either. My goal was to find structural equations for sales models that I could have built into my INZPLA-model configuration system.

What Kilger provided me with structural information for cost-performance models, I hoped Little could have provided me with structural information for sales-quantity-models.

⁴²⁵ Little, J. D. C. *BRANDAID: A Marketing-mix Model, Part 1: Structure*. In: Operations Research, 1975, 23, No. 4, p. 628-655. And: *BRANDAID: A Marketing-mix Model, Part 2: Implementation, Calibration, and Case Study*. In: Operations Research, 1975, 23, No. 4, p. 656-673.

⁴²⁶ According to Google Scholar (1.8.2017), his article "*Models and Managers...*" was quoted 1,556 times. The first part of the BRANDAID article was called 316 times and the second part 68 times.

However, the GROOVY model and also Little's modeling requirements were a failure from this point of view, and I now hoped that Little with his BRANDAID model could still deliver something useful. In this text, Little claims to have developed a general quantitative theory of sales quantity planning, which can be described by means of structural equations in the form of a sales-quantity-model. Like the BRANDAID model, the GROOVY model is also a sales-quantity-model with non-observation hypothesis equations. However, there are two main differences.

As mentioned the GROOVY model contains only one decision variable in the form of the advertising costs, while the BRANDAID model allows the use of several decision variables, of which the advertising costs are only one.

Above all, however, the BRANDAID differs from the GROOVY model in that it has an unusual model structure that was previously unknown to me from the literature. And Little does not point it out either that he has adopted this structural structure of a sales-quantity-model from another author. The sales quantity (SQ_p) to be planned is determined by the following hypothesis equation

$$SQ_p = SQ_0 \cdot e_1 \cdot e_2 \cdot \dots \cdot e_n \quad (93)$$

It is to be referred to as the multiplier hypothesis of the sales quantity. The peculiarity of Little's approach can already be seen in the structure of this hypothesis equation. To plan the sales quantity of an article (SQ_p), a reference sales quantity (SQ_0) is assumed that refers to a specific reference case (or "*reference conditions*"). The planning consists in the planning of certain variables, which Little refers to as sales influence indices with the designation "e". Their product of e_1 to e_n multiplied by the reference sales quantity gives the sales quantity (SQ_p) to be planned.⁴²⁷

The sizes e_1 to e_n , therefore, act as multipliers of the reference sales quantity. The sales quantity (SQ_p) is planned by planning the difference between SQ_p and the reference sales quantity (SQ_0), that is, by influencing these *sales influence indices* (or more informative "sales quantity multipliers") e_1 to e_n . Each of these *sales influence indices* is the peak value of a "submodel", so that the structural equations of a BRANDAID model, apart from the multiplier hypothesis (93) for determining the planned sales quantity (SQ_p), only occur in the submodels.

In the following, two submodels of the BRANDAID model will be discussed in more detail, namely the *advertising submodel* and the *price submodel*. The *advertising submodel* is characterized by the fact that it has (like the GROOVY model) only one decision variable in form of the advertising costs. The *price submodel* also has only one decision variable and (as the name suggests) this is the sales price.

After the treatment of these two submodels, the remaining ten submodels proposed by Little are briefly discussed. This is followed by an analysis of the entire structure of the BRANDAID model. The structure of its multiplier hypothesis of the sales quantity (93)

⁴²⁷ The name "*sales influence index*" will be used from now on. Little also uses the terms effect index, sales rate index, effect on reference sales, effect on sales rate, sales effect on brand sales influence (index), sales effect index, sales index, and only sales rate.

and the linking with the submodels via its *sales influence indices* are of particular interest. Finally, the question is asked, which problems might arise for a marketing manager, if he wants to make a subjective estimation of the parameter values of the hypothesis equations occurring in the submodels.

Structure of the BRANDAID advertising submodel.

Each submodel has a peak variable as described, which Little as mentioned calls *sales influence index* e . The *sales influence index* of a submodel is described in this by a so-called e-hypothesis equation. An e-hypothesis equation, which depends only on the model parameters of its submodel, is called a reduced e-hypothesis equation. In the case of the advertising submodel, Little uses the following e-hypothesis equation:

$$e(t) = \alpha \cdot e(t-1) + (1 - \alpha) \cdot r[a(t)] \quad (94)$$

However, the e-hypothesis equation (94) is not identical to the reduced e-hypothesis equation of the advertising submodel, because the advertising rate $a(t)$ occurring in it is an endogenous model variable described by the following NO-hypothesis equation

$$a(t) = h(t) \cdot k(t) \cdot x(t) / h_0 \cdot k_0 \cdot x_0 \quad (95)$$

The advertising rate $a(t)$ occurs in the form of an index, just as $e(t)$ in (94) is an index that acts as a multiplier. The advertising rate $a(t)$ depends on three model parameters, namely h - *copy effectiveness*, k - *media efficiency* and x - *spending rate*. The sizes $h(t)$, $k(t)$ and $x(t)$ refer to the plan period t . The corresponding values h_0 , k_0 , and x_0 refer to the reference case ("reference conditions") as do the reference sales quantities SQ_0 in the multiplier hypothesis of the sales quantity (93). The parameters of a BRANDAID model with the index "0" (such as h_0 , k_0 and x_0) are to be referred to as reference parameters, while the parameters that are corresponding to them are to be referred to with the time index t (such as $h(t)$, $k(t)$ and $x(t)$) are called plan parameters. In a BRANDAID model, they always appear as a pair in the quotient form " $P(t)/P_0$ ". The reference case ("reference conditions") will be identified more precisely later (s.p.264). And this applies to the reference sales quantity and the reference parameters that are assigned to such a reference case, as will be shown later.

Our initial goal is to determine the reduced e-hypothesis equation of the advertising submodel. It results from (94) and (95) with

$$e(t) = \alpha \cdot e(t-1) + (1 - \alpha) \cdot r[h(t) \cdot k(t) \cdot x(t) / h_0 \cdot k_0 \cdot x_0] \quad (96)$$

The *sales influence index* e thus depends on α times of its value of the previous period $t-1$. The effect exerted by the *advertising costs* x of the plan period t , i.e., $x(t)$, is only included in the *sales influence index* with a share of $1 - \alpha$. The *advertising rate* $a(t)$ in (94) is the independent variable of the *response function* $r[a(t)]$, whose dependent variable is r . Little comments on this response function: "Sometimes the response function is part of a more extensive structure, perhaps involving time lag and other phenomena." ⁴²⁸

⁴²⁸ Little uses the terms "response curve", "response function", "judgmental relation" and "response relation" synonymously. Since the term *response function* is the most frequently used by him, only it

This is exactly the case with the e-hypothesis equation of the *advertising submodel*.

A closer look at the reduced e-hypothesis equation (96) of the advertising submodel shows that it is not a structural equation that can be used to calculate a system of equations. This can be seen from the fact that the expression $r[h(t) \cdot k(t) \cdot x(t) / h_0 \cdot k_0 \cdot x_0]$ in (96) can also be expressed in the form

$$r(t) = F[z(t)] \quad (97)$$

with

$$z(t) = h(t) \cdot k(t) \cdot x(t) / h_0 \cdot k_0 \cdot x_0$$

$r = F[z(t)]$ is the response function, whose concrete functional course $F[\dots]$ Little does not describe with a structural equation.

In view of the e-hypothesis equation (96), a statement on the structure of all other hypothesis equations of the BRANDAID model should already be made. The reduced e-hypothesis equation (96) of the advertising submodel has the strongest structural differentiation of all the e-hypothesis equations of the BRANDAID model discussed by Little, although it is not a structural equation due to the hypothesis equation (97). This makes it possible to determine that all the e-hypothesis equations discussed by Little in his BRANDAID model are no structural equations.

This finding was extremely surprising for me and should have been a reason to give up working with the BRANDAID model. For my goal was only to find structural hypothesis equations that could have been incorporated into the model configuration system of the Integrated Target Commitment Planning. This goal was not achievable.

At that time, however, I decided to pursue Little's *Decision Calculus modeling* further and analyze it from the point of view of the Integrated Target Commitment Planning.

The reason for this was that Little's modeling approach, as will be reported in more detail later (s.p.283 and 289), is extremely well known. It is no exaggeration to say that the use of models in the field of managerial planning was and still is equated with the use of Little's *Decision Calculus models* by almost the entire scientific community.

Since I was also active in the field of *managerial models*, I wanted to thoroughly analyze Little's approach, regardless of whether the INZPLA-System benefits from it. And as it turned out later (s.p.293), in addition to my own surprise, an important insight for modeling and planning the sales area of an Integrated Target Commitment Planning came out.

Thus we turn again to the reduced hypothesis equation of the advertising submodel (96). In Little's GROOVY model, the ADBUDG sales-quantity hypothesis equation was a completely structured response function. In Little's BRANDAID model, however, the response function of the advertising costs $r[h(t) \cdot k(t) \cdot x(t) / h_0 \cdot k_0 \cdot x_0]$ is as mentioned not a structural equation. This is a step backward, and one might wonder why Little did not use the ADBUDG hypothesis equation (NN-H6) or at least another structurally complete re-

sponse function. He probably recognized this deficit later. In a supplement from 1981, he points out (with Lodish) that the ADBUDG hypothesis equation can also be used as a response function in the BRANDAID model.⁴²⁹ This should be done here. The result is the only completely structural equation of the slightly modified BRANDAID model

$$r(t) = (\max - \min) \cdot [h(t) \cdot k(t) \cdot x(t) / h_0 \cdot k_0 \cdot x_0]^\gamma / (\delta + [h(t) \cdot k(t) \cdot x(t) / h_0 \cdot k_0 \cdot x_0]^\gamma) \quad (98)$$

Structure of the BRANDAID price submodel. As already quoted, a BRANDAID model should enable a “marketing manager” to “make decisions about price, advertising, promotion”. If a BRANDAID model contains a *price* and an *advertising submodel*, then one would arrive at a sales-quantity hypothesis equation which, if inserted into a planning model with a profit target, would allow to “make decisions about price” and “advertising”. Therefore, what Little has to notice about such a price submodel will be investigated next.

Little’s price submodel consists of two equations. First, the hypothesis equation of the *sales influence index* $e(t)$, which is included in the multiplier hypothesis of the sales quantity (93). This is

$$e(t) = \Psi[x(t)] \cdot r[a(t)] \quad (99)$$

$r[a(t)]$ is the response function, whose explanatory variable $a(t)$ is replaced by

$$a(t) = z(t)/z_0 \quad (100)$$

This results in the reduced equation of the *sales influence index*

$$e(t) = \Psi[x(t)] \cdot r[z(t)/z_0] \quad (101)$$

z is the producer’s sales price (*manufactures brand price*) and z_0 is the *reference brand price*.

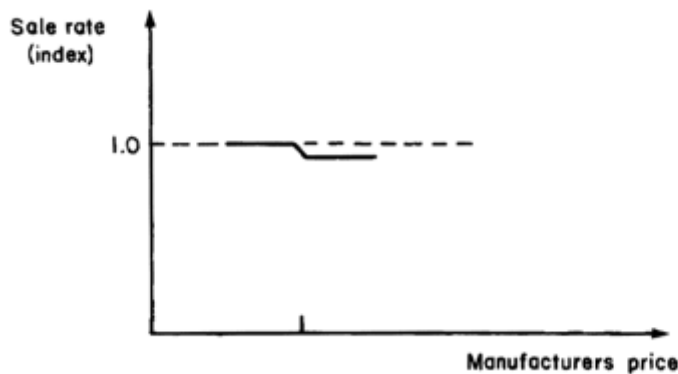


Fig. 56: Little’s example of the relationship between the manufacturer price of an article and its sales rate or sales influence index.

But what does the expression $\Psi[x(t)]$ in (101) mean? It is based on a certain assumption underlying Little’s model formulation. Little distinguishes between the *manufactures brand price* and the *retail price* of the retailer selling the item to consumers. $\Psi[x(t)]$ he

⁴²⁹ Little, D.C., Lodish, L.M. *Commentary on “Judgment Based Decision Models”*, in: Journal of Marketing, 45(1981), p. 29.

calls the "*additional effect of retail price-ending (index)*" What is meant by this is rather unclear to me, and so I quote the full explanation Little provides about this additional effect so that everyone can form its own opinion.

"For the most part, retailers take the wholesale price and apply a standard make up to set retail price. Consumer buying, however, is often considered subject to a price-ending effect whereby a shelf-price jump from 49 cents to 51 cents may produce a bigger loss than one from 51 cents to 53 cents." I can't see how this reference should lead to a certain course of $\Psi[x(t)]$. $\Psi[x(t)]$ is, therefore, neglected and we start with the reduced e-hypothesis equation

$$e(t) = r[z(t)/z_0] \quad (102)$$

Little points out, "*response curves can be either user supplied or built-in*". It would be of interest to learn which structural equation he uses in a "*built in*" version of the response function $r[z(t)/z_0]$.

The only information he provides on the course of an e-hypothesis equation of the *price submodel* is the course of the *sales rate* (or *sales influence index*) e in relation to the *manufactures price* as described in Fig. 56.⁴³⁰ Thus, it does not provide information about a structural equation of the e-hypothesis of the price submodel that can be integrated into a model configuration system.

Construction of other BRANDAID submodels. So far, two response submodels of Little's BRANDAID model system have been described, the advertising and price submodel. However, as already mentioned above, little's BRANDAID model system is intended to provide a general hypothesis system for the development of sales-quantity-models as "*an expansion of ADBUDG*".

An initial overview is provided in Fig. 57, in which little distinguishes between 24 types of *sales influences*. In his opinion, twelve of these sales influences can function as a *sales influence index* of a *response submodel*. But he describes none of these response submodels by structural equations. Although he formulates e-hypotheses for four areas, these are not structural equations. And in my opinion they work with such unclear non-observation variables that they are irrelevant to someone like me who intended to use them as structural equations of a model configuration system.

The four submodels describe the areas of promotion, salesman, competition and retail distribution. Below are the e-hypotheses of these four areas cited by Little.

Of course, these equations alone do not allow to understand my judgment that they are completely unsuitable for a model configuration system of an annual operational planning, but they could at least serve as a starting point for a reader to form his own judgment.

e-hypothesis equation *promotion*

⁴³⁰ The vertical line on the abscissa probably indicates the price of the reference case.

$$e(t) = e_0 \{ 1 + \sum_p l_p r_p [a_p(t_p)] [q_p(t - t_p) - 1] (1 - b_p) \}. \quad (103)$$

e-hypothesis equation *salesman*

$$e(t) = \alpha e(t-1) + (1 - \alpha) r(d). \quad (104)$$

$$\hat{d}(t) = \beta \hat{d}(t-1) + (1 - \beta) a(t).$$

$$a(t) = h(t) k(t) x(t) / h_0 k_0 x_0.$$

e-hypothesis equation *competition*

$$e_b(i, t) = e'_b(i, t) - \sum_{c \neq b} [s_{0c}/s_{0b}] \gamma_{bc}(i) [e'_c(i, t) - 1]. \quad (105)$$

e-hypothesis equation *retail distribution*

$$e(t) = r[d(t)]. \quad (106)$$

$$d(t) = d_0 \prod_{k,D} e(k, t).$$

Sales influences	Model options	
	Direct index	Response submodel
Manufacturer's control variables		
M1. Product characteristics	✓	
M2. Price	✓	✓
M3. Advertising	✓	✓
M4. Consumer promotion		
(a) Price-off	✓	✓
(b) Sampling	✓	✓
(c) Coupons	✓	✓
(d) Premiums	✓	✓
(e) Other	✓	
M5. Trade promotion		
(a) Price-off	✓	✓
(b) Other	✓	
M6. Salesman effort	✓	✓
M7. Package		
(a) Graphics and function	✓	
(b) Assortment	✓	
M8. Production capacity	✓	✓
M9. Other	✓	
Environmental influences		
E1. Seasonality	✓	
E2. Trend	✓	✓
E3. Other	✓	
Retailer activities		
R1. Availability	✓	✓
R2. Price	✓	
R3. Promotion	✓	
R4. Advertising	✓	
R5. Consumer sales at fixed distribution		✓
R6. Other	✓	

Fig. 57: Response submodels of the BRANDAID model system

Thus including the advertising and price submodel six of the sub-models listed in Fig. 57 are described by more or less informative e-hypothesis equations. The other submodels mentioned there are described by Little only briefly verbally or not at all.

Some submodels, of which one learns nothing, except their names listed in Fig. 57, seem

extremely strange. One example is the "*M8 Production capacity*" submodel. It should be a submodel containing a decision variable (*manufacture's control variable*).

How should one imagine its output size, i.e., its "*sales influence index*" e ? In operational planning models, the capacity of a production area for the planning period is usually assumed to be an uncontrollable basic parameter and thus used as a capacity constraint for the optimization with certain decision variables. In principle, it could also be used as a decision variable, but then it would have an influence on the costs. However, costs except the advertising costs play no role at all in Little's sales-quantity-models. Therefore, the significance of the submodel called "*M8 Production capacity*" is highly questionable if nothing more is said about it than the text in Fig. 57.

To put it plainly: the list of response submodels in Fig. 57 is an imposition in view of what is said about them with regard to their use as "*response submodels*" in the form of structural equations. The BRANDAID model is designed by Little as a *managerial model*. According to him, it is a "*flexible on-line model*" whose relationships should also be available "*built in*".⁴³¹ In my opinion, such a system cannot work without structural equations. Little, however, does not advance to these structural equations, which should be found in such submodels.

Little's BRANDAID hypothesis system in a general view. It has already been pointed out that Little works in his BRANDAID model with hypotheses that are highly unusual. As described, the SQ_p sales quantity to be planned is determined by multiplying a reference sales quantity SQ_0 with the *sales influence indices* $e_1, e_2, \dots$. The BRANDAID modeling always assumes the existence of a reference case ("*reference conditions*"), which is characterized by the fact that a certain reference sales quantity (SQ_0) and certain reference parameters are "assigned" to it. The reference sales quantity acts as an explaining variable in the multiplier hypothesis of the sales quantity (93), while the reference parameters $P^1_0, P^2_0, \dots$ occur as hypothesis parameters in the hypothesis equations of the submodels. An important structural characteristic of a BRANDAID model is as already mentioned that each reference parameter corresponds to a plan parameter and this parameter pair always appears in the hypothesis equations as quotients of the form " P_p/P_0 ".

This can be seen, for example, in the response function (96). The reduced sales-quantity hypothesis equation of a BRANDAID model, therefore, has the general form

$$SQ_p = SQ_0 \cdot e_1(P^{11}_p/P^{11}_0, P^{12}_p/P^{12}_0, \dots, P^{1n}_p/P^{1n}_0) \cdot e_2(P^{21}_p/P^{21}_0, P^{22}_p/P^{22}_0, \dots, P^{2m}_p/P^{2m}_0) \cdot \dots \quad (107)$$

Everything Little has to say about the reference case, and its reference variables can be read from the following sentence: "*a set of reference conditions are defined, usually from sales and marketing activities in the recent past*". The term "*reference*" is used by Little in the terms *reference variable*, *reference sale*, *reference price* or *reference advertising*

⁴³¹ Strangely enough, Little doesn't say a single word about this computer-supported "on-line" use of the BRANDAID system and the problems that arise.

rate 53 times, but in my opinion, it is not clear what status these "reference case variables" have in the model.

A marketing manager who is responsible for determining the parameter values of a response function $e = F(P^1_p/P^1_0, P^2_p/P^2_0, \dots, P^n_p/P^n_0)$ may have some difficulties in view of these definitional ambiguities. The parameter coefficients P_p/P_0 in (107) are always rate variables due to their definition and the same also applies to the *sales influence indices* e . In addition, it is aggravating that the *sales influence indices* e are always non-observation variables and this almost always also applies to the rate sizes (P_p/P_0) .⁴³²

A marketing manager who is nevertheless willing to make such an estimate in view of this ambiguity of definition and the non-observability of the *sales influence indices* and almost all parameters of a response function $e = \dots$ can only be admired.

Model-based reconstruction of the BRANDAID model

Little's comments on the structure and semantics of his BRANDAID model seemed so unclear to me that I considered it necessary to carry out a model-based reconstruction of his approach. His term *reference conditions* (reference case) is particularly unclear. Little's text shows only that the reference sales quantity and the reference parameters are "somehow" assigned to the reference case. Little points out that the *reference conditions* originate from the "*recent past*". This means that the reference sales quantity and the reference parameters "*are defined... in the recent past*". From a model-theoretical point of view, such a temporal designation of quantities that should occur in a model is unacceptable. This is because a sales quantity such as SQ_0 must always be assigned to a period, and this period must be defined in the time system used for the model in question. The same applies to a reference parameter such as the advertising costs x_0 in the NO-hypothesis equation (96).

Instead of the unclear term "*recent past*", we will, therefore, introduce the term reference period and since this should be "*recent*", the previous period of the planning period t , i.e., period $t-1$, is chosen. Little's notation of the time scripts will be changed now. The reference sales quantity assigned to the previous period and the reference parameters are now marked with the time index " $t-1$ " and no longer with " 0 ".⁴³³

The reference sales quantity is, therefore, assumed to be the planned sales quantity of the previous period $t-1$, that is, $SQ(t-1)$.⁴³⁴ What status should the reference parameters from this period have? They must be parameters that represent the parameters of the reduced equation of the sales quantity

⁴³² The same structural relations contain the five non-observation hypothesis equations of the SONAL model developed by Albers which will be discussed later in Fig. 58. Its explanatory variables z_1 to z_5 and explained variables e_1 , e_2 , e_3 , RAG, and RDG are also not observable rate variables, which must be estimated.

⁴³³ As mentioned, Little uses the term "reference" 53 times. However, I introduced the term "reference period" instead of "*recent past*". The same applies to the two reference terms "*reference sales quantity*" and "*reference parameters*" which are not used by Little.

⁴³⁴ One could also assume that $SQ(t-1)$ is the actual value of the previous period. The necessary reconstruction of the reference variables as actual values of an ex-post hypothesis equation, which explains the actual value of the sales quantity $SQ(t-1)$ (ex-post), fails, however, because the parameter values P_1 , $P_2, \dots$ are almost always non-observation values. They, therefore, have no actual value.

$$SQ(t-1) = F(P^1, \dots, P^n)$$

But how should this previous period model with the reduced sales quantity equation be structured? It should have the same structural equation as the reduced sales quantity equation for the current period t . Such a case exists, for example, in the linear price-sales-quantity hypothesis equation, if their structural equation for planning SQ would apply to both period's t and $t-1$, that is

$$SQ(t) = P_1 - P_2 \cdot SP$$

$$SQ(t-1) = P_1 - P_2 \cdot SP$$

The values of the parameters (P_1 , P_2 , and the sales price SP) can differ from each other in the two periods; only their structural relationship should be the same.

It is, therefore, questionable whether the multiplier hypothesis of the sales quantity (93) could be traced back to two structurally identical reduced sales quantity equations of periods t and $t-1$ on the basis of Little's comments on the "*reference conditions*" of the "*recent past*". This would bring us back to a "normal model formulation."

A general representation of the two sales quantity equations of $SQ(t)$ and $SQ(t-1)$, which should be derived from Little's multiplier hypothesis, would have the form

$$SQ(t) = F(P^1, \dots, P^n) \quad (108)$$

and

$$SQ(t-1) = F(P^1, \dots, P^n) \quad (109)$$

In such a case, you could then plan the sales quantity $SQ(t)$ using only the hypothesis equation (108), i.e., a "normal" hypothesis equation" of the sales quantity SQ . This is because some of its parameters P_i are controlled variables such as the sales price or the advertising costs, which in Little's model formulation for determining the planned sales quantity $SQ(t)$, i.e. the multiplier hypothesis (93), always originate from a submodel.

But why doesn't Little use a "normal" sales quantity plan model or its reduced price-sales-quantity hypothesis equation (108) to plan the sales quantity $SQ(t)$ or, as in his GROOVY model, to plan an article contribution margin dependent on this sales quantity?

Only Little can answer that question himself. He doesn't say a word about it in his text. One can only make an assumption. As will be described later, Little proudly points out (s.p.268) that with his multiplier hypothesis (93) up to twelve well distinguishable *sub-models* can be formulated in an elegant and novel way, which also could be complemented by further submodels, i.e., the ideal of a model development. He could be of the opinion that this modular model design can only be formulated so elegantly if the sales quantity to be planned is described using his multiplier hypothesis (93). This would at least be a plausible reason for using this strange hypothesis equation.

In order to convert the structurally reduced multiplier-sales-quantity hypothesis equation of a BRANDAID model into the "normal" hypothesis equations of a sales quantity for periods t and $t-1$, a general deduction procedure is required. However, such a procedure is not feasible.

This should be demonstrated by simplest form of Little's multiplier-sales quantity hypothesis equation. It consists in form of the, however not very plausible, hypothesis, in

which the sales quantity in the period $SQ(t)$ is the product of a quotient $P(t)/(P(t-1))$ with $SQ(t-1)$, where $P(t)/(P(t-1))$ according to (107) corresponds to the values of a parameter P in the periods t and $t-1$. This results in

$$SQ(t) = SQ(t-1) \cdot P(t)/P(t-1)$$

The question arises how two structurally identical hypotheses of the sales quantity SQ in the periods t and $t-1$, i.e.

$$SQ(t) = \dots$$

and

$$SQ(t-1) = \dots$$

can be deduced from this hypothesis equation? The answer is: It's impossible to deduce a normal and structural identical form of a hypotheses equation for $SQ(t)$ and $SQ(t-1)$. If you agree, the question arises what consequences does this have for Little's multiplier hypothesis equation? The answer is: None. One can only note that Little has formulated an (at least for me incomprehensible) "incremental hypothesis" with his multiplier hypothesis of the sales quantity (93), which cannot be reconciled with the usual formulation of hypothesis equations in forecast models.

Karl Popper would say: *"Such a derivability you tried to realize plays no role in the acceptance of Little's hypothesis; the only decisive criteria is that the reduced sales quantity hypothesis of a BRANDAID model can be falsified. And if a marketing manager develops a system of hypothesis equation according to the structure of the BRANDAID model, then such a falsifiable hypothesis equation can apparently be determined."*

One could now point out to Karl Popper under which "macabre" circumstances a marketing manager must determine the parameter values required to forecast the sales quantity of a BRANDAID model. *"The marketing manager must determine the value of the "reference sales quantity" without knowing what is meant by "recent past". He has to define the values of reference parameters, most of which cannot even be observed and are not clearly defined. But not only that: he must also determine the values of the unobservable plan parameters of a series of non-observation hypothesis equations, in which the model parameters always occur in the form $P(t)/P_0$ ". Isn't that absurd?"*

Popper's answer would be: *"That's the marketing manager's problem, whether he's willing to go along with it. It is only decisive to repeat that Little's hypothesis equation of the sales quantity can be falsified. And the success of the forecast shows how good it was. It, therefore, depends solely on the marketing manager whether he is willing to make the necessary estimates."*

And the master is right. However, if I were a marketing manager, I would know how I would react if Little or one of his followers wanted me to estimate the values of the hypothesis parameters and the values of the non-observation variables of the non-observation hypotheses of a BRANDAID model.

With his two criteria for checking hypotheses, i.e., the criterion of falsifiability and the criterion of forecasting success, Popper allows an unlimited formulation of (falsifiable)

hypothesis equations. The question is, however, whether a certain pre-selection would not be appropriate with regard to the hypotheses to be examined.

Little's multiplier hypothesis equation of the sales quantity (93) seems very questionable to me and precisely because it is so immensely attractive. Hundreds of empirically verifiable hypotheses can be formulated, but they should already have a certain plausibility. Otherwise, it's like Professor B. in the following story.

Professor A and Professor B meet at a congress. The following conversation unfolds:

A: *"With what do you concern yourself, Mr. Colleague?"* B: *For ten years I have been studying the influence of the constellation of Jupiter on the sexual behavior of guinea pigs. I have formulated and checked various hypotheses.* A: *Oh, that's very interesting. And what did you find out?* B: *There is no connection.* A: *What a pity that none of your hypotheses have worked. Why don't you try Mars?* B: *I've thought about that, too. I still have ten years until I'm retired.*

Submodels are desirable. Little's assumption that there are (up to twelve) submodels that can be formulated separately, but which are nevertheless integrated into the overall model as peak variables via their *sales influence indices* (e) has something fascinating about it. The goal of every system analysis is to find subsystems (and thus descriptive submodels) that are as well encapsulated from each other as possible, whose minimal interfaces nevertheless allow an adequate description of the existing interrelationships.⁴³⁵ This was an important design criterion in the development of the hyperstructure model of a standard cost-performance accounting, and I had some difficulty in designing certain types of area models (i.e., submodels) of the cost centers, which are connected to the other area models (sub-models) solely via so-called order quantity-price relationships. The fewer order quantity-price relationships between the area models, the better the encapsulation. Unfortunately, however, there is usually a whole number of order quantity-price relationships between these area models, whose connections are necessary to determine the top target of the planning, i.e., the operating result.

In the case of the BRANDAID model, on the other hand, ideal "subsystem conditions" are present. All submodels have no input variables from other submodels and only one output variable in the form of the *sales influence index* (e), which is included in the multiplier hypothesis of the sales quantity (93). Little is aware of this by writing: *"The structure is modular so that individual decision areas can be added or deleted at will."* And he highlights the novelty of his submodel approach by noting *"notable difference from previously published works are"...* *"a dedication to modularity and flexibility."*

The question arises: Somehow, these submodels must be related to each other. The answer is that the interactions between the submodels come about through their *sales influ-*

⁴³⁵ The determination of submodels that have a minimum of connections with the other submodels of the entire model can be carried out by determining a minimal feedback structural matrix of the entire model. See: Zwicker, E., *Simultaneous and recursive planning models: Structure, semantics and application*, Berlin 2003, p.4, www.lnzpla.de/IN25-2003c.pdf. (Text in German, title translated).

ence indices in the multiplier hypothesis of the sales quantity. Little is fully aware of this. Therefore, he remarks. "*The use of a multiplicative form in (93) implies a specific assumption of marketing effects...*"⁴³⁶ He describes this effect using an example: "*thus a 20 percent improvement of each of two sales indices implies a 44 percent increase of sales ($1.2 \cdot 1.2 = 1.44$)*". And he continues: "*This form on interaction is automatically built in.*"

I consider this "*specific assumption about the interaction of marketing effects*" rather questionable. It applies between the sales influence indices of all twelve response submodels listed in Fig. 57, whose structural equations are still outstanding, however.

If Little had provided the structural equations for at least two submodels, such as the *advertising* and *price submodel*, with a numerical example, then an exploratory analyses of the "*interaction of marketing effects*" underlying this hypothesis would have been possible. For example, it would have been possible to generate a series of iso-sales quantity curves using the advertising costs and the sales price as coordinate sizes. If the marketing manager considered these iso-sales quantity curves as utterly absurd, then a conflict would arise between the multiplier hypothesis and its implications in the form of these iso-sales quantity curves.

As already described in the discussion of *judgmental balancing* (s.p.256), the subjective credibility of a conclusion should have the same weight as the subjective credibility of its premise. However, if there is a credibility difference between a premise and its conclusion, the premise and here the multiplier hypothesis should be modified within the framework of judgmental balancing until it, and its conclusion in question have the same credibility. It would have been interesting to check the BRANDAID model with such an "implications acceptance analysis". However, as already mentioned Little does not deal with such *judgmental balancing*, which in my opinion is an important procedure for the examination of *mental equation models* and should not be ignored in such a fundamental and groundbreaking contribution.

Judgmental parameter estimation in the BRANDAID and GROOVY model. Thus, the structural equations of Little's GROOVY model and the uncomplete structure of the BRANDAID are discussed.

However, such a model development is only the first step towards the realization of the Decision Calculus Concept. The second step consists of the subjective estimation of the model parameters by the responsible managers, i.e., the *judgmental parameter estimation*. The necessity of such an estimation has already been pointed out, and it has been shown (see Fig. 55) how the parameters of an ADBUDG hypothesis equation can be determined by an "intelligent" *judgmental calibration mechanism* in a manager-friendly way according to Little's proposal.

In the following, this procedure of judgmental parameter estimation as a second step of the creation of a Decision Calculus model shall be summarized and appreciated.

As an example, it is assumed that a BRANDAID model was developed in a company whose structural equations correspond to the mental model of the marketing manager responsible for it. This model also includes the e-hypothesis equation (98) of the advertis-

⁴³⁶ The numbering of the formula refers to this text. In the original, reference is made to (4).

ing submodel. As mentioned Little develops only one more strongly structured e-hypothesis equation for the advertising submodels (96). It is the most structured of his e-hypothesis, but it is no structural hypothesis equation. However, it can be concretized into a complete structural equation by using the ADBUDG hypothesis equation for $r[\dots]$, which has already been inserted into the hypothesis equation (98). It results from the insertion of (95) into (93)

$$e(t) = \alpha \cdot e(t-1) + (1-\alpha) \cdot \{(\max - \min) \cdot [h(t) \cdot k(t) \cdot x(t) / h_0 \cdot k_0 \cdot x_0]^\gamma / (\delta + [h(t) \cdot k(t) \cdot x(t) / h_0 \cdot k_0 \cdot x_0]^\gamma)\} \quad (110)$$

and thus represents a reduced, fully structured e-hypothesis equation of the advertising sub-model.

Based on the reduced e-hypothesis equation (110) it shall be shown what the marketing manager has to expect when it comes to subjectively estimating the parameters of this hypothesis equation as parameters of his *mental model*. To determine all parameters and initial values of this e-hypothesis equation of the advertising submodel, the marketing manager must subjectively estimate the numerical values of four initial values and seven parameters in the step described by Little as *calibration*.⁴³⁷ The determination of these *judgmentally estimated parameters* seems to me to be the main problem of all *managerial models*, which are to be developed according to Little's ideas with his Decision Calculus Concept.

How does the estimate work in detail? Equation (110) is a dynamic hypothesis equation since the *sales influence index* $e(t)$ depends on its delayed value $e(t-1)$. Therefore, the marketing manager must estimate this previous period value of the non-observation value e , i.e., $e(t-1)$, but not enough, he must also estimate the parameter α , which states with what proportion the previous period value influences the *sales influence index* of the planning period. Imagine you are asked to make such an estimate. Actual values are not available for either variable.

But also the estimation of the parameters in the expression $\{\dots\}$ is not quite easy. It describes the reduced equation of three hypotheses and two definitions. In order to be able to carry out the estimation of the parameters of these hypotheses with the aid of a computer within the framework of a judgmental calibration mechanism, these hypotheses have to be worked through separately.

The response function underlying the e-hypothesis equation (96) is as described an ADBUDG hypothesis equation of the form

$$r = (\max - \min) \cdot [z_1]^\gamma / (\delta + [z_1]^\gamma) \quad (111)$$

Its explaining variable z_1 is a non-observation quantity described by the following (proportional) NN-hypothesis equation

$$z_1 = p_1 \cdot z_2 \quad \text{NN-hypothesis equation [rate]} \quad (112)$$

with

$$p_1 = h(t) / h_0 \quad \text{Definition equation [rate]}$$

⁴³⁷ These are the four initial values $e(t-1)$, h_0 , k_0 , x_0 and the seven parameters α , $\max$, $\min$, γ , δ , $h(t)$ and $k(t)$.

z_2 again depends on the following NO-hypothesis equation:

$$z_2 = p_2 \cdot z_3 \quad \text{NO-hypothesis equation [rate]} \quad (113)$$

with

$$p_2 = k(t)/k_0 \quad \text{Definition equation [rate]}$$

and z_3 results with

$$z_3 = x(t)/x_0 \quad \text{Definition equation [rate]} \quad (114)$$

As described by Little, sizes h and k are referred to as *copy effectiveness* and *media efficiency*. Since variables called *effectiveness* and *efficiency* describe the relation of an effort variable to a yield variable by definition, i.e., are indices or rates, the increases p_1 and p_2 of the two proportional hypothesis equations z_1 and z_2 are the rates of change of two indices or rates.

In a computer-assisted judgmental calibration mechanism, the equations listed shall be submitted to the marketing manager for his subjective parameter estimation in the order (114) - (113) - (112) - (111). Only x_0 , that is, the advertising costs of the previous period in (114), are actual values that can be taken from the operational systems. The size $x(t)$ in (114), that is the advertising costs of the upcoming planning period is a decision variable that must be determined within the framework of the upcoming planning (for example, by maximizing the article contribution margin).

In the ADBUDG hypothesis equation of the GROOVY model (NN-H6), the dependent variable *unadj-share* and the independent variable *wtd-adv* are unobservable flow variables. In the ADBUDG hypothesis equation (NN-H6) of the BRANDAID model, the dependent variable *unadj-share* and the independent variable *wtd-adv* are also non-observation variables, but unlike the GROOVY model, they are not flow variables but rates. The marketing manager must, therefore, specify the functional course between two unobservable rate parameters. The same applies to the hypothesis equations (112) and (113).

This should not be very easy for a marketing manager. On the problem of calibration, Little notes: "*exclusive reliance on previous data bases will usually be misleading; the calibration task is to estimate what is going to happen, not what has already happened.*"⁴³⁸ In view of the described advertising submodel, one can notice that there are no *previous data* for the non-observation hypothesis equations used there, with which one can estimate the values of their hypothesis parameters.

As mentioned Little remarks in his BRANDAID text, "*response curves can be either user-supplied or built in.*" The term user-supplied probably also means that the user can specify the course of a response function graphically with the help of a computer. This was not mentioned in his first text "*Models and Managers...*", the original propagation of his concept. I consider such an individual input of the graphical course of response functions of univariate functions to be very useful.

Forrester has already used so-called *table functions* in the form of polygon courses in his

⁴³⁸ Little, J. D. C. *BRANDAID: A Marketing-mix Model*, Part 1, op., p. 631

System Dynamics models. An online entry of such function courses can be integrated into a model configuration system without difficulty.⁴³⁹ Even if Little would explicitly prescribe this, it does not change the basic problem of the Decision Calculus Concept, and that is the numerical determination of parameters of non-observation hypothesis equations by the responsible marketing manager.

Nine years after his GROOVY text, Little seems to have some concerns about performing a parameter calibration. In his 1981 supplement (with Lodish) he reports that in his application experiments *"the response curve trends to jump around if the ADBUDG calibrations questions are reanswered from period to period."* He continues (with Lodish): *"It is very important to maintain limits because we find that, when the time comes for calibration, people become overly fatigued if there are too many detailed judgments to be made."*

One can only agree with that. The "limit" could already be reached by the marketing manager's exhaustion if, as in the case described, four initial values and seven hypothesis parameters of the e-hypothesis equation (110) of the BRANDAID-advertising response model have to be determined. Whereby this is only one of the e-hypothesis equations from the maximum of twelve possible response models cited by Little.

The main problem can be identified by the following question: Which manager would be willing of letting the concrete courses between *unobservable flow variables* or even *unobservable rates of flow variables* elicit from his brain, where they (perhaps) have so far remained in a latent slumber existence?

That is a factual question. Personally, I would know how to answer it for myself. Identifying the *mental models* of managers is basically a reasonable procedure. As described, nothing else is done in the system of the Integrated Target Commitment Planning. However, it is true: what is not in the head of a manager cannot be elicited from him even with the most ingenious methods.

When I worked as a programmer at IBM's Hamburg office during the semester vacation (s.p.17) in 1962, Thomas J. Watson, IBM's first CEO, brought a brief message to his employees in the entrance area. On a not exactly small poster attached to a wall, only one word was displayed in large font: **THINK.**

One day later someone (I knew who it was) had someone artfully written in the same writing, size, and color: **I can't.**

If Little had hung a poster on his office door to promote and label his Decision Calculus Concept, on which only the word **Estimate** could have been read, then it would not have been surprising if the following supplement had been found soon afterward: **I can't.**⁴⁴⁰

⁴³⁹ Almost anything could be done analytically with a model that contains a table function. Sensitivity analyses could be carried out, and also optimizations using search methods. With the help of binary optimization methods, it may even be possible to determine global extreme values.

⁴⁴⁰ Students often comment on the posters of professors. This was also true for my postings. Only the following story is worth telling: A professor of the London School of Business had posted the following message on his notice board: *"Hereby I take the liberty of announcing that I have been appointed Her Majesty Queen Elizabeth II's personal advisor"*. The next day, the message was supplemented by a handwritten message: *"God save the Queen."*

Little's Follower: The SONAL-Model

To my regret, Little's texts did not provide me with new insights that would have served the further development of the INZPLA-System. This applied both with regard to his methodical requirements for building managerial models and with regard to the possibility of integrating certain structural relationships of his GROOVY or BRANDAID sales-quantity-model into the INZPLA-model configuration system.

As already mentioned, this goal was the only reason to analyze Little's contributions, at least at the beginning. One can perhaps imagine that I was somewhat disappointed not to have found anything "tangible" for me in Little's highly praised texts and above all no structural equations of sales-quantity-models that I could have incorporated "in good conscience" into the hyperstructure model of a one-year operational planning.

However, I kept looking. Finally, after I had already put Little's models "ad acta", in 1992, I found a sales-quantity-model that was not only structurally cleanly described but also had a comprehensible numerical example. It was the so-called SONAL model developed by Sönke Albers.⁴⁴¹

Albers is still one of the most proven experts in the field of sales response models. This can be seen, for example, in the last edition of the "state-of-the-art-work" *Handbook of Marketing Decisions*, where he published together with Mantrala a text with the topic *"Models for Sales Management Decisions"*.⁴⁴² Albers postulated the applicability of his model beyond the individual case and worked with ON-, NN- and NO-hypothesis equations in the sense of Little's method of hypothesis generation. Due to its clearly described structural equations, this model could easily have been included in the INZPLA configuration system as a possible sales-quantity-model.

I will briefly introduce this model below and explain why I did not integrate it into the configuration system. After this decision, I gave up trying to include sales-quantity-models in the INZPLA-System. This will be reported later.

Alber's SONAL model has the same structural features as the BRANDAID model. It works with Little's multiplier hypothesis, whose *sales influence indices* are the peak variable of certain submodels.⁴⁴³ The structural equations of the SONAL model are shown in Fig. 58.

The sales quantity (SQ) is multiplied from the product of the market volume (V) by the market share of the article in question (M). Therefore the market share (M) of an article (and not its sales quantity as with Little) results from the product of three *sales influence indices* e_1 , e_2 and e_3 with the market share of a reference size (M_0). This reference size,

⁴⁴¹ Albers, S., *Ursachenanalyse von marketingbedingten Ist-Soll-Deckungsbeitragsabweichungen*, in: ZfB (1992) 2, p. 199-223.

⁴⁴² Albers, S., Mantrala, M., *Models for Sales Management Decisions*, op. cit. This article exceeds all other contributions by its 47 pages.

⁴⁴³ Strangely enough, he does not quote Little's article *"Models and Managers..."* or Little's text on the BRANDAID model. He is thus a "hidden follower."

although dimensionless, must refer to a period. This is because the variables defining them - *company sales value* and *total market sales value* - are flow variables that refer to a reference period. Little used the waxy formulation "*recent past*" to indicate the timing of this reference period. Albers uses the no less vague phrase "*as before*". Such formulations cannot be satisfied for a model-based reconstruction. For this reason, Albers "as before sizes" are assumed to be the sizes of the previous period according to the reconstruction carried out at Little. Albers marks his "as before sizes" with the index "w". Following Little's notation, they are labeled with the index "0". The market share (M), which Albers described as a "as before size" with M_w , is, therefore, described by M_0 as shown in Fig. 58.

The indices e_1 to e_3 are the peak variables of the three submodels. They are inserted additionally in analogy to Little's representation of the submodels of a BRANDAID model. The same applies to sizes z_1 to z_5 , which were additionally inserted as explaining variables of the hypothesis equations (A3), (A7), (A9), and (A11) and (A13), because Albers did not explicate them.⁴⁴⁴

The sales-quantity-model contains three *response submodels* with five hypothesis equations (*response functions*). Fig. 58 shows whether the hypothesis equations are observation or non-observation hypothesis equations. The question is whether the *relative awareness degree* (RAD), the *awareness degree of the branch* (ADB), the *relative distribution degree* (RDG) and the *distribution degree* (DG) are observation or non-observation variables. Albers points out that market research institutions could investigate them.

That does not sound convincing to me. Fig. 58 assumes that they are non-observation variables. If a user sees himself in a position to define them (however) operationally, their status would change accordingly. However, Albers also deals with the case that only subjective estimates come into question, by noticing, "*those who cannot fall back on such investigations are dependent on their subjective assessments*". In order to "*explicitly provide*" the knowledge about the interrelationships to be modeled, Albers continues, "*I have developed the computer-supported system ERLAB, which enables a user-friendly setpoint planning on the basis of subjective estimates of interdependencies*". This is completely in the sense of Little's demand to develop of a judgmental calibration mechanism, whereby Little himself describes such a mechanism only in the form of his five questions for the calibration of the ADBUDG hypothesis equation (NN-H6).

Albers is obviously optimistic that a marketing manager will succeed in determining the parameter values of his SONAL model, i.e., the parameter values of the five hypothesis equations β , γ , a , b and c , with the help of his ERLAB system. However, an experience report has not yet been submitted, and a description of this ERLAB system is also not available. The quantities z_1 , z_4 , and z_5 are indirect observation quantities because they can

⁴⁴⁴ By removing these variables, you get back to the original SONAL equation model.

be clearly traced back to observation values via their definition equations.

Structural equation	Type of structural equation	Type of explained variable	Number
$SQ = M \cdot V$ $4.000 = 0,1 \cdot 40.000$	OO-Hypoth.	Flow Variable	(A1)
$M = M_0 \cdot e_1 \cdot e_2 \cdot e_3$ $0,1 = 0,09 \cdot 1,111 \cdot 0,9776 \cdot 1,022$	OO-Hypoth.	Rate	(A2)
$e_1 = (z_1)^a$ $1,111 = (0,9337)^{-1,53431}$	NO-Hypoth.	Rate	(A3)
$z_1 = R / R_0$ $0,9337 = 1,0 / 1,071$	Def-Equat.	Rate	(A4)
$R = SP / BP$ $1,0 = 420 / 420$	Def-Equat.	Rate	(A5)
$R_0 = P_0 / BP_0$ $1,071 = 450 / 420$	Def-Equat	Rate	(A6)
$e_2 = (z_2)^b$ $0,9776 = (0,87875)^{0,17474}$	NN-Hypoth.	Rate	(A7)
$z_2 = RAD / RAD_0$ $0,87875 = 0,10357 / 0,11786$	Def-Equat.	Rate	(A8)
$e_3 = (z_3)^c$ $1,022 = (1,06248)^{0,36425}$	NN-Hypoth.	Rate	(A9)
$z_3 = RDG / RDG_0$ $1,06248 = 0,11087 / 0,10435$	Def-Equat.	Rate	(A10)
$RAD = RAD_0 \cdot (z_4)^\beta / ADB$ $0,11786 = 0,11786 \cdot (0,75)^{0,449195612} / 280$	NO-Hypoth.	Rate	(A11)
$z_4 = AB / AB_0$ $0,75 = 150.000 / 200.000$	Def-Equat.	Rate	(A12)
$RDG = DG_0 \cdot (z_5)^\gamma / DBB$ $0,11087 = 48 \cdot (1,125)^{0,51471} / 460$	NO-Hypoth.	Rate	(A13)
$z_5 = DB / DB_0$ $1,125 = 450.000 / 400.000$	Def-Equat.	Rate	(A14)
Legend: SQ- Sales quantity M - Market share, V- Market volume R - Relative price, RAD - Relative awareness degree, RDG- Relative distribution degree, SP - Sales price, BP - Branch price, ADB - Awareness degree of the branch, DG - Distribution degree DBB - Distribution budget branch, DB - Distribution budget AB - Advertising budget, a, b, c, β , γ - Hypothesis parameters			

Fig. 58: Structural equations and other characteristics of the SONAL model

This allows their actual values to be calculated.⁴⁴⁵ All explained and explaining variables of the five hypothesis equations have as with Little the same dimension of a rate and are, therefore, not flow variables. In contrast to Little, all hypothesis equations (*response functions*) are clearly determined structurally in the form of an exponential function $r = x^p$. The numbers corresponding to the equations in Fig. 58 are taken from the numeric

⁴⁴⁵ See the "actual value status" of such variables: Zwicker, E., *Actual Cost-Performance Models: Structure, Semantics and Application*, Berlin 2008, www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated).

example of Albers. The model has three decision variables (*control variables*). These are the *sales price* (SP), the *distribution budget* (DB) and the *advertising budget* (AB).

It should be noted that all five hypothesis equations have the status of non-observation hypothesis equations because their explained variables are non-observation quantities. These non-observation variables, for which there are no actual values from the past, are always rate variables. A marketing manager who is supposed to estimate their parameter values with Alber's ERLAB system may have some difficulties.

It may be particularly difficult to estimate the parameters a and c of the e -hypothesis equations (A7) and (A9), since the explained and the explaining variables e and z are non-observation variables. An econometric estimation of the parameter values a , b , c , β , γ of the five hypotheses is not possible, since the actual values of the explained and the explanatory variables of the past periods are required.

Fig. 58 shows the course of the e -hypothesis equations, $e_1 = z_1^a$ and $e_2 = z_2^b$ with the parameter values used by Albers for his planning alternative. In addition, the progression of a hypothesis equation with another parameter value is inserted.

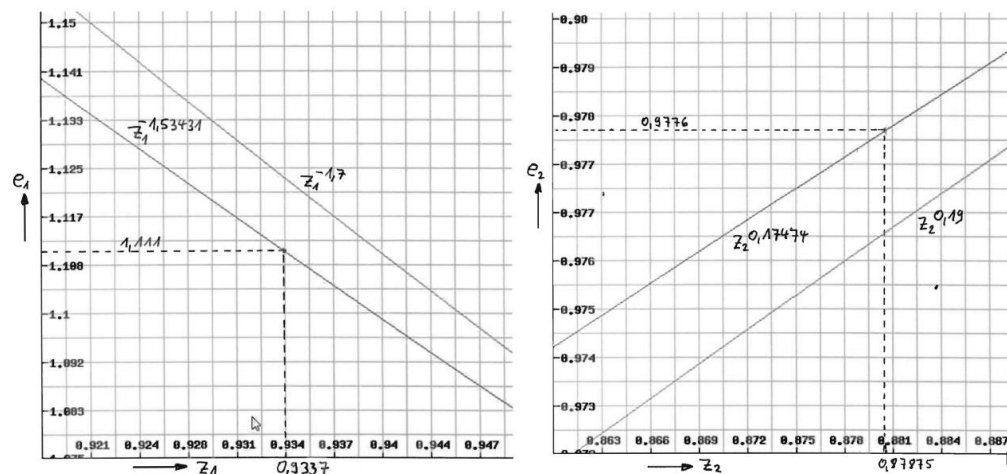


Fig. 59: Course of the e -hypothesis equations $e_1 = z_1^{-1.53431}$ and $e_2 = z_2^{0.17474}$ in the SONAL model

In contrast to Little's rather inadequate descriptions, there are no formal objections to Alber's SONAL model. It is structurally clearly described and the variables are marked in such a way that a user could see himself in a position to regard them as plausible.

However, plausibility is not enough. The acceptance of a model is decisive. As already mentioned for the GROOVY model (s.p.253), two criteria must be met. On the one hand, it is necessary that the marketing manager who is responsible for the planning with the sales-quantity-model has definitely accepted the structural equations as his *mental model* and is also prepared to estimate the numerical values of the parameters a , b , c , β and γ of the five hypothesis equations. A further condition, however, is that the model must also be applied and "proven" not only with one but also with as many users as possible.

Already during the discussion of the GROOVY model, it was pointed out (s.p.253) that the success of a model depends solely on its forecasting success. According to Albers the

SONAL model "comes from consumer electronics" and, according to this formulation, has apparently been used there.

Alber's description of the SONAL model took place *thirty-four years* ago, and the question of its probation could now actually be answered.

In order to get to the bottom of this, I would like to make a kind of offer. The English-language newspaper Daily Mail awarded a cash price (*Cross Channel Price*) of £ 1,000 for the first crossing of the English Channel by air in 1908. Following this tradition, I would also like to make such an offer:

The first company that contacts and informs me that it has used the SONAL model or another well-defined sales-quantity-model with at least the price and the advertising costs as a decision variable which is integrated with its annual operational planning in the frame of a cost-performance model (e.g., based on the SAP-CO system or Excel) receives a price (*Sales Model Application Price*) in the amount of thirty-four bottles of wine.

However, one prerequisite is that the model was used for at least two years (probation), that I can visit the company and have a detailed look at the software, the structural equations and the results in a text that can be called up here. ⁴⁴⁶

The SONAL model in the light of the Integrated Target Commitment Planning. Albers not only develops the structural equations of his SONAL model but also performs a planning with his model, which he calls *setpoint planning*. This planning is also followed by a variance analysis of the top target of its planning, namely the article contribution margin. With a variance analysis, he performs an "*actual- setpoint contribution margin variances*" of the SONAL article, as can already be seen from the title of his article. In the following, only his *setpoint planning* of the contribution margin (and not the variance analysis carried out by him) is described and then considered in the light of the Integrated Target Commitment Planning.

In order to be able to carry out a *setpoint planning* of the article contribution margin, Albers has extended the previously described sales-quantity-model by three structural equations which lead to the contribution margin of the SONAL article functioning as the peak variable of this extended "contribution margin model". These are the following equations:⁴⁴⁷

$$\begin{aligned} \text{ARCM} &= \text{SQ} \cdot \text{SP} - \text{AB} - \text{DB} - \text{TC} \\ 120.000 &= 4.000 \cdot 420 - 150.000 - 450.000 - 960.000 \end{aligned} \quad (\text{A15})$$

$$\begin{aligned} \text{UCP} &= \text{UCP}_0 \cdot (\text{SQ} / \text{SQ}_0)^\delta \\ 240 &= 250 \cdot (4.000 / 2.700)^{-0,1038615} \end{aligned} \quad (\text{A16})$$

$$\begin{aligned} \text{TC} &= \text{UCP} \cdot \text{SQ} \\ 960.000 &= 240 \cdot 4.000 \end{aligned} \quad (\text{A17})$$

⁴⁴⁶ The wine is an "Edelzwicker". The Edelzwicker is a blended wine that is no longer quite 'in'. But he is not completely 'out' either. One of the internet pages says, "If however a German bourgeois restaurant offers an Edelzwicker, you should not do without it".

⁴⁴⁷ The names of the model variables are changed compared to Albers.

ARCM - Article Contribution Margin, SQ - Sales Quantity, SP- Sales Price, AB - Advertising Budget, DB - Distribution Budget, TC - Total Production Cost, UCP - Unit Costs Production, δ - Parameters of the Unit Cost Hypothesis (A16)

Albers *setpoint planning* now consists of planning a setpoint of the article contribution margin. The question is which model parameters that can be influenced by the company should in Alber's view be used for this *setpoint planning*. Or to put it another way: which model parameters are changed within the framework of the *setpoint planning* in order to achieve the setpoint of the article contribution margin? In any case, these are the three, as Albers calls them, "*marketing instruments*", namely the parameters *sales price* (SP), *advertising budget* (AB) and *distribution budget* (DB). The planning should lead to certain "*setpoint values for the individual marketing instruments*".

In addition to these parameters, however, there is another group of parameters that can be used to achieve the planned setpoint contribution margin. These are the parameters of the hypothesis equations that connect the three, "*marketing instruments*" SP, AB, and DB with the *sales influence indices*, and are described by $e_1 = F(a, P)$, $e_2 = F(b, \beta, AB)$ and $e_3 = F(c, \gamma, DB)$. It is somewhat unclear whether, in Alber's opinion, these parameters should be used as parameters that can be influenced for planning the setpoint of the contribution margin. However, there is some evidence for it.

Albers describes in his text a situation in which it should be guaranteed that the "*setpoints for the market share M_s corresponds to that market share M_{sc} which results from the assumption of elasticities γ, β, a, b, c and the setpoints for the use of instruments.... Such inequality of $M_s \neq M_{sc}$ is likely to occur frequently, as it is very difficult to estimate the overall effect, i.e., M_s , as a product of the individual effects of the instruments. Then you are forced to adjust either M_s or the individual elasticities until $M_s = M_{sc}$.*"

	Marketing instruments			Hypothesis parameters					Top target
	SP	AB	DB	a	b	c	β	γ	ARCM
Set-point	420	150,000	450,000	-1.53431	0.17474	0.36425	0.449195612	0.51471	120,000

Fig. 60: Results of Albers' setpoint planning with the SONAL model

Here he describes an iterative adjustment method for planning a "setpoint" depending on parameters that can be influenced by the planner. This also includes the "*individual elasticities*" of the five hypothesis equations. If they were uncontrollable parameters, they could not be "adjusted", as Albers puts it, as part of a plan to achieve a *setpoint*.

This conclusion is also confirmed by Alber's remark that these elasticities can be changed by the same percentage with his ERLAB system within the framework of a computer-assisted target value analysis in such a way that a setpoint of the target value in question is achieved. However, this only makes sense if the parameters changed by the same percentage are variables that can be influenced and are not variables that cannot be influenced, such as an exchange rate.

The numerical values in Fig. 58 describe the result of Albers "*setpoint planning*". Fig. 60 shows the setpoint top target as the result of this *setpoint planning*, i.e., an article contribution margin of € 120,000. Furthermore, the figure contains the setpoints values of the

model parameters that are to be realized in order to achieve this setpoint value of the article contribution margin.

However, it is quite incomprehensible why Albers uses the market share (M) as the setpoint value in his iterative procedure of a *setpoint planning* and not the setpoint value of the article contribution margin (ARCM) because its setpoint value is ultimately to be planned as the top target of his contribution margin model.

Integrated Target Commitment Planning with the SONAL model. The question of how an Integrated Target Commitment Planning could proceed based on the Albers contribution margin model is now being investigated.

As in Albers planning procedure, the article contribution margin is chosen as the top target. The parameters that can be used in the context of the Integrated Target Commitment Planning to influence the article contribution margin are those selected by Albers and listed in Fig. 60. In order to examine their suitability as basic targets or decision variables of an Integrated Target Commitment Planning to be carried out with the SONAL model, a distinction is to be made between "hypothesis parameters" and "*marketing instruments*" as shown in Fig. 60.

To the hypothesis parameters. All five hypothesis equations of the sales-quantity-model are described by a function of the form $y = p_1 \cdot x^{p_2}$. The question is whether these hypotheses can be used as target commitment functions of an Integrated Target Commitment Planning with their hypothesis parameters p as basic targets. Let us look at the hypotheses of the *sales influence indices* e_1 to e_3 , for which $p_1 = 1$. They form one-parametric hypothesis equations, as is also the case with the cost hypothesis "*costs = proportional cost rate • employment*". This cost hypothesis is used as a target commitment function in the context of the Integrated Target Commitment Planning with the "proportional cost rate" as the basic target.⁴⁴⁸ It would, therefore, make sense to use the three e -hypotheses of the form $e = x^{p_2}$ in the same way as a target commitment functions. Its parameter p_2 would be a basic target, the amount of which the corporate management could negotiate with the sales manager.

If a basic target is agreed as a setpoint in an Integrated Target Commitment Planning, then this planning and control procedure requires that a setpoint-actual comparison is to be made with this basic target. It must, therefore, be possible to determine an actual value for this basic target. This is the case with the proportional cost rate commitment; because its defining variables, *costs* and *employment* are observation variables whose actual values can be determined. This allows you to determine the actual value of the proportional cost rate using the definition equation "*actual costs/actual employment*".

However, the three e -hypothesis equations are non-observation hypothesis equations, since the *sales influence indices* e are always non-observation quantities. Therefore, the actual value of the hypothesis parameter p_2 in $e = x^{p_2}$ cannot be determined. It is, there-

⁴⁴⁸ See line 3 in Fig. 2 on page 33

fore, not possible to determine the setpoint-actual variance $p_2^{SP} - p_2^{ACT}$, since there exists no actual value of p_2 . As a result, the parameters p_2 of the hypothesis equation $e = x^{p_2}$ cannot be used as basic targets for an Integrated Target Commitment Planning.

As described elsewhere (s.p.79), a setpoint-actual control can also be carried out at a higher aggregation level than the basic target level in question. The next higher aggregation level would be the e-level, i.e., the setpoint-actual control would have to be based on the setpoint and actual values of the *sales influence indices* (e). However, this is also not possible because the *sales influence indices* (e), as non-observation variables, do not have actual values and, therefore, a setpoint-actual control cannot be carried out at the e-level either. Therefore, the hypothesis equation $e = x^{p_2}$ cannot be regarded as a target commitment function.

However, you can also use the sales quantity level for a setpoint-actual comparison. In this case, the entire reduced sales-quantity hypothesis equation of a sales-quantity-model would have to be used as the sales manager's target commitment function. This case we will discuss later (s.p.292). However, the result is already anticipated: In my opinion such a case will not occur because a sales manager will not agree to comply with such a target commitment function.

For the hypothesis equations (A11) and (A12), whose parameters β and γ can also be interpreted as marketing efficiency parameters, their use as a target commitment function depends on whether the relative awareness degree (RAG) and the relative distribution degree (RDG) are measurable, which Albers does not exclude.⁴⁴⁹

The statement that the five non-observation hypothesis equations cannot be used as target commitment functions does not mean, however, that it is not possible to carry out "a planning" with them. It should be remembered that the subjective estimation of the parameter values by the marketing manager is only used to generate an empirically verifiable (reduced) sales-quantity hypothesis equation with the help of Little's already described empirical hypothesis generation procedure. Its structural form is in the case of the SONAL model:⁴⁵⁰

$$SQ = \frac{RAD_0^b \cdot BP_0^a \cdot DB^{c \cdot y} \cdot DG_0^c \cdot M_0 \cdot P^a \cdot V \cdot AB^{(b \cdot \beta)}}{ACB^b \cdot BP^a \cdot DB_0^{c \cdot y} \cdot DGB^c \cdot P_0^a \cdot RAD_0^b \cdot RDG_0^c \cdot AB_0^{(b \cdot \beta)}} \quad (A18)$$

This results in the reduced empirically verifiable sales-quantity hypothesis equation

$$SQ = PA1 \cdot DB^{PA2} \cdot P^{PA3} \cdot AB^{PA4}/PA5 \quad (A19)$$

with

$$PA1 = RAD_0 \cdot BP_0^a \cdot DG_0^c \cdot M_0 \cdot V$$

$$PA2 = c \cdot \gamma$$

$$PA3 = a$$

⁴⁴⁹ The measurability of the actual values of the other explanatory variables in the equations is assumed.

⁴⁵⁰ It was not determined by Albers.

$$PA4 = b \cdot \beta$$

$$PA5 = ADB^b \cdot BP^a \cdot DB_0^{c \cdot \gamma} \cdot DGB^c \cdot P_0^a \cdot RAG_0^b \cdot AB_0^{b \cdot \beta}$$

If the values of the 19 subjectively estimated parameters and the actual values of the reference variables are determined and on this base, the numerical values of the parameters PA1 to PA5 are calculated, then the empirically verifiable hypothesis equation of the sales quantity is obtained. In the light of Little's empirical hypothesis generation procedure, the five non-observation hypothesis equations and the twelve definition equations, i.e., the equations (A1) to (A17), which are necessary to determine the hypothesis equation (A19), could be deleted according to the maxim: "*The empirical hypothesis generation procedure has done its duty. We now continue to work solely with the generated empirically verifiable sales-quantity hypothesis equation (A19)*".

Using this sales-quantity hypothesis equation, the actual "planning" can then be carried out together with the equations (A15) to (A17). It consists of "planning" the article contribution margin by determining the values of the "*marketing instruments*" P, DB, and WB.

In fact, this is not the way to proceed; instead the planning is carried out using the original sales-quantity-model with equations (A1) to (A17). However, one should bear in mind that planning is actually, only acceptable based on the empirical hypothesis equation of the sales quantity (A18) implicitly contained in the equations.

To Alber's "*marketing instruments*". The five hypothesis parameters a, b, c, β and γ listed in Fig. 60 and used by Albers for planning are, as has been explained, not suitable as basic targets of an Integrated Target Commitment Planning.⁴⁵¹ We, therefore, turn to the three *marketing instruments* listed in Fig. 60.

			Planning values Albers	Result Bottom- Up-Optimization
Top target	Article contribution margin	ACB	120,000,- €	393,491,64 €
Decision- variable	Sales price	P	420,- €/Unit	694,43 €/Unit
	Distribution budget	DB	450,000,- €	109,765,22 €
	Advertising budget	AB	150,000,- €	45,954,75 €

Fig. 61: Comparison between the values of Albers' setpoint planning and a maximizing planning of the article contribution margin of the SONAL model

As described by Albers, they are used to plan a setpoint value for the article contribution margin (ARCM) as the goal of his *setpoint planning*. As Fig. 59 shows, his planning ex-

⁴⁵¹ As already mentioned, it is discussed on page 292 why this is as good as impossible even with a setpoint-actual control on the sales quantity level.

ample leads to a setpoint value of € 120,000, which was realized with the values of the five hypothesis parameters and the values of the three marketing instruments listed there. Albers' *setpoint planning* consists of specifying a setpoint value of € 120,000 for the article contribution margin and then in determining the amounts of his three marketing instruments and the five hypothesis parameters in such a way that this setpoint value is achieved. In the light of the Integrated Target Commitment Planning, Albers approach leads to a fundamental error.

The three "*marketing instruments*", i.e., the *own price* (P), the *advertising budget* (AB), and the *distribution budget* (DB) are decision variable in the light of the Integrated Target Commitment Planning. They would be used in a cost-performance model within the framework of an Integrated Target Commitment Planning to maximize the top target, i.e., the operating result. If one were to use the Albers model to carry out an Integrated Target Commitment Planning, then these three "*marketing instruments*" or decision variables would have to be used to maximize the article contribution margin. As mentioned Albers model does not contain any parameters that could be considered as basic targets of an Integrated Target Commitment Planning.

Therefore, no Target Commitment Planning could be carried out. However, the three decision variables in the model must in any case used to maximize the article contribution margin. It does not matter whether the model contains basic targets or not. In the context of the systematization of the different types of an Integrated Target Commitment Planning, this pure optimizing planning is a "degenerate type" of this planning procedure.⁴⁵²

Already during the discussion of the GROOVY model, I criticized Little for not pointing out in his planning example that it is necessary to maximize the annual article contribution margin contained in the GROOVY model by using the advertising costs as a decision variable. As described above (s.p.255), I could not find out whether Little maximized the GROOVY model because of his inadequate specification.

In the case of the SONAL model, however, this is possible because the structural equations are completely clear and the numerical application example of the model can be examined to see whether Albers has maximized the article contribution margin. As can already be seen from the description of his *setpoint planning*, this is apparently not the case. The "proof" is provided by Fig. 61, which shows the planned values chosen by Albers for his *marketing instruments* to achieve a setpoint of 120.000 € and the values that would have resulted from maximizing the article contribution margin with these *marketing instruments* (or decision variables of an Integrated Target Commitment Planning).⁴⁵³

Thus, the heretical question arises why Albers did not at least come up with the idea, in his example, that planning should be done in the form of a maximization (i.e., a maximizing planning) with the decision variables available to him.

⁴⁵² In the systematization of the types of an Integrated Target Commitment Planning in Fig. 40, on page 150 this case is indicated by row 3 and column 12. The "Integrated Target Commitment Planning" should, therefore, actually be called "Integrated Target Commitment and Optimization Planning".

⁴⁵³ The Excel representations of the SONAL model, which lead to the two alternatives, can be found at www.Inzpla.de/SONAL-Optimierung.pdf.

• A conversation with John D.C. Little

Preliminary remarks. It seems appropriate to say something about John D.C. Little before describing my conversation with him. Little was the first Ph.D. student to complete his doctorate in the field of Operations Research with a thesis on dynamic programming. The "queuing formula" $L = \lambda \cdot W$, which has gone down in literature as *Little's Law*, goes back to him. It states that the average number of customers in a queue (L) corresponds to the product of the average arrival rate of the customers (λ) with the average waiting time in the queue (W).⁴⁵⁴

He is the co-author of a text on the *traveling salesman problem*, in which the term "branch and bound" was introduced for the first time as a technique for solving the minimization of the distance to be covered by the traveling salesman. With this article, the algorithm was popularized.

However, his best-known work is his already mentioned contribution "*Models and Managers. The Concept of a Decision Calculus*". This article was awarded the title "one of the ten most influential papers published in *Management Science*".⁴⁵⁵ Larson assesses the importance of this article as follows: "A landmark paper for Little was '*Managers and Models. The Concept of a Decision Calculus*' (1970), whose concepts have been adopted and used world-wide"⁴⁵⁶. This publication by Little's and also the text on the BRANDAID model that further deepens his concept of the Decision Calculus Concept have led to the conclusion that Little "is considered to be a founder of marketing science".⁴⁵⁷

His contribution to the application of quantitative models in marketing was also acknowledged by the fact that the Institute for Operations Research and the Management Sciences (INFORMS) presents an annual John D. C. Little Award "to the best marketing paper published in *Marketing Science*, *Management Science*, or another *INFORMS* journal."⁴⁵⁸ His article "*Models and Manager...*", which he published in 1970, and which is discussed here was reprinted completely in the journal *Management Science* 34 years later, in 2004, because of its fundamental importance, i.e., the place of its original publication, a unique event in the history of this journal.⁴⁵⁹

⁴⁵⁴ Little, John D.C. *A Proof of the Queuing Formula: " $L = \lambda W$ "*, in: *Operations Research* 1961, 9(3) p. 383-387.

⁴⁵⁵ <https://www.informs.org/Explore/History-of-O.R.-Excellence/Miser-Harris-Presidential-Portrait-Gallery/John-D.-C.-Little> Internet, 4.7.2017.

⁴⁵⁶ Larson, Richard, C. IFORS Operational Research Hall of Fame John D.C. Little, in: *International Transactions in Operational Research*, 11(2004) p. 362.

⁴⁵⁷ www.informs.org/Explore/History-of-O.R.-Excellence/Miser-Harris-Presidential-Portrait-Gallery/John-D.-C.-Little

⁴⁵⁸ See: <https://www.informs.org/Recognizing-Excellence/Community-Prizes/Marketing-Science-Society/John-D.-C.-Little-Award> Internet 4.7.2017,

⁴⁵⁹ Little, John D.C. *Models and Managers: The Concept of a Decision Calculus*. *Management Science*, 2004, 50., No. 12 supplement, p. 1841-1853.

In 1989 Little was appointed "*MIT Institute Professor*".⁴⁶⁰ This is a title awarded to some twelve MIT scientists who are "*all world leaders in their field*."⁴⁶¹

One can imagine that I was not entirely unbiased in the expectation of meeting one of MIT's most renowned professors.⁴⁶²

However, I only wanted to talk to him about his *managerial models* to be developed according to the Decision Calculus Concept, and in that field, I already had a certain level of knowledge. It was the same state of knowledge that I described earlier in this text. Only I did not know the SONAL model from Albers at that time, because it was published later.

You prepare yourself for such a conversation. So I had already thought about what I would tell him if he asked me what I thought of his approach. If I had given him my free and frank opinion, I would have told him:

- that I consider his six requirements to create managerial models to be considerable trivialities that are of no use to anyone.
- that his contribution in "Models and Manager..." in my view consists only in allowing the formulation of non-observation hypothesis equations for the development of managerial models whose parameter values can be subjectively estimated by a manager. However, this procedure, which I have described as "Little's permission", can only be reconstructed with difficulty from his text.
- that not only from the point of view of the Integrated Target Commitment Planning but also from the decision theory as the relevant planning logic in the GROOVY model, a maximization of the "*cumulative contribution after advertising*" would be required. However, Little does not mention such a maximization with any word and does not consider it necessary later (1981) with a weak argument.
- that due to his insufficient description of the numerical planning example of the GROOVY model, I was not in a position to reconstruct it and, therefore, could not check whether he had carried out a maximization of the "*cumulative contribution after advertising*".

and finally

- that I consider the structural description of the BRANDAID model to be completely inadequate with regard to its use as a structural model of a model configuration system for planning sales quantities within the framework of a company's annual operational planning.

However, I did not do that, of course, but only resolved to ask three very modest questions.

⁴⁶⁰ Jay W. Forrester, about whom I reported in detail elsewhere and also about a meeting with him (see page 11), was also MIT Institute Professor.

⁴⁶¹ Larson, Richard, IFORS Operational Research Hall of Fame John D.C. Little, op. cit., p. 363.

⁴⁶² For the honors Little has received, see also: Hauser, John R., Urban, Glen L., Ed., *From Little's Law to Marketing Science: Essays in Honor of John DC Little*, MIT Press, 2016. A video recording of an interview with John D.C. Little about his work can be found under the title: "*Models and managers – from Little's Law to marketing science*", <https://www.youtube.com/watch?v=2TsFXgu4s7k> Internet 5.6.2017.

The Conversation. The conversation took place in April 1987. It all started with a mishap. My suitcase had not arrived when I landed in Boston and was not delivered until two days later. Therefore, I sat across from John D.C. Little in a less than respectable travel gulf while he was correctly dressed in suit and tie. However, he sympathetically assured me that this was common practice at Eastern Airlines and something similar had already happened to him.

The environment of our conversation also seems to me worth mentioning. His office with a view on the Charles River seemed pretty small to me. His secretary did not have a separate workroom but sat at her desk directly in front of the entrance to his room in an open interior area, in which further secretaries sat in front of the corresponding offices of his colleagues at their desks. Considering the staterooms in which some colleagues in Germany reside, who are not known to be distinguished by special expertise, I found this quite impressive. This was not about impressive knick-knacks.

The first question Little asked me was what I was so busy with. I then told him that I would develop equation models for the operational planning and control of companies and developed a software system that would enable interactive communication between managers as planners and the model in accordance with the requirements of his Decision Calculus Concept.

To awaken his interest, I told him that I reconstructed the budgeting example in Welsch's book *"Budgeting: Profit Planning and Control"* as an equation model and that this model includes a not inconsiderable number of equations.⁴⁶³ With such a model, the top and area managers could carry out their annual operational planning interactively.

My consideration was that if he knew of a budgeting system for an operational planning and control, then, in my opinion, it could only be the system developed by Welsch. It would have been a good starting point to talk about how this model has been able to meet his six requirements.

At that time, there was probably no larger equation model for a company, and after all, he had formulated his requirements for all *"managerial models"* and not only for his two sales-quantity-models consisting of a few equations. However, my efforts to arouse his interest in an at least partial application of his Decision Calculus Concept were in vain.⁴⁶⁴ He replied that if, as in my case, it was a matter of simulating models, he could recommend that I get in touch with Forrester and his System Dynamics people. (However, I already knew that, and the topic System Dynamics was long over for me.) That was the end of this topic for him.

Then I came to his article *Models and Managers*, which contributed significantly to his high reputation. I told him, as was true, that as a "model builder" I read his paper with great interest and that this was the reason for visiting him here. He took note of this statement with a friendly smile.

⁴⁶³ In fact, there were thousands, but I didn't want to come up with big numbers, given that he had developed GROOVY, a judgmental *managerial model* consisting only of originally seven equations. And besides; *"small is beautiful."*

⁴⁶⁴ With Michael Scott Morton, on the other hand, I had more success with my reference to the Welsch model, see page 528.

Of course, I did not intend to address my above-mentioned points of criticism. The only thing I might have wanted to tell him was my thesis that from the point of view of science theory he had propagated a method of modeling in which the reduced equation of the sales-quantity hypothesis equation as an empirically verifiable ex-ante hypothesis and its success in forecasting was ultimately all that mattered. All other assessment criteria are irrelevant in my view.

After my experiences with Forrester (s.p.16) and the friendly but distanced greeting, I had the feeling that this was already going too far. Therefore, I ask him just three questions:

First: Did he maximize the article contribution margin with the GROOVY and BRANDAID models, i.e., his two examples for generating and applying *judgmental sales response models* (the optimization question)? I was aware that this was not the case, but I wanted to hear what he had to say.

Second: How many companies have actually used his GROOVY or BRANDAID model for their sales quantity planning and what experiences have they made with it? (the application question).

Thirdly: on what further developments in this area he is working on? (the pipeline question).

I started with the first question, i.e., the optimization question. I would have preferred to ask him, "*It's evident to maximize the article contribution margin for your GROOVY and BRANDAID models to be used for planning. Why didn't you do that?*" However, I only asked him very vaguely and politely whether he had also carried out an optimization with his two models. His answer was short and clear "no". The "no" was so definite that it was clear to me that the topic was finished for him.

This rather abrupt and short answer was quite astonishing. My subsequent assumption is that he has been asked this some times before. Because for everyone who looks at the two texts, it is actually obvious to ask this question. Little was at least then one of the Popes or even the Pope of American Operations Research. That this Pope developed potential models of optimization in his article, which contributed significantly to his fame, but with which he then did not carry out any optimization, is probably worrying him in retrospect. And who wants to be reminded of such a thing? It was a good thing that I had not made my question more specific.

Then I asked him my second question whether the two models he described would also be applied in practice (the application question).

That was the most crucial question. As mentioned above, it brings no sense to dispute about a method for generating hypothesis equations. The decisive factor is whether or not a manager is willing to use a *judgmental sales model* developed by him, which must contain a reduced (empirically verifiable) sales-quantity hypothesis equation, in his planning. However, in the end, such use is not enough either. The final criterion is whether an acceptable forecast is attained. However, at first, I was only interested in whether his models were used at all.

He replied that he had founded a company in which such applications had been carried out in practice.⁴⁶⁵ He answered my further question, whether there were many companies, with "yes". And was the operation successful? Again, the answer was "Yes". I realized he did not want to say any more about it, who knows why.

Then I did not ask the last question about the further development at all. For these brief answers did not lead me to expect that he would become more talkative in answering this question. I said to myself, if he has developed something new, then he would it publish, and then I will read it.

Then followed a short talk about the weather in Boston, whereupon the meeting ended. It was a conversation that could be described as friendly and pleasant but also distant. Little showed no trace of time pressure or signs of impatience in front of an unknowing visitor, in a somewhat strange outfit from a faculty that did not appear in any of the ranking lists, in which the MIT-Sloan School always ranked right at the top.

Under these circumstances, it is to be appreciated that he was even willing to talk to me. As I see it, it could have been a longer conversation, I had enough to talk about, but it always takes two.

The conversation with Little made a lasting impression on me, and I wondered why he only answered my questions with yes and no. Especially the answer to the application question made me think. If he has already founded a company with the name "Management Decision Systems Inc.", then it was only natural that he should have tried to put his judgmental sales response models into practice from there. I henceforth referred to the three questions described as the *Little questions*. In the years that followed, it occurred to me repeatedly whether these three Little questions could still be answered.

The third question, i.e., the pipeline question, can now be answered clearly. As already mentioned, Little has not published anything else, since his 2004 commentary.

The second question, i.e., the application question, cannot be answered with certainty. As explained in detail in the previous section, I consider it rather unlikely that any company has used or will use a *judgmental sales response model* corresponding to the Decision Calculus Concept within the framework of an operational year-month-planning. The situation is more likely to be that a marketing manager has developed a "*stand-alone model*" for his personal planning under the guidance of a modeling expert. However, that does not interest me.

Little had already answered the first question, i.e., the optimization question. It was also a question that I could have answered myself.

Decision Calculus models in retrospect. Little does not provide a closed structural system of equations for any of the submodels he deals with that could have been built into a model configuration system such as the INZPLA configuration system. I consider a plan-

⁴⁶⁵ It was the company "Management Decision Systems Inc.", which he founded together with Glenn Urban, an MIT colleague.

ning procedure based on an unclearly defined reference case to be unacceptable. This also applies (until the opposite is proven) to the SONAL model, whose structural design with multiplicatively linked *sales influence indices* and *submodels* is in accordance with the BRANDAID model. According to Little it was only supposed to be the forerunner of the BRANDAID model.

The question that interested me, as mentioned, only in dealing with Little's requirements for the development of models, was whether these requirements could also be useful for the development of INZPLA-models. The answer was negative as described. From my point of view at that time (and later on too), Little's proposals for the development of *managerial models* could only be seen as banalities.

Only his hypothesis generation method, which allows the use of non-observation hypothesis equation, seemed to me of interest as a method. However, I even doubt Little was aware that he developed a method for developing empirically testable OO-hypothesis equations of *managerial models*.

As Albers' SONAL model has shown, I do not think this approach of hypothesis generation is very promising. However, you cannot refuse it. The success of the forecast with these hypotheses is decisive.

The question I asked myself from the beginning was, as mentioned above, whether Little and his "followers" like Albers succeed in developing sales-quantity-models with such a model generation procedure that could be integrated into the model configuration system of the Integrated Target Commitment Planning. This question will be raised again.

These sales-quantity-models must contain structural equations that can be used in the framework of a formal company planning and are distinguished by the ability to be used by as large a group of users as possible. John D.C. Little answered the question whether there were many users of his models as reported with a brief "yes". However, even then I had my doubts as to whether this was true and these doubts have not changed to this day. In Little's last statement from 2004 on the Decision Calculus Concept, in the section "*What happened since?*" he refers to the practical success of his concept and points out accordingly, "*Decision calculus ideas appear in many published models at practice from 1960s to the 1980s*".⁴⁶⁶

In his view these "ideas" were implemented within the framework of the MEDIAC, CALLPLAN, BRANDAID, SPRINTER and ASSESSOR models. Apart from BRANDAID, however, these are not model systems, of the only group, I am interested, and these are general sales-quantity-models. These are models with structural equations that go beyond the individual case and include the usual decision variables of a *marketing mix model* such as sales prices and advertising costs.

After 1980, virtually nothing is reported in the literature about the use of standardized sales-quantity-models in certain companies. Little says, "*Published papers were the tip of the iceberg*". "*Some models had hundreds and even thousands of applications many of which continue in an evolved form to this day.*"

⁴⁶⁶ Little, J.D.C., *Comments on "Models and Managers: The Concept of a Decision Calculus"*, In: Management Science 50(12_supplement) (2004) p.1854-1860.

Such approaches as Albers' SONAL model system, which also implements a "*Decision Calculus idea*", namely hypothesis generation with non-observation hypothesis equations for the development of a standard sales-quantity-model, hardly fall under the "*thousands of applications*".

I would have loved to incorporate the structural equations of some standard sales-quantity-models into the configuration system of the INZPLA-system. John D.C. Little seemed to me at that time to be the right and the only possible "supplier". However, even from today's perspective, I do not see any possibility of adopting one or more versions of a standard sales-quantity-model from any "supplier" at all.

Little's "revolutionary paper". Little's reputation as the founder of scientific marketing is not diminished by these somewhat critical comments on his modeling proposals. This also applies to the claim that he has not contributed anything to the development of sales-quantity-models that can be used in the context of planning with cost-performance models and that his "followers" have apparently not succeeded in doing so either. On the one hand, hardly anyone reads this text, and if he reads it, he does not need to agree to this assessment either.

Little's reputation is set in stone anyway. Almost forty years after its publication, nothing has changed in the high assessment of his article "*Models and Managers*". Hauser and Urban called it a "*revolutionary paper*" in 2015.⁴⁶⁷ And Levasseur points out in a text from 2015 that Little can be considered a "*giant*" in the field of scientific marketing even from today's perspective. Little's principles for creating *managerial models* are regarded by Levasseur as his most outstanding achievement. In his opinion, "*practitioners who want to build prescriptive models... that managers will use should consider adopting Little's principles of model building.*"⁴⁶⁸

Simon's assertion of a structural break and the consequences

To my knowledge, Hermann Simon is the only author who has made a critical and well-founded contribution to the application of "*sales-response-models*". His criticism aims at two levels of model development.⁴⁶⁹

On the one hand, he points out that the calibration of ex-ante sales response models should be rejected by using econometric estimates. The reason for this is that there are too many changes in the environment in the sales area that are not covered by historical values. Econometrically speaking, there are too many structural breaks. In short, Simon believes that past data can be used in marketing to estimate the parameters of ex-post models but not of ex-ante models.

This assertion does not come from an inexperienced person since Simon is one of the few

⁴⁶⁷ John D.C. Little: A Profile. In Hauser, J.R., Urban, G.L., *From Little's Law to Marketing Science*, Cambridge, Mass., 2016, p.11.

⁴⁶⁸ Levasseur, R., E., *People Skills: Building Analytics Decision Models That Managers Use - A Change Management Perspective*. Interfaces, 2015, 45. No. 4, p. 363-364.

⁴⁶⁹ Simon, H., *Marketing Science and the Ivory Tower*. In: Business Strategy Review, 1994, 5. Jg., No. 1, p. 29-45.

business economists, who are on the one hand econometrically qualified and on the other hand, has extensive experience with the development of econometric models in the context of a consulting firm, which he founded. And these were negative.⁴⁷⁰

As already mentioned (s.p.237) I consider Little's "*primacy of an econometric parameter calibration*" to be missed. Despite my negative assessment of Little's method to generate subjective sales-quantity-models, when developing *managerial models*, one thing is nevertheless clear: one should work with subjectively estimated model parameters in order to bring the managers' knowledge into a model. However, the econometric estimation is the wrong way in case of a *managerial model*. This view coincides with Simon's view. He sees this as "*a simple way to extract and systematically structure expert knowledge*". Everything has its limitations, and there are also limits here.

However, the development is going in a different direction. Albers and Mantrala express themselves in a state-of-the-art-contribution regarding the relevance of econometric sales-response models as follows: "*The method of subjective estimation was the dominant method used in reported applications until the end of the 1980s. Since then, the econometric estimation of response functions based on historical data has gained ground.*"⁴⁷¹

The use of econometrically determined parameter values in ex-ante hypotheses in sales-quantity-models cannot principally be rejected from the viewpoint of an Integrated Target Commitment Planning. Although it is possible to determine certain parameters econometrically, at least only the subjective estimate of the person who is responsible for the *managerial model* counts. This is the person as Little puts it, who has "*substantial responsibility for all marketing control variables*". In the light of the responsibility interpretation of the Integrated Target Commitment Planning, this "*substantial responsibility*" is regarded as the responsibility to fulfill the basic targets, as the responsibility to realize the decision parameters and as the responsibility to estimate the uncontrollable basic parameters.

Simon criticizes the econometric approach, but he is open to the *Decision Calculus models* when he says,

"*Credit should also be given to the decision-calculus-type models first suggested by Little (1971). Here subjective estimates by managers or other experts are used to support pricing, advertising, sales force, or similar decisions (e.g., Lodish et al. 1988). I have found this approach to be very useful (Simon 1989). It is not very scientific in a theory-testing sense but a simple way to extract and systematically structure expert knowledge. Too little research has been done on how to do this: in my view, managers are a much richer source of marketing knowledge than they are currently perceived to be.*"⁴⁷²

In my view, a scientific way of theory testing is always possible if a reduced empirically verifiable OO-hypothesis equation of sales quantity can be derived from a Decision Calculus sales-quantity-model.

⁴⁷⁰ Simon-Kucher & Partners was founded by him in 1985. Simon was also Professor of Marketing at two German universities from 1979-1995.

⁴⁷¹ Albers, S., Mantrala, M., *Models for Sales Management Decisions*, op. cit., p. 173.

⁴⁷² Simon, H., *Marketing Science and the Ivory Tower*, op. cit., p. 37.

Simon's requirement is implemented in the system of the Integrated Target Commitment Planning since the INZPLA-System is geared towards "*how to do this*", namely "*to extract manager knowledge*". However, that alone is not enough, the managers must also be held responsible for the numbers in which their knowledge is reflected.⁴⁷³

However, Simon goes one step further, and this leads to the second thrust of his criticism. And this is much more fundamental. He expresses doubts as to whether time invariant relationships can be found in the sales area that can be described by equations. In this sense, he poses the "*fundamental question: Why should there be any law like relationship between marketing variables? Why should those relationships behave according to a regular pattern?*"

This question is very justified. But how does this question about the existence or non-existence of a "*law-like-relationship*" influence the formulation of an (ex-ante) hypothesis that a sales manager formulates within the framework of an Integrated Target Commitment Planning, e.g., in the form of a linear relationship between the sales price and the sales quantity of an article? The answer is not at all.⁴⁷⁴

And why not? The uncontrollable hypothesis equations (i.e., the pure forecasting equations) of an INZPLA-model represent ex-ante hypotheses that describe only the subjective view of the person who is responsible for the forecast. If a sales manager, therefore, insists on integrating the SONAL model with its structural equations into a cost-performance model of the Integrated Target Commitment Planning and is willing to determine the values of the hypothesis parameters as an "estimator" within the framework of a bottom-up planning, then there are no objections against it. The only question is whether a sales manager can be found who is willing to accept the structural hypothesis equations and is in a position to subjectively estimate the values of the parameters in these hypothesis equations.⁴⁷⁵

What happens if his forecast is completely wrong? This question has already been discussed elsewhere using the example of a forecast of the exchange rate by an estimator.⁴⁷⁶ If, at the end of the planning period, it becomes apparent that the head of the finance department responsible for the estimate has completely misestimated the euro-dollar exchange rate, then the only question for the corporate management is, whether in future one should commission another employee or an external institute with the estimate, because one believes that they will "do it better". If a decision is made to use an external institute's estimate in the future, then this "exchange rate estimator" (until "proof to the contrary") is given a higher "forecasting competence".⁴⁷⁷

When studying Little's GROOVY model, but especially his BRANDAID model, the non-

⁴⁷³ The formulation "*to extract manager knowledge*" originates from me.

⁴⁷⁴ See also the corresponding argumentation on page 150 that the proof or falsification of Herbert Simon's theory of aspiration level adjustment does not affect the validity of its normative turn, i.e., the procedure of the Integrated Target Commitment Planning.

⁴⁷⁵ To get to know him and to talk to him, this is as described, worth for me a box of wine and a trip to his place of residence.

⁴⁷⁶ See in detail: Zwicker, E., *Is the Integrated Target Commitment Planning a Procedure or a normative Theory?* p. 6, Berlin 2016, www.lnzpla.de/IN48-2016.pdf. (Text in German, title translated). The following two sentences are taken from there almost literally.

⁴⁷⁷ For reliable estimates of exchange rates by external institutions, see the footnote on page 408.

observation hypothesis equations used by him seemed so absurd to me that I had great doubts as to whether such models could be successfully applied in practice or have been successfully used in practice. This was also true of Alber's SONAL model, which, in contrast to Little's models and others not mentioned here, at least had a useful purpose, namely to analyze it on a structural and numerical level.

Apart from the estimation problem described above, the resulting reduced sales-quantity hypothesis equation of the SONAL model is simply too complicated. If one determines the reduced numerically concretized sales-quantity hypothesis equation of the SONAL model then it looks as already described (s.p.280) like this:

$$SQ = PA1 \cdot DB^{PA2} \cdot P^{PA3} \cdot WB^{PA4}/PA5 \quad (115)$$

Its parameters PA1 to PA5 would only be used as basic targets in an Integrated Target Commitment Planning if a marketing manager would be willing to accept them as such. In this case the sales-quantity hypothesis equation (115) would be a target commitment function of the marketing manager. The setpoint-actual control would then have to take place at the sales quantity level. I think it is out of the question for a marketing manager to get involved in something like this. The linear price sales quantity function

$$SQ = P_1 - P_2 \cdot SP \quad (116)$$

can also be used as a target commitment function. Here, the sales manager commits himself to realize different sales quantities (SQ) depending on the sales price (SP) chosen by the corporate management. The goal of this negotiation is, to change the original bottom-up values of parameters P_1 and P_2 .⁴⁷⁸ The setpoint-actual comparison is carried out at the sales quantity level. In my opinion, this linear sales-quantity hypothesis equation is the utmost that can be required of a sales manager as his target commitment function that he has to achieve.

This negative assessment of the successful application of sales-quantity-models in the context of the Integrated Target Commitment Planning has prompted me to draw up the following claim:

Cost-performance models of an Integrated Target Commitment Planning should not contain any sales-quantity hypothesis equations.

There is another argument in supporting this claim, and this bases on Simon's assertion of a structural break. It can be formulated as follows: If unforeseeable changes (structural breaks) are constantly occurring in the sales area, it is pointless to develop sales-quantity-models that lead to total mis-forecasts due to these unforeseeable changes. If the Simonian structural break assertion is considered correct, which is the case with me, then the claim to dispense the use of sales-quantity hypothesis equations becomes even more im-

⁴⁷⁸ See: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 44. www.Inzpla.de/IN_37-2008c.pdf. (Text in German, title translated).

portant. However, what is the consequence of this renunciation? It leads to the provision which should be observed when designing cost-performance models for an Integrated Target Commitment Planning in the area of sales planning and which reads as follows:

The planning of sales quantities in a cost-performance model of an Integrated Target Commitment Planning should only be carried out in the form of singular price-sales-quantity commitment.

As described, this type of a target commitment is a so-called *business basis commitment* (s.p.80). The commitment to adhere to a certain sales quantity of an article is based on the agreement that the previously determined bottom-up sales price of this article is realized. If it turns out at the end of the plan year that this is not the case, the setpoint sales quantity must be renegotiated after the end of the plan year (ex-post).

This ex-post basic target negotiation of a sales quantity commitment can also take place with regard to compliance with certain other basic business parameters which can be influenced by the corporate management and which appear as decision parameters in the plan cost-performance model. These are primarily advertising and sales promotion costs. However, this ex-post negotiation of the sales quantity commitment can also be extended to the change of other unforeseeable potential business basis variables, such as the behavior of competitors or the weather conditions.⁴⁷⁹

That's no good way to proceed because it will become difficult to reach an ex-post agreement on ex-ante unforeseeable changes in the basis of the agreement and their impact on sales quantities. Otherwise, however, all conceivable changes to the business basis (i.e., possible structural breaks in the light of the model description) would have to be included as alternative constellations in the price-sales-quantity target commitment function. And that is utopian.

However, my pleasure in carrying out an optimization is so great that in the case of determining the sales price of an article I would like to make a suggestion as to how one could perhaps still bring an optimization into play.

Corporate management could set not only one sales price (SP) as an unchangeable business basis but also two (SP₁ and SP₂). The sales manager would then be asked to make a sales quantity commitment (SQ₁ and SQ₂) at each of the two sales prices. The INZPLA-System then uses the two coordinates to determine the price-sales-quantity hypothesis equation (116) and calculates the maximum operating result in relation to the sales price (SP) within the interval of SP₁ and SP₂. The bottom-up value of the sales quantity (SQ^{BU}) is calculated for this sales price SP^{max} by using the price-sales-quantity hypothesis. If the sales manager agrees to this bottom-up sales quantity (SQ^{BU}) at this price (SP^{max}) as the basis of the commitment (and this is not unlikely), then it will be set as the sales manager's bottom-up target commitment quantity.

⁴⁷⁹ On the procedure for ex-post negotiation of basic target commitments, which leads to an ex-post planning model in the event of major structural breaks, see: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 266, www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

Why this effort?

A reader may ask why so many pages of this "History..." are dedicated to the topic "sales-quantity-models" and thus to the possibilities of model-based sales planning as a sub-area of the Integrated Target Commitment Planning. The reason for this is that I had the ambition to design the Integrated Target Commitment Planning as comprehensively as possible and this also means to include the sales area in the modeling as comprehensively as possible.

I was reasonably satisfied with the development of the cost-performance models. Kilger was an outstanding "know-how supplier" here. Through my extensions and differentiations of his approach (s.p.516), I had developed a hyperstructure model in the production area with which I was reasonably satisfied. For it was possible to carry out a sales quantity-driven planning from sales quantities through production areas and various interim inventories to the purchase quantities.

In the sales area, on the other hand, I found the singular price-sales-quantity commitment rather simple. In practice, it is only used within the framework of an annual operational planning and, as already mentioned, the SAP-CO system only allows such sales planning from a purely technical point of view. However, that is not a counterargument. I also knew how one could "in principle" overcome the somewhat hillbilly looking singular price-sales-quantity commitment planning by introducing sales-quantity-models with as many decision variables (i.e., marketing mix models) as possible.

If a reasonably acceptable sales-quantity-model would be available, then at least some companies would have been given the opportunity to consider whether they should leave it at a singular price-sales-quantity commitment or use a price-sales-quantity target commitment function or even a sales-quantity hypothesis equation that contains further sales policy decision variables.

I would have liked to use sales-quantity hypothesis equations with sales policy decision variables for another reason as well. As described (s.p.62), a standard cost-performance model does not contain any decision variables. Therefore, during the planning steps, no optimization with decision variables takes place, but "only" a pure Integrated Target Commitment Planning is being practiced.

However, there is the so called bottom-up planning of the second step (s.p.58), in which the operating result is maximized with the help of basic-target alternatives. But this is a rarely used optimization method. I have also described in a separate text how to maximize the operating result using certain decision variables with a cost-performance model in the form of an optimal elimination planning.⁴⁸⁰

However, all of these optimization methods are somewhat exotic and serve more to prove that an optimization can be carried out under certain circumstances using a cost-performance model.

In my opinion, the only case where a cost-performance model could be used to carry out

⁴⁸⁰ See: Zwicker, E., *Integrated Target Commitment Planning and Optimizing Planning*, Berlin 2000, www.Inzpla.de/IN08-2000c.pdf. (Text in German, title translated).

an optimizing planning that would be suitable for a larger number of companies is, if an acceptable sales-quantity hypothesis equation with one or more decision variables were additionally built into a standard plan cost-performance model.

In the simplest case, the sales price would act as a decision variable of a linear price-sales-quantity hypothesis equation. In this case, a mixed optimization basic Target Commitment Planning would be carried out, as described using a variant of the furniture model discussed here.⁴⁸¹

**** It is astonishing that this linear price-sales-quantity hypothesis equation was not first described as the simplest variant of a *Decision Calculus model* with a decision variable by Little if he wants to deal with the planning of sales quantities in the context of *managerial models*, as was his concern. Instead of using the GROOVY model with advertising costs as a decision variable, it would have made more sense to use this simple price-sales-quantity hypothesis equation with the decision variable "sales price" as an example of a *Decision Calculus model* in the sales area. Little's demand for "model simplicity" meets this price-sales-quantity-model at least more than the GROOVY model. ****

Elsewhere, I have described an Integrated Target Commitment Planning model as a downwards cut-off optimization model (s.p.492). From this point of view, the Integrated Target Commitment Planning is actually only a crutch that is necessary because it is not possible to disaggregate a cost-performance model to certain decision variables that can be used to maximize the operating result.

Optimization is the highlight of every planning. Therefore, my goal was not only to use such a simple sales-quantity hypothesis equation as the linear price-sales-quantity hypothesis equation in the INZPLA-System with price as the only decision variable. Rather, I wanted to use sales-quantity hypothesis equations with several decision variables that would have to be so plausible that a not inconsiderable number of sales managers could be willing to accept them. This would have increased the "optimization share" in the model configuration system.

Hence my extensive research in this area. Otherwise, I would never have dealt so intensively with Little and Albers and a number of other authors in this field. There were enough other challenges in the development of the INZPLA-System. However, unfortunately, nothing has emerged. Little as "*founder of marketing science*" and his "followers" were a disappointment.

Even though the study of Little's modeling requirements and the three sales-quantity-models was not very productive from the point of view of the Integrated Target Commitment Planning, the study of his texts nevertheless had an incredibly stimulating effect for me. His requirements for the development of *managerial models* and his models de-

⁴⁸¹ See: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 41f. www.Inzpla.de/IN_37-2008c.pdf. (Text in German, title translated).

veloped in connection with these requirements showed me at what trivial level "the competition" was moving. And this encouraged me to further refine and expand the Integrated Target Commitment Planning. For this system is nothing more than a comprehensive planning and control system based on models that fall into the category of Little's "*managerial models*".

There are always new insights.

As reported, Hermann Simon's assertion of a structural break finally led me to abandon the idea of including a sales-quantity hypothesis equation in the configuration system of the INZPLA-System. The configuration system should only contain structural equations, which also serve a practical application. And this goal was hindered by Simon's assertion of a structural break.

Even the idea of using only a linear sales-quantity-model with price as the only decision variable in the context of an operational planning was unrealistic in my opinion. But when I read Simon's book "*Confessions of the Pricing Man*" in January 2018, my attitude changed.⁴⁸² Now I think it makes sense to insert at least linear price-sales-quantity hypothesis equations into the cost-performance models of an Integrated Target Commitment Planning and to carry out a mixed optimization basic Target Commitment Planning on this basis.

The curious thing is that the one who convinced me with his structural break assertion, to reject the use of sales-quantity-models in the context of an operational planning, has convinced me now, that at least linear price-sales-quantity hypothesis equations can be successfully used in practice in the context of an optimizing planning. Before I report about this surprising change of opinion, I would like to say something about Hermann Simon.

Can theory and practice be reconciled?

Hermann Simon has a career that is probably unique in the field of economics. He has developed from a quantitatively oriented, excellently qualified theorist in the field of "sales modeling" to the world's leading expert for all questions relating to "prices".

One could also call him the "price pope", but that always sounds a little ironic to me, which is not intended.

When one learns that he founded a consulting company responsible for solving price problems, that employed 1,400 employees worldwide with 39 offices in 25 countries and generated a sales value of 309 million € in 2018, then it can hardly be denied that he had achieved immense practical success in the area of "*pricing*". I looked at his earlier theoretical writings on the subject of sales models after reading his "*Confessions*" and considered them as top contributions. I know a little about models to be able to judge that.

With his "*Confession of the Pricing Man*", he wants to say something concluding at the end of his professional career, just as I did with my "History...". His message, which he associates with his work, could be formulated in this way: "*Here you can find out what*

⁴⁸² Simon, Hermann, *Confessions of the Pricing Man, How Price Affects Everything*, Cham, 2015,

useful and interesting facts someone can tell you about the fascinating world of prices who has spent his life dealing with "prices".

In my opinion, at least, he has achieved this in an outstanding way. An excellent performance that is second to none.⁴⁸³ Simon has changed my picture of *"the world of prices"*, to put it prosaically. It is unbelievable how diverse and complex this *"world of prices"* is. And Simon's *"Confessions"*, as he puts it, are indeed a *"journey through that amazing world"*. If he reports, *"I have encountered prices in thousands of forms"*, then I take it completely off his hands after reading his *"Confessions"*.

In addition, I always like it when someone is enthusiastic about his area in view of the lameness that you so often come across today. And this is shown above all by his descriptions of personal experiences and insights.

The man is extremely impressive, and that goes for quite a few I know. In the field of prices, his work can be compared with Alfred Sloan's autobiography *"My Years with General Motors"*, which was intended by Alfred Sloan's as an inspiration for managers (s.p.352). For Simon, prices are an *"endlessly fascinating and interesting marketing instrument"*, and everything he says about it is just as fascinating.⁴⁸⁴

My view of the Integrated Target Commitment Planning has also changed when reading his *"Confessions"*. If you have configured a cost-performance model with the SAP-CO system that is to be used for planning, a price and a sales quantity are assigned to an article and the planner has to enter a plan value for both values. The more than a hundred thousand users of the SAP-CO system are planning their prices and sales quantities in this way. When carrying out a singular price-sales-quantity commitment in a plan cost-performance model of the Integrated Target Commitment Planning, it is assumed as described that the corporate management (or another responsible person) "somehow" determines the sales price of an article and its amount is then included in the planning model as a decision parameter.

A sales quantity commitment is then negotiated with the sales area using this price as the "business basis" and possibly other decision parameters serving as further business basis parameters, such as advertising costs and sales promotion costs. Within the framework of these commitment negotiations, an attempt is being made to increase the operating result by reducing costs on the basis of the other basic targets (commitment targets of the areas), which only affect costs. In this procedure, the sales prices serve as "input variables" that are in no way called into question. It has only now become clear to me what many different considerations could underlie such price fixing. One should look a little bit further than one's own nose.

⁴⁸³ After this extraordinary praise and the not exactly negative appraisals that followed, I take the liberty of pointing out that although I have already seen Hermann Simon at a conference, I have never exchanged a word with him.

⁴⁸⁴ For a further appreciation of the achievements of Hermann Simon, see chapter 38 *Praising yes - but why and whom?*, on page 585.

However, the question I was also interested in reading has a job-specific background. It is the question, what remains of the original theories of an outstanding theorist, if he has been so successful in practice in the course of his further life as a consultant in the same field. Does the sentence that I have repeatedly proclaimed in my lectures and in other contexts still apply here "*Nothing is more practical than a good theory*" (s.p.360).

As already mentioned, Simon's initial involvement with sales-quantity-models took place at a high formal level. To give a visual impression, a sales function equation developed in 1978 (one year before his habilitation) based on a model developed by Philip Kotler should be mentioned.⁴⁸⁵

$$S_{j,t} = G_t \cdot V_t \cdot (n \bar{P}^e \bar{A}^w \bar{D}^c)^{-c \cdot d^{-t}} \left(\sum_i^n P_{i,t}^e A_{i,t}^w D_{i,t}^c \right)^{c \cdot d^{-t} - 1} P_{j,t}^e A_{j,t}^w D_{j,t}^c. \quad (117)$$

S is the sales quantity of a company j at time t. Using this kinetic model, he examined the time course of the elasticities of the three decision variables *price* (P), *advertising* (A) and *distribution effort* (D). At first, he determined an optimal price strategy for the price as the only decision variable and then for the three decision variables P, A and D together.⁴⁸⁶ The "*optimal pricing strategy*" determined by Simon in the first case, i.e., the decision rule for determining the profit-maximum sales price $P_{j,t}^*$, which functions as the only decision variable, has the form:

$$P_{j,t}^* = \frac{\epsilon_{j,t}}{\epsilon_{j,t} + 1} \cdot C_{j,t} = \frac{e \{ 1 + (cd^{-t} - 1)/n \}}{e \{ 1 + (cd^{-t} - 1)/n \} + 1} \cdot C_{j,t}. \quad (118)$$

The sales-quantity hypothesis equation (117) and also the decision rule (118) derived from it for determining the optimum sales price do not look exactly straightforward, and they actually aren't. Simon's analyses, such as determining the optimum price decision regulation (118), are extremely demanding and innovative. However, he does not discuss the empirical relevance of this sales-quantity hypothesis equation. It is a contribution which, then and still today, entitles one to higher academic degrees. And that's what he got. In 1995, that was sixteen years after his habilitation and an appointment to a professorship in marketing, he decided to leave the university and devote himself solely to his consulting business. Twenty-three years have passed, since then and during this time he is, without reservation, the world's leading expert on everything to do with prices, namely an applications expert.

For me, who has been permanently involved with equation models in the corporate sector for more than fifty years, some of which have been applied at least once (s.p.336f.), the question arises, to what extent Simon's sales-quantity-models with several decision variables (*marketing-mix models*) or even just *price-response models* with the price as the only decision variables have been used in at least some of the more than "5,000 pricing projects" carried out by his company so far.⁴⁸⁷

⁴⁸⁵ Simon, Hermann: *An analytical Investigation of Kotler's competitive Simulation Model*. In: Management Science 24.14, 1978, p. 1462-1473.

⁴⁸⁶ "kinetic models" are models in which no time-delayed relationships occur between periods. For "kinetic models", the term "historical models" dating back to Samuelson is more often used.

⁴⁸⁷ "Since that time the firm has conducted over 5,000 pricing projects throughout the world in all major

In other words; what remains of the price-sales-quantity-models of his academic period as a part of an implementation of these many "*pricing projects*"? This question is also interesting because Simon explicitly points out that his company's activity is based on academic methods and scientific rigor to solving practical problems.⁴⁸⁸ And in his "*Confessions*" he says it even more clearly, "*I tried to take the quantitative, theoretical concepts and make them accessible and useful so that these businesspeople could make better pricing decisions at their own companies.*"

After reading his article "*Marketing Science and the Ivory Tower*" (s.p.289) and the resulting formulation of "*Simon's structural break assertion*", I was pretty sure that the answer of my question "*what remains of the price-sales-quantity-models of his academic period?*" would be: **Nothing.**

However, I was wrong. And that became clear to me after I had read his "*Confessions*". I realized that Simon's assertion of a structural break does not rule out the development of a "*price-response model*" based on subjective estimates for an upcoming planning period, which can and should then also be used to maximize the article contribution margin.

Does Simon expect a manager to formulate such abstruse models as the GROOVY, BRANDAID or SONAL model? Fortunately not. Rather, he propagates the formulation of simple "*price-response models*" in the form of linear price-sales-quantity hypothesis equations.

This is exactly the kind of sales-quantity hypothesis equation that I hoped (s.p.293) that a company might be willing to use it in combination with a cost-performance model to carry out its operational planning. The variant of the furniture model, which I developed to describe precisely this case of maximizing the operating result based on the sales price as a decision variable, turns out to be at least not superfluous if one follows Simon's suggestion.⁴⁸⁹

However, what does Simon say in his "*Confessions*" more precisely about the development and use of such linear price-sales-quantity hypothesis equations? He points out that in his experience, the use of linear price-sales-quantity hypothesis equations is entirely appropriate to describe the relationship between the price and the sales quantity of an article in a company for a planning period. And he tries to invalidate objections from the outset by pointing out: "*Of course, in reality these functions are not always linear..... But my decades of experience tell me that within relevant price intervals, the linear demand curve is a sufficient approximation of reality and, therefore, a very useful tool. You can treat the recommendations we discussed in this section as broadly applicable lessons*

industries. "

⁴⁸⁸ See http://www2.simon-kucher.com/sites/default/files/Hermann%20Simon_detailed_CV.pdf.

⁴⁸⁹ For a detailed description of the optimization of this variant of the furniture model discussed here, see: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, op. cit., p. 43f. www.Inzpla.de/IN_37-2008c.pdf. (Text in German, title translated).

about taking pricing decisions." And these are: "If you want to set price in a professional manner, you have to know what your demand curve looks like. The demand curve helps you estimate and quantify the impact your decisions will have. The demand curve and the cost curve define the chain of effects through which price ultimately influences your profit."

In order to develop this "demand curve", my previously mentioned hypothesis generation procedure could be applied in the form of the entry of two price-sales-quantity coordinates (s.p.293). This is indeed a simple procedure that everyone should come up with immediately. However, I had already imagined it that way back then and had also conceived it from a programming point of view.

Simon also points out that more than two estimates could be used as coordinate reference points to generate a price-sales-quantity hypothesis equation. In this sense, he remarks, *"I would recommend that you gather these estimates for more than just a "one up, one down" scenario. This will reveal whether larger price changes-whether down or up-result in disproportionately higher or lower volumes, which, in turn, would show how price elasticity changes depending on the magnitude of the intended price change."*

This would then lead to a specification of a polygon course on the screen, i.e., to the development of what Forrester calls *"table functions"* (s.p.271).

The simplest case, as Simon explains, would be to generate a *"one up, one down" "scenario"* from the actual value of the previous year, which would lead to two further coordination points of the *"demand function" (price response function)*. Even a modified price-sales-quantity hypothesis equation taking into account the behavior of competitors, cannot be ruled out. What proposals does he develop to this end?

"We can do this in a number of ways. Instead of using our own price as the independent variable, we can replace that with the difference between our price and our competitor's. We can also use the relative price, which would be our price divided by our competitor's price, as the independent variable. Finally, we can include our competitor's price as an additional variable in our demand curve. We can likewise use any of the methods described above to quantify the effects of changes in our competitors' prices on our sales quantity."

It is extremely important for Simon that a company has to think about the course of the *"demand curve"* of its articles. For him, the requirement that companies should determine the *"demand curves"* of their articles is *"a key lesson in this book,"* and he expresses this unequivocally: *"You need to know what your demand curve looks like, the more precisely, the better. When companies do not know their demand curves - especially in the case of premium and luxury goods - they will be poking around in the dark searching for the optimal price to charge."*

What about maximization?

Simon recommends to make an upcoming planning in the form of maximizing the article contribution margin with the sales price as a decision variable, i.e., precisely that which

Little and Albers do not have in mind with their models.

With a view to this maximization, he deals in particular with the linear price-sales-quantity hypothesis equation. He points out that the sales price (SP), which is used in this case to maximize the article contribution margin (ARCM) is described by the following decision rule,^{490, 491}

$$SP^{ACRM-max} = \frac{1}{2} ([P_1 / P_2] + VUC) \quad (119)$$

For me it was extremely surprising that Simon, as the globally active "*top pricing man*" who is focused on practical success, regards maximizing the "*profit*", i.e., the article contribution margin, as such an important demand that he so emphasizes it in his "*Confession*", which is limited to the essentials. In contrast to this the academic "marketing stars" John D.C. Little and Sönke Albers have as reported dispensed with such an optimization in their models GROOVY, BRANDAID, and SONAL.

What are the consequences for the INZPLA-System?

In a standard plan cost-performance model such as the furniture model, "*sales quantity-driven planning*" is practiced. If now, as Simon demands, a price response function is used, then the sales quantity is no longer the initial driver in the model, but the sales price. It would, therefore, be appropriate to speak of "*sales-price-driven planning*". In this case, the sales quantity does no longer appear as a model parameter in the if-then-calculation tableau of the cost-performance model of an Integrated Target Commitment Planning, as in the furniture model (s.p.370) but the sales price.

The sensitivity coefficients in the lines of the if-then-calculation tableau, which correspond to the sales prices, are then the measures by which one can judge to what extent Simon's assertion applies to the articles in question, "*that price is the most effective profit driver*".

However, in view of the classification of model parameters in the system of an Integrated Target Commitment Planning, a differentiation is necessary with regard to the term "*profit driver*". All parameters of a standard cost-performance model of an Integrated Target Commitment Planning, which appear in the if-then-calculation tableaus of the areas and the central planning, are "*profit drivers*" insofar as their change in one of the two directions increases the "profit" (the operating result).⁴⁹² In my understanding the term "*profit driver*" also includes the requirement that it can be influenced by the company, i.e., that it can be "driven" by the company towards an increase of the operating result, which is not the case with "*uncontrollable basic parameters*" such as an exchange rate. Therefore, in

⁴⁹⁰ Simon defines this "simple decision rule" for calculating $SP^{ACRM-max}$ without symbols using a numerical example and explains it by saying: "*The optimal price lies exactly in between the maximum price and the variable unit cost. The maximum price is the price which results in sales of zero.*"

⁴⁹¹ The development of this decision rule for determining the so-called "Cournotian price" is described on page 377. There it is shown in the form $SP^{OR-max} = (P_1 + VUC \cdot P_2) / (2 \cdot P_2)$.

⁴⁹² The usual if-then-calculation tableaus contain the basic targets of an area (see page 160, 172, 180 and 370). They always have a direction that leads to an increase and correspondingly to a decrease in the operating result. With an optimal price, on the other hand, a change in any direction always leads to a decrease in the operating result.

my view, only the model parameters that can be influenced can be considered as "profit drivers", which are comparable with the sales price as one of the *"effective profit drivers"*. In the concept of the Integrated Target Commitment Planning, these controllable parameters are the decision variables and the basic targets. However, the sensitivity coefficients of these two types of "controllable parameters" are not comparable with each other when it comes to assessing them according to the question which of them possesses the greatest "driving force" in respect to the operating result. Decision variables, such as the sales price as a parameter of a price-sales-quantity hypothesis equation, are characterized in an Integrated Target Commitment Planning model (s.p.29) that they can be changed by the person responsible for determining them in a company without a burden. The basic targets, on the other hand, can only be achieved through a burden (or effort) on the part of the area managers (and his co-workers). And it is not sure if they will even be realized. In view of their strength as *"profit drivers"*, sales prices can, therefore, only be compared with other decision variables occurring in the cost-performance model of an Integrated Target Commitment Planning. For example, if a price-sales-quantity hypothesis equation with price and advertising costs were used, then one could decide which of them is the *"most effective profit driver"* based on the sensitivity coefficients of these decision variables in the if-then-calculation tableau.

Moreover, some basic targets may also have a higher sensitivity coefficient than a sales price. For example, raw material prices in the iron and steel industry have extremely high sensitivity coefficients. However, they are not decision variables, but at best basic targets to be negotiated with the purchasing department.⁴⁹³

What drives the sales price?

If you have built a linear price-sales-quantity hypothesis equation into a standard cost-performance model of the Integrated Target Commitment Planning, then the sales quantity is no longer a basic target, but an endogenous variable. Therefore, the sales quantity does no longer appear in the if-then-calculation tableau of a sales area. Instead, the if-then-calculation tableau of the central planning (if it is responsible for pricing) now contains the sales price as a model parameter. It can look at the sensitivity coefficient of this sales price, but the central planning can in contrast to the basic targets in the if-then-calculation tableau no longer change the value of the sales price. Rather, the change in the sales price takes place through a system-controlled optimization, namely as follows: If the basic targets have been changed in the course of a planning step and a calculation of the model is to take place, then the central planning, as coordinator of the planning process, instructs the INZPLA-system to carry out this model calculation with the changed basic targets.

Together with this model calculation, the decision variables and thus the sales price are then determined using an optimization procedure in such a way that the operating result is maximized. Central planning can then only take note of the optimal sales price (SP^{OR-max}) determined in this way in its if-then-calculation tableau and look at the sensitivity coefficient determined by the system for this optimum case.

⁴⁹³ It is not for nothing that it is said, *"Purchasing is a profit making job"*.

If a linear price-sales-quantity hypothesis equation is used in an INZPLA cost-performance model, it is also possible to incorporate the optimal decision rule (119) directly into the model. In this way, a model-generated optimization is practiced. In these circumstances, the sales price is not a model parameter that no longer appears in the if-then-calculation tableau of the central planning. Model parameters are instead the parameters of the decision rule (119) determining the profit maximizing sales price, i.e., the parameters of the price-sales-quantity hypothesis equation (P_1 and P_2) and the variable unit costs (VUC).

In the case of such modeling, it can also be said that the (profit maximizing) sales price to be determined is "driven" by three parameters, whenever these parameters (as basic targets) are changed during planning. If a price-sales-quantity target commitment function exists, then its parameters P_1 and P_2 are the basic targets with which the course of the target commitment function is negotiated.⁴⁹⁴

The variable unit cost (VUC) in (119) is never a basic parameter in a realistic INZPLA-model, but an endogenous variable. Their reduced hypothesis equation generally consists of components of the form (s.p.104):

$$M_1 \cdot M_2 \cdot \dots \cdot M_n \cdot PP \quad (64)$$

The variables M_i in (64) are so-called quantity multipliers such as consumption rates, scrap rates, and production coefficients, which can be basic targets of an Integrated Target Commitment Planning. The procurement price (PP) may also be basic targets. Other definition components of variable unit costs are also possible, in which the quantity multipliers are not multiplied by the procurement price (PP) but by a proportional cost rate (as a possible basic target).

Within the planning steps of an Integrated Target Commitment Planning, these basic targets are varied as described and then finally agreed. They are, therefore, to be regarded as (controllable) "*profit drivers*". "*Profit driver*" of this planning procedure is then no longer the sales price, but a certain quantity of "*profit drivers*" in the form of these basic targets. The variable costs, therefore, also play a role in determining the optimum sales price of an article. The fact that variable costs prove to be drivers of an optimal sales price shows that the flexible plan cost accounting is also not unimportant in the world of pricing.

If, for example, the bottom-up value of a consumption quantity rate is changed in a production area where ten finished products and twenty intermediates of other finished products are processed, then the profit maximizing sales prices of thirty finished products will change as a result.⁴⁹⁵

Simon explicitly points out in his text (which can also be seen from the decision rule (119) that a change of the variable unit costs (VUC) by Δx leads change of the (so far)

⁴⁹⁴ However, these are not negotiated directly but are determined on the screen as a result of the negotiated graphical course of the price-sales target commitment quantity function. See: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of comprehensive Company Planning and Control*, Berlin 2010, p. 44. www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated).

⁴⁹⁵ The ThyssenKrupp Steel model had 37,933 consumption rates, 3,864 proportional cost rates, and 9,594 production coefficients (see page 43).

optimal sales prices $SP^{ARCM-max}$ by $\Delta x/2$. Such a change is made continuously during the planning process as described, if quantity multipliers, procurement prices or proportional cost rates are changed.⁴⁹⁶ The maximization demanded by Simon would thus be fully integrated into the planning process of an Integrated Target Commitment Planning using a linear price response function.

How's the practice?

Finally, the question arises as to whether it has not long been customary in practice to carry out such sales price-related maximizations of the article contribution margins and whether Simon's requirement only reflects what is already being practiced everywhere. At least that has not gotten around with SAP yet, because such a maximization is not realizable in the SAP-CO module.

My literature research did not lead to a practical report describing such a case. And as for the "marketing-mix models" with the price and another marketing instrument like the advertising costs, I am as mentioned (s.p.277) willing to sacrifice 34 bottles of wine to learn more about it.

It is quite unlikely that there are companies that have developed linear price response functions for certain articles to maximize the contribution margin of these articles (and thus also the operating result). Simon with his projects should be the only exception. This assumption is supported by the relevant literature.

In addition to Simon's "Confessions", with its concern for practical use, there is another work by Nagle and Müller conceived solely for the world of practice entitled "*The Strategy and Tactics of Pricing - A Guide to Growing More Profitability*".⁴⁹⁷ It has been published in its sixth edition and in some ways can be regarded as a "competitor product" of Simon's work.⁴⁹⁸ In the sixth edition of this work, published at the beginning of 2018, the authors also express their views using price-sales-quantity hypothesis equations (they speak of *demand functions*) to determine sales prices. Their opinion is as follows: *Economic theorists propose pricing based upon estimating the demand curve for a product and then "optimizing" the price level, given the incremental cost of production. In theory, this is totally consistent with the approach we propose in this book, but in practice, it is almost always impractical* (p.7).⁴⁹⁹ That concludes the topic for them.

⁴⁹⁶ Maximizing the contribution margin of an article (ARCM) with the sales price as a decision variable involves maximizing the operating result if the variable unit costs do not depend on other decision variables, which is not assumed here.

⁴⁹⁷ Nagle, Thomas, Müller, Georg, *The Strategy and Tactics of Pricing - A Guide to Growing More Profitability*, 6th Ed., New York, 2018.

⁴⁹⁸ Kevin Mitchel, President of the "Professional Pricing Society", describes Nagele's work as a "*highly regarded reference for pricing professionals*" (p.331) in: "*The Strategy...*", but Simon does not do worse, because Mitchel describes him as a "*giant within our discipline*" and further remarks, "*This book will help you improve your pricing, management skills, strategies, and tactics - and it will help your company also*". (Amazon review). However, I prefer Simon's work.

⁴⁹⁹ The reason they cite for this is essentially Simon's assertion of a structural break. Similarly refusing also: Larson, Ronald B., *Promoting demand-based Pricing*, Journal of Revenue and Pricing Management, p.1-10, 2017. For Dholakia the term "*demand curve*" obviously does not exist at all. See:

Simon's message. For Hermann Simon, the price is a factor that plays a dominant role in any planning, because *"all paths to profit begin with price. There is no way around that. This is as deep as most pricing practitioners dive into the topic of price decisions."* In conversations with top managers, he recommended, *"Keep in mind that price is the most effective profit driver."* The guiding principle that follows from his unique experience with prices could actually be *"pricing is the most effective profit making job"*. And I guess he is right on this point.

Conclusion.

At the beginning, I had pointed out that I was personally interested in what remained of Simon's highly formal sales-quantity-models with which he began his career as *"pricing man"* after working for years in the consulting business of *"pricing"*. There is actually some left. After all, the optimization of linear price response models in practice is likely to be based solely on him and probably even to be carried out by him alone.

Perhaps, however, this development was already apparent at an early stage. In the quoted article from 1979, in which, as mentioned, he investigated the not exactly simple sales quantity hypothesis (117) and, as a result, determined the even less simple optimal price-decision rule (118), he concludes at the end of his analyses: *"Finally, the analysis demonstrates that complex marketing models should be treated with certain reservations"* (p.1472). His path to the simplest possible form of such a *"marketing model"*, namely the linear price-sales-quantity hypothesis equation (116), was thus already mapped out.

Hermann Simon's *"Confessions"* have led me, albeit rather late, to a change in my assessment that it does not make sense to use sales-quantity-models in the context of a company operational planning. In view of the rather exhausting and abstruse reflections of Little and Albers, which led to nothing, it was almost a blessing for me to read his *"Confessions"*. Now I believe that a linear price-sales-quantity hypothesis equation and other variations should be built into the INZPLA configuration system of a plan cost-performance model because there is a good chance that users will use them to optimize planning.

However, of course, these are all just age reflections because the INZPLA-System has not been in use for years and only lives in a data stick. Such an installation will no longer take place.

19. Küpper's contribution to operational company planning and control in the light of the Integrated Target Commitment Planning

Robert Kaplan is the leading representative of Management Accounting (Controlling) in the English-speaking area. With his claim to develop a *new Management Accounting System*, it made sense to compare this "system" with the "system" of the Integrated Target Commitment Planning and Control. The same applies to the concept of the Balanced Scorecard and Activity-Based Costing, which were propagated by Kaplan as new developments in the field of "*management accounting*". These procedures also coincide with areas of the Integrated Target Commitment Planning and, therefore, suggest a comparison.

Hans Ulrich Küpper is the most important German-speaking representative of controlling (management accounting) but also in the entire field of German-speaking business administration.⁵⁰⁰ In accordance with Blohm's evaluation procedure (s.p.502), he was the number one among all competing German-speaking professors of business administration.

In the German-speaking area, he is the authoritative representative of a scientifically based controlling. He has also made considerable contributions to cost and performance accounting as a sub-area of operational company planning and control.

In contrast to Kaplan, he does not propagate his own self-contained system, but he is the one who tries most to work out the methodological foundations of this field. In view of the fact that Küpper is also at the forefront of German-language business administration and his publications are widely used in academia, the differences between Küpper's theory and my model-based approach are discussed below.

However, my texts are only comparable to his texts to a very limited extent. The reason for this is that almost all of my work is based on equation models whose parameters (basic parameters) and also endogenous variables are interpreted in the sense of a specific planning procedure (the Integrated Target Commitment Planning). Since Küpper does not show the slightest indication of such an approach, there are few competing claims with regard to the procedure of the Integrated Target Commitment Planning and Control.

In this text, I already criticized Küpper's unclear definitions of the central pairs of cost concepts in the light of a model-based reconstruction (s.p.137). The central terms of cost accounting used by Küpper do not seem to me to be suitable for working fruitfully with them. In my opinion, the connection of the concept of control with the concept of a control loop planning is also untenable (s.p.108), since, in my belief, the control loop theory cannot be used at all as a control procedure following the step of an operational planning.

⁵⁰⁰ According to a study by Schäffer, Binder, and Gmür, Küpper is the most frequently cited author in the field of controlling (management accounting) in German-speaking countries. See: Schäffer, U., Binder, C., Gmür, M. *Structure and Development of Controlling Research - A Citation and Cocitation Analysis of Controlling Contributions in German Scientific Journals from 1970 to 2003*, in: Zeitschrift für Betriebswirtschaft (ZfB), 2006, p. 395 - 440. (Text in German, title translated). For Küpper's outstanding role in all German-language business administration, see page 502.

Other remarks refer, for example, to the rather unclear description of cost center tableaux, which are compared with the cost element tableaux assigned to a cost center in the Integrated Target Commitment Planning.⁵⁰¹

As already mentioned, I consider Küpper's assertion that the cost accounting sheet is "*the most important tool for performing cost center accounting tasks*" to be completely wrong (s.p.153).⁵⁰² The fact that Küpper uses the so-called staircase allocation procedure, for allocations between cost centers with an interdependent settlement, shows that his presentation of cost accounting systems is no longer completely up-to-date.⁵⁰³ This procedure could only be mentioned today in a history of cost accounting. This is because it is an inferior method that leads to incorrect results if the cost-performance model contains simultaneous equations. And this is almost always the case in practice.⁵⁰⁴

Furthermore, I also criticize (s.p.371) Küpper's methodical justification of ratio hierarchies, which are developed on the basis of so-called definition extensions. With his theoretical justification, Küpper has given legitimacy to a large set of hierarchical definition systems of ratios described in the literature, whose application is completely inappropriate. These so-called pseudo ratio hierarchies are misleading and suggests connections that do not exist.⁵⁰⁵

However, the deficits described do not lead to any contradiction with the system of the Integrated Target Commitment Planning. Unless Küpper would insist that his definitions, procedures, and representations (such as using a cost allocation sheet for planning) should have absolute validity. However, he does not make such categorical demands.

With regard to the Integrated Target Commitment Planning, there is only one point in which an assertion by Küpper contradicts a fundamental statement for the generation of plan and actual cost-performance models.

In his text, Küpper describes the differences between the cost of sales and the total cost accounting. In his opinion, a disadvantage of the total cost accounting method is that an inventory-taking (physical stocktaking) of the inventory has to be carried out, whereas this is not necessary with the cost-of-sales method. This assertion is incorrect and contradicts also the approach used in an INZPLA-model. From the point of view of the Integrated Target Commitment Planning, however, it is rather time-consuming to make clear what is wrong with it.

⁵⁰¹ See: Zwicker, E., *Classic Cost and Performance Accounting in the Light of the Integrated Target Commitment Planning*, op. cit., p. 28f., www.Inzpla.de/IN15-2002a.pdf. (Text in German, title translated).

⁵⁰² Schweitzer, M., Küpper, H. U., *Systeme der Kosten- und Erlösrechnung*, p. 134, 10th. Ed., München, 2011.

⁵⁰³ Schweitzer, M., Küpper, H.U., *Systeme der Kosten- und Erlösrechnung*, p. 136, 9th. Ed., München, 2008.

⁵⁰⁴ See page 627 and in detail: Zwicker, E., *Classic Cost and Performance Accounting*,.... p. 49f. www.Inzpla.de/IN15-2002a.pdf.

⁵⁰⁵ See in detail: Zwicker, E., *The RoI Target System and other Target Systems in the Light of the Integrated Target Commitment Planning*, Berlin 2014, p.34, www.Inzpla.de/IN44-2014.pdf. (Text in German, title translated).

The model-based clarification and critique of Küpper's assertion is presented in chapter 37 named "*Forms of a model-based critique*" (s.p.557). In this chapter, verbal statements of some authors about certain quantitative relationships in the area of operational planning and control are analyzed on a model-based level. It is shown that these statements, as in Küpper's case, are on this level not tenable.

Küpper's standard work on controlling "*Controlling, Conception, Tasks, Instruments*" contains a chapter entitled "*Theory of controlling*". This chapter, which serves as a "*theoretical foundation for controlling*", should be analyzed from the perspective of the model-based approach of the Integrated Target Commitment Planning.⁵⁰⁶ This is because the "*theoretical foundation of controlling*" also includes the theoretical foundation of operational company planning and control. And this is an area that has occupied me for decades. One result of this work is the Integrated Target Commitment Planning, which at least claims to have made a contribution to the "theory of operational company planning and control". It, therefore, seems to be appropriate to consider what Küpper has to say about the "*theory of controlling*" and how his statements are to be assessed in the light of the Integrated Target Commitment Planning.

Küpper's considerations are, as already mentioned, not in direct contradiction to the concept (or "theory") of the Integrated Target Commitment Planning. They are far too imprecise for this. However, they are inadequate and misleading from the point of view of a model-based planning and control. Küppers remarks on the "*theoretical foundation of controlling*", which are relevant for the area of a model-based controlling, can be divided into three subject areas, which he also names as follows. First; "*Control theory as the theoretical foundation of controlling*", second: "*The agency theory as the theoretical foundation of controlling*" and third: "*Modeling as the theoretical foundation of controlling*."

The first topic "*Control theory as the theoretical foundation of controlling*" shows a lack of knowledge of control theory and misunderstands its use in the field of operational company planning and control. Those who take what is written there seriously will not be able to develop an operational planning model because they are simply being led in the wrong direction. The justification for this claim can be found in a separate text.⁵⁰⁷

The second topic "*Agency theory as the theoretical foundation of controlling*" is devoted to the theory that is now part of mainstream research in the field of controlling. Küpper's high assessment of the relevance of the agency theory is also reflected in the preface to his work on controlling, which already points out that the "that the "*theoretical foundation of controlling*"... "*has made substantial progress, especially through the approaches of agency theory*".⁵⁰⁸

⁵⁰⁶ Küpper, H.U. *Controlling, Konzeption, Aufgaben, Instrumente*, Stuttgart, 5th. Ed., 2008, p. 65f.

⁵⁰⁷ Zwicker, E., *Küpper's Characterization of the Control Theory for the theoretical Foundation of Controlling in the Light of the Integrated Target Commitment Planning*, Berlin 2011, www.Inzpla.de/IN-40a-2011d.pdf. (Text in German, title translated).

⁵⁰⁸ See: Küpper, H.U., *Controlling...*, op. cit., Preface to the 3rd Ed., Stuttgart 2001.

Despite this ambitious claim, however, Küpper does not provide any information on how the agency theory could be applied in the field of controlling (management accounting). His entire reflections on the so-called *hidden-action agency theory* move on the level of an agent-principal relationship that has not been further concretized and work with terms such as "*actions of the agent*", which are marked with the symbols a_1 up to a_n or the "*financial result*", which is described by the symbol x . The entire empirical content of the optimization model developed by Küpper is described by three hypotheses that are not further specified. First, the probability distribution $\phi(x|a_i)$, which shows the probability with which an action of the agent (a_i) leads to a financial result (x). Second the *compensation function* $s = F_s(x)$ of the agent, which prescribes what compensation (s) the agent is to receive as a proportion of the financial result (x) he has generated, and finally the *effort function* of the agent $V = F_v(a_i)$, which describes the agent's work effort (V) caused by an action (a_i) performed by him.⁵⁰⁹

Küpper's most concrete statement regarding the application of the normative agency theory is that in companies there is "*a hierarchy between positions*", "*whose holders can be interpreted as principal with regard to the lower level and as agent with regard to the higher level*" (p.93).

That may be so. But how the developed formula apparatus with the probability distribution $\phi(x|a_i)$, the compensation function $s = F_s(x)$ and the effort function of the agent $V = F_v(a_i)$ is to be applied to this agent-principal relationship in a company mentioned above by Küpper he does not say a word about this.

Assuming that the process of negotiating target commitments between the corporate management (the "*superordinate level*") and certain responsibility areas (the "*subordinate levels*") could be interpreted as an agent-principal relationship in the sense of the normative agency theory, then only one question is of interest: How can the normative agency theory serve the *principal* (corporate management) to "improve" the operational planning of its company or even what proposes the normative agency theory to "maximize" the utility of the principal?

To achieve this, the question must first be clarified: Can the terms of the agency theory such as "principal's utility", "financial result", "agent's compensation" or "agent's effort" be applied as variables of a cost-performance model? And this finally leads to the question of how the normative agency theory can be applied in a company to plan the operating result with a cost-performance model and how it could contribute to improving the planning procedures practiced so far?

Küpper's text on the normative agency theory as a theoretical foundation for controlling has almost nothing to do with controlling (management accounting). For me, this insight was, as described elsewhere (s.p.399), the reason to engage with the field of the agency

⁵⁰⁹ Küpper's comments on the development of an optimization approach in the form of a Lagrange function are difficult to understand. Within a text of 42 lines, he uses the symbol "A" to describe the hidden-action agency theory for three different facts. Once "A" is used to indicate the level of effort in the sentence "*that the agent has the level of effort A*" (p.88), then as "*set of possible actions*" ($a' \in A$) formula (I-30) on page 89 and finally also as the number A to indicate "*A-1 constraints*" (p.89).

theory. Ultimately this led to the development of a variant of the normative agency theory called normative multi-agent hidden-effort agency theory or multi-agent hidden-effort agency planning.⁵¹⁰ It is in a position to answer the asked questions above.

The third topic of Küpper's methodological considerations is; "*Modeling as the theoretical foundation of controlling*". Here Küpper shows a certain ignorance regarding the structure, semantics, and analysis of models in the area of controlling. His considerations on this area will be discussed in more detail here because I consider the use of models in the area of controlling to be extremely important for everybody dealing with controlling. As already mentioned, Küpper's considerations do not go into such depth that they conflict with the modeling paradigm of the Integrated Target Commitment Planning. The only problem is that if someone reads these statements from "the" standard work of controlling with the deepest methodological orientation as "*state of the art*" of the construction and application of models and thus comes to the insight that one cannot say anything more about modeling, then he will be denied access to model-based operational company planning.

The following text is intended to draw the attention of a reader of Küpper's work to these shortcomings in order (perhaps) to change his assessment of the possibilities of model-based planning and control.

In his discussions on the "*Structure of optimization and simulation models*", Küpper points out that these models contain "*functions*". Without defining this term, he notes, "*the functions contained in them (the models) can reflect real-theoretical hypotheses, their parameters observable individual events. Their validity can be verified by reality. In addition to the logical verifiability of the results derived from the model, the empirical verifiability of their content statements comes into play.*"(p.73).

This is Küpper's only comment on the structure of models and their empirical verifiability. From a modeling perspective, these remarks are not very helpful in understanding the structure and semantics of models and in assessing their empirical acceptance.

If models can contain "*real-theoretical hypotheses*", then the question arises as to how these are defined. However, such a definition is not given. Küpper does, however, provide a hint on the structure of such "*real-theoretical hypotheses*". Hypotheses described in a model by hypothesis equations are known to contain "parameters". Küpper does not define the term "parameter", but he points out, "*the parameters (of models) reflect observable individual events*". Although it is unclear what Küpper understands by a "*real-theoretical hypothesis*", it should be assumed that a "*real-theoretical hypothesis*" corresponds to an "empirically verifiable hypothesis" in order to further investigate Küpper's model-theoretical considerations. If one follows this equalization, then Küpper's marking

⁵¹⁰ With regard to the information that Küpper was one of the driving forces behind this development, see page 398. For a description of multi-agent hidden-effort agency planning, see page 381, and in detail: Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory*, Berlin 2015, www.lnzpla.de/IN46-2015.pdf. (Text in German, title translated).

of a parameter as a representative of an “*observable event*” is highly strange. In an empirically verifiable hypothesis equation, the parameters are precisely those variables that are not observable. Thus, in the cost function (s.p.34)

$$CO = FC + VUC \cdot EP \quad (120)$$

the costs (CO) and employment (EP) are observation variables and the fixed costs (FC), as well as the variable unit costs (VUC), are the hypothesis parameters. However, these hypothesis parameters are characterized precisely by the fact that they are not observable and therefore, contrary to Küpper's view, by definition, do not “*reflect observable individual events*”.

It also raises the question of what is meant by the “*logical verifiability*” of “*results derived from the model*”.

Let us assume that in the simple one-equation model (120) the two model parameters FC and VUC have the following numerical values $FC = 1,000 \text{ €}$ and $VUC = 2 \text{ €/item}$. If we now assume from the forecast that employment (EP) will be 500 units, then from this model (by a simple calculation) we can arrive at the “*result derived from the model*” that the costs (CO) will amount to 2,000 €. The empirical verifiability, therefore, does not result from (not possible) empirical verifiability of the parameters as “*observable individual events*”, but from the fact that the “*derived result*” is compared with the forecasted costs (CO^P) of € 2,000 and the (observed) actual costs (CO^A) of e.g., € 2,700.

Furthermore, the question arises as to what should be understood by the “*logical verifiability of the results derived from the model*”.⁵¹¹ As described, the forecast value of the costs of € 2,000 is “*derived*” or “*calculated*” in more concrete terms using the hypothesis equation (120) and the two values of the parameters FC, VUC and the forecast value of the observation variable EP. What should be “*logically verifiable*” after such a derivation or calculation?

The same question arises when the planned value of the operating result is calculated or forecast based on 2.6 million equations and the values of 231,994 model parameters in Thyssen-Krupp Steel's plan cost-performance model. Which “*logical verifiability*” of what is then still necessary and which “*logic*” forms the basis of this “*logical verifiability*”?

Küpper points out in his text on the structure of models that models are used for three purposes. Thus, he notes, the “***first purpose of modeling***” is “*to disclose **the knowledge or idea of interdependencies***” (p.76).⁵¹² Before the intended purpose, of disclosing “*the knowledge*” or the “*idea of interdependencies*” is discussed, it is necessary to clarify what Küpper understands by “*interdependencies*”.

⁵¹¹ The underline was added.

⁵¹² Küpper's verbatim quotations are printed in italics in this text. Since Küpper uses italics in his text to highlight text passages, Küpper's italics are printed in bold here.

The term "*interdependencies*" is of central importance in Küpper's theory, because in his view "*interdependencies are the central object of a theory of controlling*" (p.67). Interdependencies "*exist when at least two facts influence each other*" (p.67). Küpper also points out the consequences of the occurrence of interdependencies when he remarks; "*Interdependencies mean that statements of fact cannot be determined independently of one another without reducing the achievement of targets. The effects on each other and their retroactive effect must be taken into account in the individual decision*" (p.67).

Küpper's assertion of the "*mutual influenceability*" of facts as a "*central object of a theory of controlling*" should be analyzed in the light of a planning model. In a planning model (but also an actual model), interdependencies are expressed by the "feedback relationships" between two or more variables. I cannot see any other meaningful reconstruction of this term using a model.

Such a feedback relationship can only be described in a cost-performance model by describing the endogenous model variables whose linkage leads to this feedback relationship by a simultaneous (or also a so-called interdependent) system of equations.⁵¹³ However, much of the relationship between the endogenous variables of cost-performance models are recursive rather than simultaneous (or interdependent).⁵¹⁴ Recursive cost-performance models are characterized by the possibility of developing an arrow diagram of the relationship between their endogenous variables, with arrows all pointing in the same direction.

In the already mentioned plan cost-performance model of Thyssen-Krupp Steel, such a one-way arrow model can be developed for 2,508,977 variables, while only 100,058 variables constitute a simultaneous system of equations (s.p.627). For these interdependent connected endogenous variables, at least one closed arrow line can be found in an arrow diagram, which runs over all variables and describes the interdependencies between these variables.

The predominant recursive variable links in cost-performance models, i.e., their structure, semantics and their integration into a planning and control procedure, would, therefore, if Küpper would be followed, not be the "*central object of the theory of controlling*".

Küpper's interdependence theory of controlling proves to be highly unclear from the perspective of a cost-performance model used for an operational planning and control of companies.

He does not define the term "*interdependencies*" further, but he points out their consequences: "*Interdependencies lead to the fact that facts cannot be determined independently of one another without diminishing the achievement of targets*". This formulation should be considered in the light of the interdependent relationships occurring in a cost-performance model.

⁵¹³ In dynamic models, such as System Dynamics models, feedback can also be described by delayed interactions, i.e., in such case a feedback can also be recorded by a recursive model. However, such distributed lag relationships do not exist in cost-performance models.

⁵¹⁴ See the structure of recursive equation models: Zwicker, E., *Simultaneous and recursive Planning Models: Structure, Semantics and Application*, Berlin 2003, www.Inzpla.de/IN25-2003c.pdf. (Text in German, title translated).

Let us assume that the corporate management had selected the operating result as a target for its upcoming operational planning with a cost-performance model. Furthermore, it is assumed that the cost-performance model used contains a simultaneous relationship between two variables A and B, i.e., the equation $A = F(B)$ and the equation $B = F(A)$ occur in the model in a parametric concrete form. Such a case is found in a cost-performance model if two transfer prices of the water supply P_W (€/cbm) and the power supply P_P (€/KWh) are mutually dependent on each other.⁵¹⁵

Once a cost-performance model has been developed that describes the reciprocal relationship between water and electricity supply in a company, then the transfer prices of P_W and P_P must be defined. Both definitions prove to be invalid circular definitions in the sense of today's definition theory.⁵¹⁶ However, in the special case of interdependently allocated prices (contrary to the definition theory), they are to be regarded as permissible because they lead to acceptable numerical values.⁵¹⁷

A plan or actual cost-performance model that contains these definition equations allows you to determine the plan or actual values of P_W and P_P . Are these planned or actual prices now "*facts that cannot be determined independently of one another*"?

In the case of a plan cost-performance model, the two plan transfer prices P_W and P_P are values that cannot be forecast independently of one another. Are such forecasting variables that do not represent observation variables to be regarded as "*facts*"? In the case of a plan cost-performance model, hardly.

In the case of an actual cost-performance model, the actual transfer prices are also determined by solving a simultaneous system of equations. Therefore, this type of actual variables can only be traced back to certain observation variables of the actual model via a simultaneous system of equations. Are such actual transfer prices to be regarded as "*facts*"? In any case, they are not observable.

Vague formulations can be interpreted in many ways. However, they do not contribute to the understanding or definition of interdependent relationships in cost-performance models.

With regard to the planning to be carried out with a cost-performance model, Küpper's assertion to this topic is also of interest, i.e., the assertion "*without reducing the achievement of targets*". In what way should the "*achievement of targets*" be reduced by not observing such an interdependent relationship between the two transfer prices (or "*interdependent facts*")? In the example of a plan cost-performance model cited above, a reduc-

⁵¹⁵ See page 534 for such an example, in which the relationship between the transfer prices of the cost centers water and electricity generation in a company is described. And in detail: Zwicker, E., *Simultaneous and Recursive Planning Models...*, op. cit., p. 5f. www.Inzpla.de/IN25-2003c.pdf.

⁵¹⁶ See my discussion on the admissibility of this kind of circular definition with Carl Hempel (page 534).

⁵¹⁷ For it can be shown that, the Gauss-Seidel method always leads to convergence due to the special structural relationships of cost centers with an interdependent settlement. This means that the simultaneous equation system can always be solved, that is, a numerical solution can always be determined for the prices of cost centers with an interdependent settlement. See: Zwicker, E., *Simultaneous and recursive planning models...*, op. cit., p. 22. www.Inzpla.de/IN25-2003c.pdf.

tion of the “*achievement of targets*” would mean that the non-recognition of the interdependence between the two transfer prices “*reduces*” the “target”, i.e., here the operating result to be planned. A “*reduction*” of the planned operating result, however it should be defined, does not take place in this case, because the planned operating result remains unchanged if the equations describing the interdependence in the model are deleted, because all primary costs incurred are included as components in the operating result in both cases.

Only the transfer prices (or cost prices) of the two services, i.e., the price for the supply of water and electricity, are not correctly determined with regard to their cause, which in a plan cost-performance model would probably result in the calculation of “wrong” plan article profits.

Küpper's interdependencies, which for him form the “*central object(s) of a theory of controlling*”, prove to be a not exactly clear concept in the light of a model-based representation of the interrelationships.

This brings us back to Küpper's first demand that for models “*the knowledge respectively the idea of interdependencies must be disclosed*” (p.76).

Models only permit “*disclosing*” the “*knowledge*” about the implications they contain, but not “*ideas*”. In a planning model, these are certain (verifiable) prognostic claims as well as information about the model structure or implicit definition equations. According to Küpper, only one special kind of “*knowledge*” (or ideas) is revealed, namely knowledge about “*interdependencies*”.

Thus, when analyzing a model, the interdependent relationships between which model variables should be revealed. This information is obtained by the output of a (because of the simultaneity) not decomposable structure matrix of the variables of the simultaneous equation system present in the model.⁵¹⁸ However, hardly any user would be interested in such information.” *Disclosing*” interdependencies from a model is, therefore, a superfluous goal.

From a model one should derive (or “*disclose*”) (model) implications that are useful to a model user. The described determination of the forecast costs of $CO^F = 2,000 \text{ €}$ or the determination of the sensitivity of a model parameter or also the determination of the primary costs of a finished product, i.e., a primary cost analysis, would hardly belong to Küpper's “*interdependence knowledge*”. However, they represent a “*knowledge*” not yet known to the model user, which is “*hidden*” in the hypotheses and definitions of the model. And the model user is interested in having access to this knowledge because he considers it to be useful.

Küpper continues: “*A second purpose is the analysis of the interdependencies shown in the models*” (p.76). Between the first purposes, i.e., “*to reveal the knowledge... about in-*

⁵¹⁸ For the description of simultaneous equations using non-decomposable partial matrices of the structural matrix of an equation model, see: Zwicker, E., *Simultaneous and recursive Planning Models...*, op. cit., p. 2f. www.Inzpla.de/IN25-2003c.pdf

terdependencies (of a model in question)" there is no difference for me and Küpper's further remarks do not go into what this difference could consist of.

He goes on: *"The third purpose of optimization and simulation models... is to coordinate the planning itself"* (p.77).

Now it could become interesting because that is exactly what is done with a cost-performance model when it is used in the context of a certain planning procedure. However, apart from this note, the reader does not learn which methods should be used to "coordinate planning" on the basis of models.

The top-down planning with such "simulation models" (and possibly also with optimization models), which could be regarded as a contribution to "coordination of planning", is described as such elsewhere in Küpper's book.⁵¹⁹

"In the case of a retrograde or a top-down planning, for example, strategic planning is used as a starting point. Their results become the framework for tactical planning. Thus, strategic goals can be set for the development of a technical potential, the opening of a new market, and the use of synergy potentials or similar. These are to be implemented in the subsequent tactical planning by decisions about investments, sales systems, etc. The decisions at the tactical level are, in turn, considered data for an operational planning. In it, for example, concrete actions for the use of new machines, the types and quantities of products to be offered on the new market, etc. are then worked out. The lower-ranking planning serves to achieve or realize the goals and alternatives selected at the higher level. A key problem is that they prove difficult or impossible to implement."

Küpper mentions in this text a strategic, tactical and operational top-down planning. Of interest is in the context of our question are only his remarks on an operational top-down planning. And what does Küpper have to say about this planning process? In his work of almost fifty-six hundred pages entitled *"Controlling: Conception, Tasks and Instruments"*, the operational top-down planning is exclusively characterized by the above quotation and that reads: *"In it, for example, concrete actions for the use of new machines, the types and quantities of products to be offered on the new market, etc."*

In contrast, the top-down planning in the Integrated Target Commitment Planning system is dealt with in somewhat more detail. It was described (s.p.39) using the furniture model. However, what does this top-down planning require for it to be applicable at all: It is based on a classification of the basic parameters of a model, which leads to certain types of basic targets. These basic targets are linked to the top target (or top targets) of the top-down planning using definition and hypothesis equations. The use of target commitment functions is necessary because this is the only way to determine the basic target commitments of an area without having to permanently renegotiate the basic target commitments of the areas in which their employment changes as a result.

The top-down planner can be supported in determining the (top-down) basic target values by an algorithmic procedure, on the basis of which he determines the values of the basic targets that lead to the top-down values of the top target required by the corporate management.

⁵¹⁹ Küpper, H.U. *Controlling, Konzeption, Aufgaben, Instrumente*, Stuttgart, 5th. Ed., 2008, p. 347.

Top-down planning of the type described above can only be applied in practice if a configuration system is available with which the structural equations connecting the top targets with the basic targets can be generated. There would be a lot more to say about what requirements are necessary for a top-down planning and how it is to be classified in a comprehensive company planning. A further question is how a top-down planning is to be structured if the model also contains completely controllable basic parameters (decision variables), etc.

And what does Küpper say about all this? Nothing.

Even his short description of a top-down planning quoted above is incorrect from the point of view of the Integrated Target Commitment Planning. Küpper points out that "*concrete actions*"... are "*developed*" within the framework of an operational top-down planning. Accordingly, the "development of concrete actions" and the target commitment to implement them represents the most important activity of a top-down planning. The objective of a top-down planning of the Integrated Target Commitment Planning, on the other hand, is only that the central controlling determines the (top-down) values of the basic target commitments of the areas with which the (top-down) value of the operating result specified by the corporate management can be realized.

For example, the head of a sales area commits himself to achieve a sales quantity of 10,000 units if a certain sales price for this article is set beforehand by the corporate management. Another example is when an area manager commits not to exceed the travel costs of his area of € 100,000. However, these commitments are not action commitments but target commitments.

In the context of the Integrated Target Commitment Planning and thus also of the top-down planning, a (model-immanent) action planning is also possible. This is the case if both these actions and their effects on the operating result are described within the frame of the cost-performance model intended for planning.

These actions are described by the numerical values of the completely controllable basic parameters (action parameters) stated in the cost-performance model. They can appear in the model as basic parameters in the form of decision parameters and decision variables. Furthermore, action variables in a cost-performance model can also occur as endogenous variables of decision rules.⁵²⁰ If these "*concrete actions*" are "*worked out*" before the start of the planning triad, such as the determination of a (completely controllable) sales price or a (completely controllable) pressure and temperature of a production process, then they appear as fixed numerical values, i.e. decision parameters, in the model.

If it is possible to determine alternative values of a completely controllable basic parameter during the planning triad, then this parameter is a decision variable (or changeable action variable) and is used during the planning triad to maximize the operating result. In this case, the "*worked out*" "*concrete actions*" consist of determining it by optimizing the

⁵²⁰ See: Zwicker, E., *Classification of Setpoint-Actual Control Systems with special Consideration of the INZPLA Control System*, Berlin 2015, p. 13, www.Inzpla.de/IN51-2015.pdf. (Text in German, title translated).

operating result. This would be the case of a mixed optimization basic Target Commitment Planning. However, such cases can hardly be observed in practice (s.p.26).⁵²¹

In practice, operational planning is rather aimed at committing people to achieve certain targets. Once they have made the commitment, they must see how they can achieve it. The Integrated Target Commitment Planning represents a normative formulation of this procedure. Küpper's work is intended to provide both "*scientific support and practical implementation of controlling*" (foreword).

According to a survey of the heads of 235 controlling departments, controllers in their companies devote around ninety percent of their working time to the tasks of an operational planning and control.⁵²² The "*practical implementation of controlling*", therefore, takes place primarily in the area of an operational planning and control. However, operational planning and control are carried out in companies using models. In practice, the SAP-CO system dominates here. It is widely used worldwide. However, this application is nothing more than operational planning and control using a cost-performance model.

Operational planning and control with models should, therefore, be given a strong weight according to the criterion of time spent in practice. To "*scientific support*" the application of an operational planning and control systems, one should learn something about the structure and semantics of such equation models. Because these models serve as the central medium for the entire operational planning and control. It would, therefore, also be desirable if, in a chapter entitled "*Theory of Controlling*", one could learn something about how a top-down planning can be carried out with these models.

Küpper's work on controlling is a conglomerate of considerations that are on the one hand much differentiated and highly demanding (like his remarks on the application of Pontrjagin's maximum principle in control theory), but on the other hand also (like his remarks on a top-down planning) extremely superficial.⁵²³ Any continuous line is difficult to see. If Küpper's contributions to the "*theoretical foundation of controlling*" criticized in this text were deleted, it would hardly be noticeable to a reader of the remaining text.

The work is a compilation of certainly not uninteresting topics from the field of controlling, which one should certainly know. However, this work and Küpper's other publications also clearly show that the "model-based approach" of the Integrated Target Commitment Planning, to put it mildly, is not exactly the "state of the art" of controlling (management accounting), which one of the most renowned German author considers worth reporting.

⁵²¹ One such a case, in which the pressure and temperature of a manufacturing process are used as "*decision variables*", was described by Kilger. Zwicker, E., *Integrated Target Commitment Planning and Optimizing Planning*, op. cit., p. 14, www.Inzpla.de/IN08-2000c.pdf. (Text in German, title translated).

⁵²² Exner-Merkelt, K. Keinz, P., *Wie effektiv ist das Controlling in der Praxis?* In: *Controlling 1* (2005), p.17. See also the overview in: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, Berlin 2007, p. 3, www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

⁵²³ For Küpper's comments on Pontrjagin's maximum principle see: Zwicker, E., *Küpper's Characterization of the Control Theory for the theoretical Foundation of Controlling in the Light of the Integrated Target Commitment Planning*, Berlin 2011, www.Inzpla.de/IN40a-2011d.pdf. (Text in German, title translated).

Kaplan's announcement to introduce an "*entirely new management accounting system*" in his work was compared to the announcement by a theatre director who announced Hamlet and then only "*The Cousin from Nowhere*" will be performed (s.p.184). This is a polemical label that not everyone should be pleased with (s.p.526). In Goethe's Faust, however, a theatre director actually appears, who announces the following tragedy in the "Prelude". This theatre director also expresses himself on the question of how to make a play a public success. Küpper's work shows how successful this advice can be. He says,

*Only by mass you touch the mass; for any
Will finally, himself, his bit select,
Who offers much, brings something unto many,
And each go home content with effect.*"⁵²⁴

⁵²⁴ Translated by Bayard Taylor 1870-71.

20. Contact attempts and Criticism of the Integrated Target Commitment Planning

The Integrated Target Commitment Planning and Control is a normative theory (or normative procedure) that has not yet achieved a high degree of awareness. This is also because its model-based approach makes it very different from the majority of academic publications on management accounting (“controlling”) an especially on operational company planning and control.

When I developed the (computer-aided) INZPLA-System, no university lecturer in the field of controlling dealt with the SAP controlling module or the development of computer-aided planning and control systems as part of his research activities.⁵²⁵ This was shown by a 2006 survey of the activities of 74 professorships in the field of controlling.⁵²⁶ Ten of these subject areas offered exercises on the SAP-CO module, but telephone enquiries showed that lecturers carried out these exercises and that actual “research” on the SAP-CO system was not carried out by the subject representatives of this area or their employees.

Only at the chair of Hans-Ulrich Küpper were two research assistants, Gunther Friedl, and Burkhard Pedell, who had written a book about the SAP R3 system with exercises I was fond of.⁵²⁷ In March 2003, I asked Burkhard Pedell at the meeting of the Accounting Commission in Berlin whether we could perhaps work together in some way. He was not disinclined. Then I sent him a text showing exactly how we transferred the central exercise of his book into the INZPLA-System and which investigations we carried out with the cost-performance model created in this way, which are not possible in the SAP R/3 system.⁵²⁸ Unfortunately, he did not respond. There were no further attempts to make direct contact with colleagues in the area of IT applications because no one could be considered.

After this futile contact in 2003, the system was intensively further developed so that it was improved in many respects and expanded in various directions at the start of its application at ThyssenKrupp Steel (2007). During the four years of use at ThyssenKrupp Steel, several man-years continued to be invested in its further development.⁵²⁹ Overall, I was only busy with the system. System development is a time-consuming matter and not everyone's business.

⁵²⁵ The same applied to business informatics.

⁵²⁶ See the result of this study: www.Inzpla.de/SAP-Uni-Anwendung-2006.pdf

⁵²⁷ Friedl, G., Hilz, C. Pedell, B., *Controlling mit SAP/R3. Eine praxisorientierte Einführung mit umfassender Fallstudie und beispielhaften Controlling-Anwendungen*, 3rd Ed., Wiesbaden, 2002. The third author, Christian Hilz, worked in practice.

⁵²⁸ See the thirteen pages of my letter and the description of the implementation www.Inzpla.de/SAP-Pedell.pdf.

⁵²⁹ On the extent to which the system has attained at the end of development, see page 628.

***** Almost everyone could program in my department and this was also practiced. Our motto was, "*theory yes, but as far as possible no theory driven*". And the best way to realize this is to program the procedures of a normative theory and to develop (computer-aided) examples of its application. The aim should not be: "*programming without theory*"; it should rather apply "*the program is the theory*" (s.p.550). And in my opinion, the computer program of the Integrated Target Commitment Planning and Control, i.e., the INZPLA-system, with about 870,000 lines of code (s.p.628), is a detailed and precise articulation of this normative theory.⁵³⁰ *****

In order to get suggestions and to make the system a little better known, I asked two of the leading specialist representatives who worked in the field of cost and performance accounting and controlling, namely Hans-Ulrich Küpper and Alfred Wagenhofer, whether I could not even present some theses on Integrated Target Commitment Planning to them and discuss them critically. The one (Küpper) simply overheard this question. The other (Wagenhofer), when I asked him about it, replied that he had no time for it because he would not be interested in the topic (s.p.397). The behavior of these colleagues is perfectly all right. Because I too would have reacted in the same way if I had had the impression that such a discussion would not benefit me personally.

From both representatives, who (at least at that time) can be described as top representatives of German-speaking management accounting, I analyzed and criticized their work in the light of the Integrated Target Commitment Planning and Control. The discussion of Küpper's work has already taken place (s.p.306-319), that of Wagenhofer's work will take place later (s.p.427-450).

The criticism of Küpper is quite rigorous. Therefore I was not surprised when a pre-reader who had read my critical remarks on Küpper's contributions said⁵³¹ "*I am sure Küpper will avenge himself, he will turn the tables and will attack your system of the Integrated Planning of Target Commitment with all its might*". My answer was, "*That would only be good. I have waited for such a criticism for a long time, and it never happened. And then to be criticized by the number one right away, I can only profit from that*".

It would also be much easier to criticize me than my criticism of Küpper's work. The critical reflections on his work relate almost exclusively to the chapter on "*Theory of Controlling*", which is analyzed in the light of the Integrated Target Commitment Planning.

It has already been pointed out that any of Küpper's three contributions on the "*theoretical foundation of controlling*" discussed here could be deleted without a reader of his work noticing it. However, this also applies to almost every chapter of this compilatively systematizing publication.

If, on the other hand, someone wants to criticize the system of the Integrated Target

⁵³⁰ For many normative theories, such an articulation in form of a computer program is not possible but in the field of an operational planning and control of companies it is feasible.

⁵³¹ See also the text of a further criticism of Küpper: Zwicker, E., *Küpper's Characterization of the Control Theory for the theoretical Foundation of Controlling in the Light of the Integrated Target Commitment Planning*, Berlin 2011, www.Inzpla.de/IN40a-2011d.pdf.

Commitment Planning, then he can bring the whole system to its collapse by rejecting some fundamental assumptions.

If, for example, it were possible to show that the classification of basic parameters required by the Integrated Target Commitment Planning is not sustainable, then the entire system would be obsolete. However, even points of criticism that do not lead to the immediate collapse of the entire system would cause serious shocks. There are just a few.

Criticism of the assertion that the basic area targets have a restricted burden effect.

The hypothesis system of the standard cost-performance models of an Integrated Target Commitment Planning is characterized by the fact that the changes in the basic target values of one area do not influence the burden on the other areas. Therefore, (s.p.37) the sum of the burdens of all area managers (SBA) can be identified as follows:

$$SBA = F_1(BT_{1,1}, \dots, BT_{1,v1}) + \dots + F_u(BT_{u,1}, \dots, BT_{u,vu}) \quad (121)$$

(F_i - burden function of area i , $BT_{i,k}$ - basic target k of area i)

As a result, when negotiating the basic targets with the areas, it is not necessary to follow a particular order in which negotiations with the areas are to take place. If it turns out that this assumption is untenable, then in the best case, a certain order (e.g., starting from the sales areas) must be kept, and in the worst case, the negotiation of the basic targets must take place in the context of an iteration process, which runs over several areas.

Criticism of the division into sub-models. The cost-performance model of an Integrated Target Commitment Planning is structured in such a way that it can always be divided into certain sub-models of the responsibility areas. These submodels are characterized by the fact that their structural equations (and thus also the corresponding model tableaux) contain exactly only the basic targets of the respective area. This allows the area to enter the values of its bottom-up basic targets directly into the model tableaux of its submodel.⁵³²

If an area Target Commitment Planning is carried out, that is, a variant of the Integrated Target Commitment Planning, then the areas "plan" their area target directly with their area model, whose structural equations correspond to the structural equations of this area in the cost-performance model of the central planning.

If one could now prove that it is not always possible to develop such sub-models that contain exactly the basic targets (and only these) of their area, then this would cause the modular structure of the model to collapse, and the simplicity of the model structure would be lost. And the areas could no longer enter "their" basic targets, i.e., the basic targets for which they are responsible, in "their" area model at the beginning of the bottom-up planning.

Criticism of object allocation. Two allocation types are used in the model configuration system of the Integrated Target Commitment Planning to model allocations between the allocation objects (such as cost centers and cost objects). These are the allocations with

⁵³² See: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., www.Inzpla.de/IN06-2000a.pdf.

real and fictitious order quantities that correspond to certain real and fictitious transfer prices.

This made it possible to reduce the eleven allocation types used in the SAP-CO system to two. And the result is a simplification that leads to a better clarity of the allocation relationships in a cost-performance model but does not limit the modeling options. An opponent could perhaps now succeed in showing that there are plausible allocations that cannot be described by these two types of allocations. It cannot be ruled out that one of the allocation types that was previously interpreted as a fictitious purchase order does not even permit this interpretation. In such cases, the system does not collapse because this type of allocation could then also be integrated into the model configuration system as a third type of allocation, but the simplicity of the model structure would be reduced.

Criticism of the dichotomy of comprehensive company models. When applying a two-step comprehensive company planning, it is assumed that a comprehensive company planning model can always be divided into a cost-performance and a CRFI planning model (corporate result and financing) and that these two sub-models are distinguished by a special semantic (s.p.60). In practice, as already mentioned, such a separation, combined with a two-step comprehensive company planning procedure, is actually practiced. However, the separation carried out in the Integrated Target Commitment Planning system is based on a special structure and semantics of both models. It is assumed that all basic targets of the Integrated Target Commitment Planning only occur in the cost-performance model. Therefore, the bottom-up planning of the first step of a comprehensive company planning with the cost-performance model is a pure target commitment planning.⁵³³

The CRFI model, on the other hand, does not contain any basic targets, but only decision variables. As a result, the second step of the bottom-up planning, which is operated with the CRFI model, can only ever be carried out as an optimization under constraints, i.e., in the form of a pure optimizing planning. However, this "elegant" and transparent planning situation, which also attributes the procedure in practice to a clear planning logical basis, is not guaranteed.

It would no longer generally apply if it could be shown that even in a CRFI model there are basic parameters that do not influence the operating result, but for which it is nevertheless reasonable to agree on targets with regard to their planned values, e.g., in order to positively influence the company result as the top target of a CRFI model. These basic parameters in the CRFI model would then also have to be declared as basic targets, and their values would then have to be negotiated with the relevant areas during the confrontation planning. If such cases could be found, then the "elegant" separation of a comprehensive company planning into a target commitment planning and a subsequent pure optimizing planning would collapse. In the sense of a consistent planning logic, one could then actually only carry out a one-step comprehensive company planning, and that would be a pity.

⁵³³ Unless the cost-performance model also contains decision variables, which is almost never the case.

Not only the structure and semantics of the models of an Integrated Target Commitment Planning have various points of attack. Planning procedures can also be attacked well. An example is the bottom-up planning of the second step, which may have to be carried out using a cost-performance model (s.p.58). It takes a certain degree of impertinence to describe the classical linear production program planning as a method that cannot be regarded as an optimization method of the deterministic decision theory.

As described the linear production program planning is described by almost all authors and also such prominent ones like Ewert and Wagenhofer as the classical example of an application of the decision theory in the case of an operational planning (s.p.58). In the light of the Integrated Target Commitment Planning, the linear production program planning by changing the semantics of some of its parameters and introducing additional new conditions is a sometimes necessary substep of the bottom-up planning of a pure Integrated Target Commitment Planning and, therefore, not an optimization procedure covered by the decision theory.

If this reconstruction of the linear production program planning and its integration into the bottom-up planning were to be effectively attacked, then I would have a serious problem.

The methods of model exploration also offer good opportunities for an attack.

An example of this is the RR-Min variance analysis. I see these procedures as a significant advancement. The variance analysis procedures discussed in the literature to date are not capable of enabling an actual-plan variance analysis of the operating result, which goes down to the actual-plan variance of each basic parameter of a cost-performance model. The RR-Min variance analysis I developed now shows how the actual-plan variance of the operating profit can be traceable to the actual-plan variances of the areas as variances in one of three types of a full responsibility and as a variance of certain co-responsibilities.⁵³⁴ In my view, this is a considerable step forward in the further development of a theory of variance analysis.

However, the whole procedure is based on a certain causal interpretation of the so-called elementary variances (s.p.97) from the actual-plan for which the areas are held fully or co-responsible. An important characteristic of a causally interpretable variance is the existence of a so-called directional consistency of the parameter variances (s.p.101). I have now made the assertion that the elementary actual-plan variances of an RR-Min variance analysis are always characterized by such a directional consistency and I have provided detailed proof to justify this assertion.⁵³⁵

If only one example of an elementary actual-plan variance could be found that does not have the property of a directional consistency, then this proof would be incorrect. The consequence would be that this "beautiful" procedure of an actual-plan variance analysis of the operating result would not break down, but would lose its power to convince. The

⁵³⁴ The result of such an analysis can be described by the tableau shown in Fig. 22 on page 97.

⁵³⁵ See the short review on page 101 and the proof itself in: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, Berlin 2007, p. 280f, www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

causal interpretation of the elementary actual-plan variance is thus called into question. If an opponent succeeds in citing only one example of an elementary actual-plan variance that does not meet the criterion of directional consistency, then this would be very embarrassing.

Of course, I would carefully analyze all justified criticisms and try to consider them by modifying the system accordingly. Even if these critical points did not lead to the collapse of the system, but could be taken into account by a modification, then the system would definitely become more complicated, and that would be unsatisfactory.⁵³⁶

If Ulrich Küpper were to hold a public discussion with me about the Integrated Target Commitment Planning and he would present one justified point of criticism after another, so that I could only ever reply to him "*You are right*", "*You are right*", "*You are right*", then I would have a hard time with that.

However, if Karl Popper would be present at this disputation and saw how I would have to suffer blow by blow from Küpper, then my bad situation would not disturb him in the least. Although, as I have personally experienced him, as a kind and peaceful man, he would still say, "*Keep it up, keep it up. That's the way it has to be. The formulation of theories is not enough, only through criticism and by probation against criticism, there is a scientific progress*".

⁵³⁶ See the considerations on simplification of the INZPLA-System on page 146.

21. SAP's controlling system and the Integrated Target Commitment Planning

The development of the Integrated Target Commitment Planning concept and the development of a computer program for its practical application took many years. During this time, I did not go "to the diving station", but continuously studied and analyzed the available program systems for cost and performance planning of companies I would certainly have used these systems to carry out the Integrated Target Commitment Planning if it had been possible, to insert specially developed additional programs, that would allow its implementation. Soon however, it became clear that only the SAP cost accounting system could be considered as a potential system. SAP first sold a cost accounting system called RK (real-time cost accounting) as part of the R/2 application system from 1978.

Together with Stefan Elsholz, who wrote his dissertation in this field, I examined this cost accounting system intensively to see whether an Integrated Target Commitment Planning with a cost-performance model could be carried out on its basis alone.⁵³⁷ The result was that the RK system proved to be completely unsuitable for this.

SAP then developed a new application platform called R/3. A slightly modified cost accounting system called SAP-CO was offered there.⁵³⁸ However, the SAP-CO system also proved to be unsuitable for carrying out an Integrated Target Commitment Planning.

Today, more than 100,000 companies worldwide use the SAP-CO system. When so many companies use this system, it sounds a little presumptuous to say that the Integrated Target Commitment Planning is a much better system than what SAP has to offer with its controlling system.

The following section, therefore, describes why the SAP Controlling system (CO system) is not suitable for carrying out the Integrated Target Commitment Planning.

From the point of view of the Integrated Target Commitment Planning, the planning system of SAP's CO module is surprisingly weak. Given that this is the product of a high-tech company with a global monopoly in this sector, this claim may be considered quite presumptuous. The inadequacy of this system will, therefore, be discussed in more detail below.

A system must meet at least two conditions in order to be able to carry out an Integrated Target Commitment Planning with it:

1. The system must allow a one-step model calculation. In this case, the entire structural equations of a cost-performance model must be calculated in one step. The time for such a calculation should be as short as possible.
2. The system must permit a flexible modification of the model parameters of the plan-

⁵³⁷ Elsholz, S., *Das RK-System der SAP AG als Ausgangsbasis zur Entwicklung eines Unternehmensgesamtplanungsmodells*, Diss. TU Berlin 1997, (585 pages). (*The RK system of SAP AG as a starting point for the development of a comprehensive company planning model*).

⁵³⁸ Until December 2003, the product was marketed under the name SAP R/3 and until 2007 under mySAP ERP. Then only the name ERP was used. However, the content of the actual CO module has not changed.

ning model used to specify further planning alternatives. For this, the model parameters must be explicitly addressable. It is necessary that they can also be addressed and changed as elements of the described classification of the parameters of an Integrated Target Commitment Planning.

The first step is to explain why a one-step model calculation is not possible in the SAP-CO system. It is then shown that even the requirement for flexible changes to the model parameters cannot be met by the SAP-CO system.

The CO system is one of the modules of the SAP system (the so-called CO module). It essentially consists of the three (from SAP so-called) components CO-OM (Overhead Cost Controlling), CO-PC (Cost Object Controlling) and CO-PA (Profitability Analysis). If you want to plan the operating result, it starts with planning the plan allocations of the main cost centers in Cost Center Accounting (CO-OM-CCA as a sub-component of CO-OM). The model developer enters these as numerical values (e.g., 10,000 machine hours for production area Z). Then the primary variable and fixed costs in these main cost centers and the fixed and variable primary consumption quantities are "planned" by entering their plan parameter values.

Then you enter the plan parameters for the primary fixed and variable costs of the service cost centers. The planned employment of a service cost center A depends not only on the demand of the main cost centers but also on the use of their services by other service cost centers. Since the plan employment of the service cost centers cannot yet be determined in this phase due to their interdependence, a provisional plan employment is assumed for them, for which their variable costs are specified. For example, if a service cost center A has a provisional plan employment of 9,000 working hours, the variable costs of cost element X in this service cost center are planned with € 18,000. The allocations between the service cost centers are then specified. Only two of the eleven possible allocation types are covered: the direct activity allocations and the assessments.⁵³⁹

The first allocation type is the direct activity allocation. It determines the planned delivery quantities between the cost centers, based on the plan employments of the main cost centers. From the point of view of a model, the planned values of the delivery quantity structure are determined with this calculation depending on the plan employments levels of the main cost centers. This calculates the quantity structure of the "Cost Center Accounting" submodel. This calculation is based on a manually triggered plan reconciliation.⁵⁴⁰ If the "correct" plan employments of the service cost centers are determined (for example, 10,000 instead of 9,000 machine hours in service cost center A), the corresponding primary variable costs can be calculated (in the example $(18,000/9,000) \cdot$

⁵³⁹ For more information on the different types of allocation between Controlling objects in the SAP-CO system, see: Flemming, A. *Integrierte Plankostenrechnung mit SAP R/3 unter Verwendung von INZPLA-Gleichungsmodellen, (Integrated Plan Cost Accounting with SAP R/3 using INZPLA Equation Models)*, Diss. TU Berlin 2005, p. 310f.

⁵⁴⁰ On the other hand, such coordination in the form of an iteration is also conceivable with the aid of computer-assisted procedures, which are "initiated" by the computer program itself depending on certain criteria.

10,000 = 20,000 €). If you have calculated the "correct" plan employment of the service cost centers based on the plan employments of the main cost centers, you can calculate the "*activity prices*" (SAP term) or what is commonly called the transfer prices that the service cost centers charge each other. However, this also determines the plan values of the secondary costs in the service cost centers. The calculation of *activity prices* (transfer prices) and thus the secondary costs of direct activity allocation are triggered manually by a so-called iterative processing. This means that two calculation steps are already required to determine the plan values for a direct activity allocation.

However, you must also use an iteration procedure if using the second type of allocation in the SAP-CO module. It is the assessment allocation. To do this, you need to determine the cost centers that are involved in the assessment allocation procedure (determination of the assessment cycle). However, since you do not know which cost centers are affected by an assessment allocation, it would be advisable to include all cost centers (or other reference objects) in one cycle and not to define several cycles.⁵⁴¹ However, this procedure, which is assumed here, leads to extremely high computing times. As already mentioned (s.p.165), it is practically impossible to check whether the allocations are calculated correctly because, as Brück stresses, the "*relationships are too complex*". This prompted him to quote: "*You simply have to believe the assessment results of SAP R/3 in practice.*" Unfortunately, in our experience, this belief is not always justified.

However, if the allocation of assessments depends on parameters (such as certain secondary costs) that are determined during the price calculation, then it is no longer possible to allocate activities correctly. The SAP System does not recognize the simultaneous equations that occur and, therefore, does not solve them using a calculation procedure (such as the plan or price iteration described). As Brück states, such a case is "*in practice the normal case and not the exception*".⁵⁴²

If this is the case, the user can only try to reach a correct allocation with a trick. He must alternately call up the price iteration and the assessment iteration and perform a calculation until "nothing more moves", that is, further calculations do not lead to changes the costs in the cost centers (or other reference objects).⁵⁴³ A one-step model calculation in the sense of the Integrated Target Commitment Planning is, therefore, out of the question with regard to the cost center module. If additional allocation types such as indirect activity allocations, periodic repostings, template allocations, accruals, or overhead are carried out, additional calculations are necessary. None of these calculation types can automatically resolve cyclic dependencies to other calculation types.

Once all variables of the cost center module have been determined, the model calculations that take place in the cost object module (CO-PC) can begin. In this module, all

⁵⁴¹ If allocations run over two or more cycles defined by the user, unrecognizable allocation errors occur.

⁵⁴² Brück, U., *Praxishandbuch...*, op. cit., p. 101.

⁵⁴³ In the light of simultaneous systems of equations, this is a manually controlled Gauss-Seidel procedure, which does not have to lead to convergence, however, because this is not guaranteed in the case of allocations.

costs of the cost objects of the finished and intermediate products are to be calculated. To determine the costs of a cost object, it is necessary to know what raw material consumption is required for each product unit. The values of these planned consumption quantity rates of raw materials for creating a cost object must be specified. The planned price of the raw material in question must also be entered. This can be used to calculate the raw material costs of these individual raw materials.

Since the cost object requires certain production areas, you have to specify which amount of the plan employment of these cost centers (for example, 2,000 machine hours at production area Z) are necessary. Multiplying these employment amounts by the cost rates of the production areas (main cost centers) taken from the cost center module leads to the costs incurred by using these production areas. The user must also specify the consumption quantities that an intermediate product A requires in units of an intermediate product B (for example, intermediate product A requires two units of intermediate product B). Afterward, the module can be "calculated" to allocate the costs (in the case of a full cost calculation) to the cost objects of the finished products.

This allows you to call up the module Profitability Analysis (CO-PA). The cost rates of the sold finished products (or articles) are transferred to it from Cost Object Controlling (CO-PC). These are multiplied by the planned sales quantities of the finished products and result in the full costs of the individual articles. The full costs of the products (articles) are, in turn, deducted from their sales values and lead to their net article profits, the sum of which is the operating result. The operating result is, therefore, determined in the Profitability Analysis module (CO-PA) with the aid of a one-off calculation.

Five successive partial model calculations are, therefore, required across all three modules in order to calculate the operating result. In this context, it is assumed that there are no interdependencies between the assessment iteration and the transfer price iteration and that none of the other allocation types mentioned are carried out.

However, these five partial calculations are not yet sufficient for a complete calculation of the cost-performance model implicitly formulated in the SAP-CO system. As described above, only the plan employments of the main cost centers were entered as fixed plan values (such as 10,000 machine hours for production area Z), and then the planner determined the planned consumption quantities in Cost Object Controlling on the assumption of a predefined planned sales quantity.

In addition, to determine the cost rates of the intermediate products, the amounts of their capacity usage with regard to certain production areas were entered (in the example 2,000 machine hours of production area Z). However, from where did these values come from? As mentioned, Kilger points out that procedures have been developed in the USA in which the plan employments of the main cost centers "*are derived directly from the planned sales quantities*" (s.p.57).

Kilger does not use this method in his model example and does not propagate it in his work. However, the developers of the SAP-CO system have tried to enable such a "deri-

vation", that is, a sales quantity-driven planning, in their system. It is carried out using three production planning modules. However, determining the planned operating levels of the main cost centers on the basis of the planned sales quantities in the SAP System is a complex matter. It should be briefly described:

The planned sales quantities that are defined in the profitability module (CO-PA) are communicated to the module "Sales & Operations Planning" (PP-SOP). The data from Sales & Operations Planning (PP-SOP) must then be copied to Long-Term Planning (PP-MD-LTP). In PP-SOP, this requires six individual steps.⁵⁴⁴ After calling up the "Long-term planning" module (PP-MD-LTP), four further steps must be carried out. This makes it possible "*to derive activity quantities on cost centers from the planned sales quantities*".⁵⁴⁵

However, only "*the activity totals per type of service*"... "*are stored on the cost centers for this invoice.*"⁵⁴⁶ Therefore, if two intermediate products are produced in a production area Z that are required to produce the sales quantities $SQ_1 = 1,000$ units and $SQ_2 = 3,000$ units, then it is only known that, for example, 20,000 machine hours are required to produce these two intermediate products. If the sales quantities SQ_1 and SQ_2 are increased to 1,200 and 3,500 units during the alternative model calculations, the entire procedure described must be repeated to calculate a new load for Z.

In order to ensure the connection of the quantity structure from the sales to the purchase quantities, it is also necessary to take into account the quantity and value-based inventory flow rates. This is modeled in the Integrated Target Commitment Planning system using an inventory updating tableaux.⁵⁴⁷ This type of inventory flow modeling is not possible in the SAP-CO system. If the quantity and value flow through an inventory is to be taken into account in an SAP-CO application, the model developer must be aware of the incoming quantities and transfer prices of the production areas supplying the inventory that were previously calculated in the SAP-CO system. They are used to manually calculate the outgoing quantities of the inventory and the transfer prices "required" by the inventory to the purchasing production areas in accordance with the calculations carried out in an inventory updating tableau. These are then entered back into the SAP-CO system by the "SAP planner". The allocation relationships between the reference objects (for example, cost centers or cost objects) are then calculated further with them until the next inventory is reached. This then proceeds step by step across all inventories. This results in a corresponding increase in the number of calculation steps when calculating a planning alternative.⁵⁴⁸

⁵⁴⁴ See in detail: Brück, U., op. cit., p. 428f. In some steps, the input fields are distributed over four masks.

⁵⁴⁵ Brück, U., op. cit., p. 435.

⁵⁴⁶ Brück, U., op. cit., p. 436.

⁵⁴⁷ See Fig. 14 on page 69 for the structure of such an inventory updating tableau. For a description of the types of such inventory updating tableaux, see: E Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 80f., www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated).

⁵⁴⁸ For more information on this procedure: Zwicker, E., *The Model Tableau System...*, op. cit., p. 90.

Product Cost Accounting (PC module) also requires a connection via the modules described in Production Program Planning (PP modules) if you want to carry out a sales quantity-driven planning. The PP module provides information on which production or purchase quantities a raw material or intermediate cost object requires to produce the planned sales quantities. If an alternative with new sales quantities is to be calculated, these requirements for raw materials and intermediate products must also be recalculated using the production module.

The five calculation steps mentioned in the controlling modules for calculating the operating result must, therefore, be supplemented by the calculation steps and transactions described in the production planning module.⁵⁴⁹ If one considers the whole process once again, then one can only draw the conclusion that a chaotic, error-prone procedure comes into play here. Anyone who is instructed to carry out such planning is only to be regretted.

It should already be pointed out here that these sales quantity-driven relationships are reconstructed from the data tables of the SAP system using INZPLA-Connect, so that the entire relationships of a "sales quantity-driven planning" that run across the PP modules, such as the results of bill of material explosion, are contained in an INZPLA-model as structural equations. Only in this way is a one-step model calculation possible.

To assess the total effort involved in planning, it should be added that the transfer of values from one module (or submodel) to another requires certain manual transactions that are highly error-prone. All in all, however, this procedure results in planning based on sales quantity. This means that the plan allocations of the main cost centers and the requirement quantities of the cost objects are determined on the basis of the planned sales quantities.

The difficulties that arise and the effort required to calculate the operating result in the SAP-CO system in the form of a planning alternative cannot be described in more detail here.⁵⁵⁰ However, to show that others also regard such sales quantity-driven planning with the SAP-CO system as a major problem, Piechota's 1999 statement on the difficulties of integrated company planning with the SAP-CO system, cited by Brück to indicate the difficulty of integrated planning with the SAP-CO system, should be mentioned. It says,⁵⁵¹ *"I only know three controllers who claim to create their business plan with SAP*

⁵⁴⁹ As in the present case, an SAP application often requires the entry of a large number of subsequent transactions, with more or less long waiting times between the individual transactions. This is why the abbreviation "SAP" is often mockingly reproduced with "Search-Click-Pause". See page 351.

⁵⁵⁰ A critical analysis of the SAP-CO modules is carried out in detail in the work of Golas and Flemming. Golas, E. A., *Konzeption eines Prototypen für die Überführung der SAP-R/3-Kosten-Leistungsrechnung in ein gleichungsbasiertes Kosten-Leistungsmodell*, (Conception of a Prototype for the Transfer of SAP R/3 Cost-Performance Accounting into an equation-based Cost-Performance Model) Diss. TU Berlin 2001, as well as in: Flemming, A., *Integrierte Plankostenrechnung mit SAP R/3 unter Verwendung von INZPLA-Gleichungsmodellen*, (Integrated Plan Cost Accounting with SAP R/3 using INZPLA Equation Models) op. cit., p. 204f.

⁵⁵¹ Brück, U., *Käsehersteller plant sein Geschäft für 99 mit R/3*, in: Computerwoche Nr. 5/1999, The article begins with the text: "According to experts, it is difficult or even impossible to create integrated business plans with SAP R/3 software." See www.computerwoche.de/heftarchiv/1999/5/1079849/.

R/3. In the case of two, it turned out that they only enter the finished plans in R/3; the actual planning is carried out in advance with other systems. The third actually created the plan with SAP R/3 but admits that he got an ulcer. He will never plan again with SAP R/3."⁵⁵²

The situation described above still applies today, because the system has undergone almost no changes, since then. The cumbersome and error-prone planning procedure of the SAP-CO system requires a lot of time to perform a model calculation. As already reported, ThyssenKrupp Steel needs an entire working day to calculate a model alternative (s.p.162). That is still an excellent result. As already mentioned, T-Com needs ten working days to calculate all modules up to the operating result.⁵⁵³

This description should make it clear why the SAP-CO system cannot be used to carry out an Integrated Target Commitment Planning.⁵⁵⁴ The procedure requires a sequence of model calculations and transfer procedures in order to finally determine the final planning alternative and thus the value of the operating result at the end of the confrontation step. In order to be able to carry out an Integrated Target Commitment Planning, you need, as already emphasized, a model that is calculated in one step. The SAP-CO system cannot supply such a one-step model calculation. Rather, it is a lengthy, cumbersome and erroneous multi-step model calculation.

Hasso Plattner and Henning Kagermann, both former chief developers of the SAP-CO system, expressed the following opinion in a joint paper: "*Since planning is in principle an iterative process, the quality of planning is also influenced by the possible number of iteration steps. Several planning runs in a short time are increasingly demanded by the practice*".⁵⁵⁵ Almost thirty years ago, both apparently recognized that a one-step model calculation would be desirable. However, this wish has not yet been fulfilled.

Choosing the numerical values of the model parameters to calculate a planning alternative is also a tedious task in the SAP-CO module. The model parameters can sometimes only be changed individually and sometimes only indirectly by calling them using certain transaction chains. When a model has thousands of parameters that can potentially be changed, it's hard to realize.

In the Integrated Target Commitment Planning system, however, there are four ways to change model parameters (for further planning alternatives):

⁵⁵² The poor fellow. I hope that he recovered well from that.

⁵⁵³ Information authorized for notification by Reinhard Knoop, then Head of Costs and Profitability at T-Com. In the beginning, it was even 15 working days. For a description of this system, see: Knoop, R., Müller, M., *Die integrierte Kosten- und Ergebnisrechnung der T-Com*. In: ZfCM, 49 (2005), H. 1, p. 22-26. Reinhard Knoop gave a lecture on his system at the TU Berlin in July 2005. See: www.Inzpla.de/Knoop-TUB-Vtr.pdf. T-Com was also interested in using the INZPLA-System. But we chose ThyssenKrupp Steel while it possessed the most comprehensive SAP based planning system. See page 344.

⁵⁵⁴ See also on page 162 the reason why it is almost impossible to use an if-then-calculation tableau when using the SAP-CO system.

⁵⁵⁵ Plattner, H., Kagermann, H., *Einbettung eines Systems der Plankostenrechnung in ein EDV-Gesamtkonzept*. In: Scheer, A. W., *Grenzplankostenrechnung. Stand und aktuelle Probleme*, Wiesbaden 1988, p. 151.

First: In the model tableaus, by entering other numerical values in the fields of the model parameters.

Secondly: In the if-then-calculation tableau already mentioned (s.p.162).

Third: By reading Excel tableaus into which the numerical value to be changed is to be entered in addition to the names of a model parameter that are to be rounded off with the rows.⁵⁵⁶

Fourthly: By defining certain multidimensional parameter cubes, all of whose values are changed by a certain percentage.⁵⁵⁷

The plan to carry out the Integrated Target Commitment Planning using only the SAP system, therefore, proved impracticable.

So far, only the question of whether it is possible to implement the most elementary pre-requisites of an application of the Integrated Target Commitment Planning in the SAP System, i.e., a one-step model calculation and an efficient modification of the model parameters, has been discussed.

The possibilities of implementing the described planning and control procedure and the described model exploration procedures in the SAP-CO system have not even been mentioned so far. It is no exaggeration to say that none of these procedures is available in the SAP-CO system due to the lack of an equation representation of an "SAP cost-performance model".

This also applies to the model exploration procedures described, which, in addition to the target commitment planning and control with a cost-performance model, are possible.⁵⁵⁸

As described, the SAP-CO system is not able to determine the individual fixed costs of certain reference objects (such as an article group) using structural analyses (s.p.129). This means that the SAP system cannot generate any of the described one- and multidimensional profit hierarchies such as the Agthe-Mellerowicz profit hierarchy for reducing the operating profit to certain subprofits (s.p.129).

It is hard to believe that a high-tech company offers software in which a model calculation (as initially at Telekom) takes 15 working days, although it would be possible to perform such a calculation as by Thyssen in probably not more than some seconds. This time-consuming and nerve-wracking clutter with transactions and pauses (search, tap, pause) is an imposition, considering that a push of a button (tip of the finger) would suffice. An application system that requires such an approach can only be described as a disaster. It can't get any worse. A friendlier judgment would be inappropriate.

⁵⁵⁶ At ThyssenKrupp Steel, the changed values of 1,215 model parameters (such as the values of sales quantities) were entered in this way to calculate planning alternatives during planning 2008/09.

⁵⁵⁷ In addition to the third alternative (with the change of 1,215 model parameters), all other model parameters were entered in the ThyssenKrupp Steel model in this way. This input led to a change of 26,396 model parameters in planning 2008/09 using seventy three-dimensional parameter cubes.

⁵⁵⁸ To justify this claim, see: Golas, E. A., *Conception of a Prototype for the Transfer of SAP R/3 Cost-Performance Accounting into an equation-based Cost-Performance Model*, op. cit. pages 120f., 156f., 174f., and 339f. A further comparison is made in: Flemming, A, *Integrated Plan Cost Accounting with SAP R/3 using INZPLA Equation Models*, op. cit., p. 204f.

22. Rescue of the practice relevance of the Integrated Target Commitment Planning

The INZPLA-System, which was developed to carry out the Integrated Target Commitment Planning, has reached a stage around 1990 where it could have been used as a prototype in a company. I turned to various companies to persuade them to work with me. This attempt was completely unsuccessful. All of these companies used the SAP-CO system and were unwilling to use the Integrated Target Commitment Planning, as a second planning system that would work in parallel to a certain degree, with which - in addition to the SAP-CO system - the operating result could be recalculated.

SAP has a global monopoly in the field of standardized application software for companies. This applies in particular to the CO module. The strength of this monopoly is very clearly expressed in the statement by Hasso Plattner, the former Chairman of the Management Board and current Chairman of the Supervisory Board.

*"We, SAP, dominate the global market for enterprise software. We decide which partners are allowed to work with us. And if someone gets in our way, we stomp him in the ground".*⁵⁵⁹

Actually, I could have guessed that no company would be willing to use another system besides its SAP controlling system, but I did not want to acknowledge it. This was a typical case of reality blindness when one is taken by an idea. Thus, the goal of developing a system to be used in practice was probably no longer attainable.

In this situation, a decision was made whose probability of success could not be estimated. It was the decision to develop a system that analyses the SAP-CO system in a company and generates a corresponding cost-performance model of an Integrated Target Commitment Planning based on this analysis. This decision led to the development of the already mentioned system INZPLA-Connect. It was based in detail on the following consideration:

As already mentioned, the SAP-CO system can be described as a "calculating database". To calculate a cost-performance model, the user must carry out certain allocations between certain cost objects using transactions. These transactions include calculation rules, which are then carried out when the partial calculations are activated in the modules. The results of such a transaction are written to a database and are available for further transactions, the results of which are written back to the database, and so on.

The equations of a cost-performance model are, therefore, contained in the data tables of the SAP-CO system in a way that does not correspond to the usual algebraic representation of an equation. However, it should be possible to decipher this "indirect specification of equations" in such a way that a closed system of equations could be reconstructed from it, which describes all calculation references of the CO module in the form of one cost-performance model. If this cost-performance model were to be calculated, the same value

⁵⁵⁹ In: Wirtschaftswoche No. 50-03.12.1998, p. 96.

of the operating result would have to be obtained as if the operating result were calculated by the SAP-CO system. Since the plan cost-performance models thus developed are intended for the execution of an Integrated Target Commitment Planning, it would also be desirable if all structural relationships of this equation model could be reflected by the relationships in the model tableaux of an Integrated Target Commitment Planning.

Such an approach was decided, and it was extremely laborious and time-consuming to reconstruct the information in the data tables so that an equation model could be generated that met these requirements. However, it was not only possible to reproduce the value of the planned operating result of the SAP application. In all cases, it was also possible to reconstruct all relationships using the model tableaux of an Integrated Target Commitment Planning. As already mentioned, the SAP-CO system contains eleven types of cost allocation between reference objects (s.p.326). It was possible to trace these allocation types back to the two allocation types that are used in the model tableau system of the Integrated Target Commitment Planning alone, as described.⁵⁶⁰ It is obvious that this also increases model transparency compared to the SAP application.

This opened up the possibility of proceeding as follows: A user configures his model with the SAP-CO system and calculates the planned operating result. This plan cost-performance model (in non-equation form) is then transferred with INZPLA-Connect into a cost-performance model of the Integrated Target Commitment Planning. With this model, the whole planning is carried out, and the results are written back to the reporting system of the SAP system.

INZPLA-Connect was used to reconstruct the SAP-CO systems of a series of companies as cost-performance models for the Integrated Target Commitment Planning. These include Volkswagen AG, Deutsche Bank AG, Daimler Benz AG, and others.⁵⁶¹ The generation of the cost-performance models as models for the Integrated Target Commitment Planning now made it possible to modify the model parameters very easily.⁵⁶²

The speed at which a model was calculated also proved to be a great advantage. As I will report later in more detail, the equation-calculation system I have developed and main-

⁵⁶⁰ See: Flemming, A., *Integrierte Plankostenrechnung mit SAP R/3 unter Verwendung von INZPLA-Gleichungsmodellen*, (Integrated Plan Cost Accounting with SAP R/3 using INZPLA Equation Models, op. cit., p. 310. The allocation with real order quantities corresponds to the direct activity allocation in SAP. Real order quantities are described in: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of comprehensive Company Planning and Control*, Berlin 2010, p. 112f. www.Inzpla.de/IN37-2008c.pdf (Text in German, title translated). For a detailed description of the order quantity-price-relationships, in which also fictitious order quantity-price-relationships are treated see: E Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 34f., www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated).

⁵⁶¹ As already mentioned, an overview of some of the companies for which a cost-performance model or even just a cost-center model was created can be seen in Fig. 40 on page 150.

⁵⁶² In almost all models generated with INZPLA-Connect, it became apparent that inconsistencies between the modules and incorrect specifications in the modules occurred in the original SAP-CO system, which had to be eliminated in order to enable a correct conversion. In this respect, the system could also be used as a "consistency check system" of an SAP-CO system in a company.

tained, since 1968 is extremely fast and faster by dimensions than any comparable system.⁵⁶³

The model generated for ThyssenKrupp Steel takes 15 seconds to calculate a planning alternative. This is sensational in comparison with the time required for an "SAP calculation". Compared to the time required for other applications of the INZPLA-System in practice, however, this is still relatively long. The time required is not only due to the fact that the ThyssenKrupp Steel model comprises approx. 2.6 million equations but also due to the fact that - as will be described in more detail later - the model has a simultaneous equation system with over 100,000 variables, which must be solved once for each of the twelve monthly calculations.⁵⁶⁴ The cost center model of Volkswagen AG, which includes 562,266 equations, only required 0.283 seconds for its calculation.⁵⁶⁵ This made it possible to transfer every SAP-CO application to an Integrated Target Commitment Planning model and use it to carry out the planning procedures described that cannot be implemented in an SAP-CO system.

⁵⁶³ See the remarks on the speed of this equation-calculation system and its importance for the whole project on page 627.

⁵⁶⁴ See the remarks on the simultaneous system of equations on page 627.

⁵⁶⁵ See the information in Fig 40 on page 150.

23. Integrated Target Commitment Planning in use at ThyssenKrupp Steel

With the help of the developed "model transfer program" called INZPLA-Connect, each plan cost-performance model of an SAP application could now be transferred into a model tableau system of the Integrated Target Commitment Planning and thus into the equation model corresponding with this model tableau system. As mentioned above, the SAP plan cost-performance models of a series of companies were successfully transferred (the same operating result was achieved). Some of these companies have used them for planning purposes. However, as this was a research project and our resources were quite limited, we concentrated on the operational planning system of ThyssenKrupp Steel. According to our information, ThyssenKrupp Steel uses one of the world's largest (probably even the largest) SAP-based plan cost-performance models. This planning model was transferred to an equation model for the Integrated Target Commitment Planning and the corresponding model tableaus.

	Thyssen 07/08	Thyssen 08/09	Thyssen 09/10
Module			
1 Overhead Cost Management CO-OM	yes	yes	yes
2 Product Cost Controlling CO-PC	yes	yes	yes
3 Profitability Analysis CO-PA	yes	yes	yes
Cost element Statistics:			
4 Number of Cost Elements	8.888	10.510	13.693
5 thereof primary cost elements	304	346	329
6 thereof secondary cost elements	8.584	10.164	13.364
Tableau Statistic:			
7 Number of Cost Centers	2.353	2.371	2.410
8 Number of Cost Objects	1.821	1.884	1.937
9 of which are sold articles	209	204	232
10 Number Model Tableaus	21.869	30.493	40.093
Variable Statistics:			
11 Number of Parameters	231.994	240.192	242.015
12 Total Number of Equations	2.609.035	2.662.563	2.679.709
Cost Object Calculation:			
13 Highest Stage Production	33	36	36
Calculation Time in Seconds:			
14 (Reference Computer 3,0 GHz)	15	15	15

Fig. 62: Structural features of the operational INZPLA planning models (plan cost-performance models) used by ThyssenKrupp Steel to carry out its annual plan)

ThyssenKrupp Steel uses the model for one-year planning and a five-year plan, which includes the one-year planning.⁵⁶⁶ Planning for the second to fifth planning year is, there-

⁵⁶⁶ For the structure of this model, see in detail: Lehnert, S. *Mittelfristplanung mit INZPLA-Gleichungs-*

fore, carried out using the same structural equations for one-year planning. The system of the Integrated Target Commitment Planning and Control was designed to carry out an annual operational planning and control. It was, therefore, quite surprising for me that ThyssenKrupp Steel wanted to use the structural equations of the model for each year of its five-year planning. In contrast to this approach, advocates of medium-term planning with equation models argue that the planning of the second planning year and the following planning years should be carried out with models whose aggregation level should be higher than that of the basic annual planning.⁵⁶⁷

Fig. 62 shows the structural data of the INZPLA-models used for the planning years 07/08, 08/09 and 09/10.⁵⁶⁸ The planning model of the period 07/08 is to be used for a more detailed description. It explains a sales value of approx. € 9 billion. The costs are incurred in 2,353 cost centers with 9,177 reference variable units. It covers all thirteen profit centers of the company and describes 170,292 supply relationships. The entire quantity structure of the production processes is described. Production chains of up to 33 steps occur. The two order quantity diagrams in Fig. 41 and 42 on pages 151 and 152, which describe the relationships between the order quantities (and thus also the delivery quantities) of the finished products and intermediates, have already been mentioned and commented (s.p.150).

As already reported, the model contains 21,869 model tableaux. The number of basic parameters is 231,994 and their subdivision according to the types of basic parameters in the model tableaux is shown in Fig. 7 on page 43. The number of equations of the model is 2,609,035.

To illustrate the size of this INZPLA-model and its model tableau system, a comparison with Excel is made. In principle, the model could also be represented with Excel. As with INZPLA-Connect, you could also develop a transfer program from an SAP-CO application to Excel (called Excel-Connect). For each month, 2,609,035 values would have to be calculated using the same number of equations. For the 12 months of a plan year, a total of $12 \cdot 2,609,035 = 31,308,420$ equations would have to be entered as Excel formula cells. In addition, there are the equations for summing up the monthly values of the flow variables to an annual value and corresponding aggregations of the monthly values of the non-flow variables. The model tableaux would have to be described by 21,869 report fields per month. This would result in $12 \cdot 21,869 = 262,428$ report fields over every 12 months. If each of these report fields occupied a monitor area of 10 x 14 cm on a 1:1 scale, the total Excel surface area would be 3,673 square meters.

It is, therefore, a gigantic model. This is not necessarily a quality mark. After all, the

modellen am Beispiel der Eisen- und Stahlindustrie, (*Medium-term Planning with INZPLA Equation Models on the Example of the Iron and Steel Industry*). Diss. TU Berlin 2008.

⁵⁶⁷ The question of what options exist for selecting a higher aggregation level for the planning models of the second plan year and further plan years, based on an Integrated Target Commitment Planning model, is discussed in: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, Berlin 2010, p.112f., www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated).

⁵⁶⁸ The model of the plan year 2010/11, which is not mentioned here, is similarly large.

principle also applies to the development of planning models, "*the smaller, the better*". However, due to the differentiated multi-stage production processes, a higher aggregation of the model would lead to model parameters that could no longer be used as influencing parameters for planning, i.e., as basic targets.

The ThyssenKrupp Steel model is used for a one-step profit center planning. When describing profit center planning in the system of the Integrated Target Commitment Planning, it was pointed out that it is unlikely that a comprehensive model of the central planning will be developed that covers all profit center models and also describes the supply relationships between these profit centers (s.p.75). But this is precisely the case with the ThyssenKrupp Steel model. And that's why it's so big.

Furthermore, I have propagated that profit centers should have their own profit center models, whose structural equations are more or less included in the cost-performance model of the entire company. The planning process then takes the form of a coordination procedure between the profit centers and the central planning using the profit center models by the profit centers and the cost-performance model of the entire company by the central planning.

No such planning process can be observed at ThyssenKrupp Steel either. The profit center models do not play a role in the formal planning process.⁵⁶⁹ For a bottom-up planning, the profit centers communicate their bottom-up values to the central planning, which enters these values in their overall cost-performance model. The model is then calculated with these values of the basic parameters, and the bottom-up value of the operating result is determined.

This planning step is then followed by a top-down planning through the central planning. The results of this top-down planning are communicated to the profit centers that take note of them. There is no confrontation planning with the profit centers.

As part of the top-down planning, the model was calculated about twenty times in the planning year 08/09 using different values of the model parameters. To carry out such a top-down planning, which in principle had access to 240,192 basic parameters for changing their parameter values (for the plan year 08/09), it is impossible to change every model parameter intended for a change by a manual (individual) entry. For this reason, a "model parameter change system" was developed especially for ThyssenKrupp Steel with which the model parameters of a model parameter cube defined by the central planning can be changed with little effort (e.g., increase of 3.0 percent in wage groups A and C in profit centers X and Y from January to July and 3.5 percent from August to December).

During the planning for 2008/09, as already mentioned, the central planning department of ThyssenKrupp Steel used seventy such parameter cubes, with which 26,396 model parameters were changed. In addition, 1,215 model parameters (such as sales quantities) were entered via Excel tables.

In addition to the actual planning, various explorations were also carried out with the model. This included above all a primary cost analysis of the finished products. Seventy to eighty percent of the costs to produce one ton of steel are accounted for by raw materi-

⁵⁶⁹ However, this does not exclude that the profit centers may have such models.

als, fuels, and energy. It is, therefore, of interest for ThyssenKrupp Steel to find out to what extent these cost types, in particular, are included in the cost price of the individual products.

The model system allows such a primary cost analysis to be carried out.⁵⁷⁰ It was performed on the variable and total costs of selected products. This method of primary cost analysis traces the secondary (allocated) costs incurred in the cost object tableau of a finished product back to the cost element tableaus of the cost centers from which these allocations originate. This backtracking is done across sometimes very long purchase order quantity chains. If, as in the case of ThyssenKrupp Steel, a multi-stage production exists, then this retroactive accounting can also be traced back to the primary cost elements in the cost object tableaus of certain intermediate products of the finished product in question. If the primary cost elements in the cost center and cost object tableaus were defined by the expression "purchased quantity • price" and are, therefore, no as basic parameters in the form of cost values, then the input quantities (for example, for energy or raw materials) that are required to produce a product unit (for example, a ton of steel) can also be determined. The planning, which was carried out over four years, was described by those responsible for the central planning at ThyssenKrupp Steel as a "real innovative step". The Integrated Target Commitment Planning has, therefore, proven itself in practice within the framework of an extremely large and complex planning system

24. Encounters with SAP

• Dr. Sinzig visits ThyssenKrupp Steel

After the INZPLA-System was successfully used at ThyssenKrupp Steel for more than four years, I took up contact with Werner Sinzig. SAP deals with the topic of planning in various areas. However, if there is a central contact person, then it is Werner Sinzig. For many years, he has coordinated the development of the CO module (especially the CO-PA module) with Harald Stuckert and is head of the "*Innovation Topics Business Planning*" project. One insider told me: "*When it comes to planning, you can't ignore Werner Sinzig at SAP.*" The right man to familiarize SAP with the INZPLA-System.

After a phone call, he was interested in a meeting with ThyssenKrupp Steel, which took place almost the whole day in September 2010. Eleven people attended the meeting. ThyssenKrupp Steel's highest ranking representatives were Oliver Smeets (Head of Controlling) and Michael Huypen (Head of Operational Controlling), at ThyssenKrupp Steel, as. On the part of SAP, the highest ranking were Dr. Werner Sinzig (*Product Owner Business Planning*) and Dr. Hartmut Körner (*Chief Development Architect Planning*). Dr. Sinzig almost exclusively held the technical discussion on the part of SAP.

After a short description about the activities of ThyssenKrupp Steel by Oliver Smeets, I

⁵⁷⁰ For more information on this procedure, see: Lehnert, S. *Mittelfristplanung mit INZPLA-Gleichungsmodellen am Beispiel der Eisen- und Stahlindustrie*, (*Medium-term Planning with INZPLA Equation Models on the Example of the Iron and Steel Industry*). Diss. TU Berlin 2008. p. 40f.

described the structure of the ThyssenKrupp Steel model and its use by means of a PowerPoint and a video presentation.⁵⁷¹

In order to clarify the basic concept of the Integrated Target Commitment Planning, I described the structure of the furniture model using Fig. 5 (s.p.41), and then, on the basis of Fig. 2 (s.p.33), I showed how a cost center tableau is structured in a general form (s.p. 33 and 41).

Further, I mentioned Fig. 7 (s.p.43), which shows the number and types of model parameters in the furniture model and the ThyssenKrupp Steel model. This illustration shows that the ThyssenKrupp Steel model has the same types of parameters as those found in the easy-to-understand furniture model.

In the furniture model, there are only 18 parameters, while the ThyssenKrupp Steel model contains 231,994 parameters. This should make it clear that the ThyssenKrupp Steel model is in principle only an extremely large extension of the furniture model. Then I explained the overview also given in this text (Fig. 8 on p. 44), in which the number of equations of the furniture model is compared with the number of equations of the ThyssenKrupp Steel model.

After these remarks, Dr. Sinzig asked me: "What are these for equations?"⁵⁷²

	1	2	3=1*2	4	5=2*4	6=3*4	7	8=7*1	9=5+7	10=8+9	11=9	Verpflichtungsart
Kostenart	Preis	Verbrauchs-mengensatz	Proportional-kostensatz	Beschäftigung	Verbrauchs-menge variabel	Variable Kosten	Verbrauchs-menge fix	Fixe Kosten	Verbrauchs-menge gesamt	Kostenart-gesamt-kosten	Bestell-menge	
Reisekosten								50.000		50.000		1
Reparaturen	30						100	3.000	100	3.000	100	2
Schmiermittel			0,20	10.000		2.000				2.000		3
Strom	0,20	15	3,00	10.000	150.000	30.000			150.000	30.000	150.000	4
...	...	...	...	...	...	...	...	...	...	...	...	
Gesamtkosten (€)										700.000		
Beschäftigung (MSId)										9000	10.000	11.000
Vollkostensatz (€ / MSId)										70,00		

Fig. 63: Number of equations in the case of the above cost element tableau

Then I said, "As I have just described, you can recognize them in the tableau of the furniture model as arithmetic specifications". And when he looked at me somewhat disbelievingly, I recalled the cost element tableau already discussed in my lecture (i.e., Fig. 2), circled the equations with the pencil of my tableau PC and said, "This is the first equation" and wrote a one to the circle. "This is the second equation," and wrote a two to this circle. I did so up to the seventh equation that can be found in the tableau.

The result shows Fig. 63. Then I said, "If you count these equations in the various model tableau and also the equations connecting the model tableaus, then 41 equations are ob-

⁵⁷¹ The PowerPoint slides of the presentation are available at www.Inzpla.de/SAP-Treffen-Thyssen.pp

⁵⁷² Before the meeting, I had already sent him an older edition of this document, in which, as in this edition, the structure of the furniture model and also its connection to large cost-performance models such as the ThyssenKrupp Steel model were described.

tained with the furniture model and with the ThyssenKrupp Steel model, you should not believe it, you get about 2.6 million equations".

Thereafter, a video demonstration was used to demonstrate how large quantities of parameter values, e.g., for a top-down planning, could be changed by specifying a three-dimensional data cube as part of a process specially developed for Thyssen-Krupp Steel.⁵⁷³ My presentation concluded with the remark that Hasso Plattner had already called for planning alternatives to be quickly calculated twenty years ago. With the INZPLA-System, this requirement has now been realized for the first time based on an SAP application.⁵⁷⁴

The further discussion, directly after my lecture, took place almost exclusively between Dr. Sinzig and me and I could find out that there were quite some difficulties in the communication, between us. Obviously, the idea of using an "equation model", whose variables are influenced via model parameters and that is "planned" by changing these model parameters was, to put it this way "quite outlandish for him".

Dr. Sinzig wrote his dissertation with such a renowned scientist as Paul Riebel. At Riebel from the University of Frankfurt, he was also employed as a research associate. The title of his dissertation was: "Database-oriented accounting". The main focus of this work is on how to organize, store and evaluate accounting data appropriately. It has already appeared in the third edition. Even today, Dr. Sinzig is still a lecturer at his home university in Frankfurt, where he is holding a lecture entitled "Database-Oriented Accounting" (WS 2010).

Sinzig's work does not contain a single word about the use of equations to describe an accounting system. The equation-oriented (or model-oriented) accounting system approach I represent is, so to speak, the opposite of a database-oriented accounting system. The world of equation-oriented accounting was and is, therefore, probably not so much in the focus of his activities.

Dr. Sinzig then gave a lecture about "In-memory-based planning". He pointed out that the "in-memory concept", which will be realized by SAP, will also put the planning now on a completely different basis because the SAP data tableaus would be kept in the working memory during the execution of a working order. This would allow queries to be carried out about 20,000 times faster. He described the advantages of this "in-memory concept". However, he did not say anything about planning models that are now being developed or applied on this basis. If, as project manager of "Innovation Topics Business Planning", he did not want to disclose a project that had to be kept secret, then he succeeded excellently.

On the subject of "calculation", he merely stated, "*You can now calculate everything in a flash, e.g., exponential smoothing*". Exponential smoothing is used to forecast a quantity, such as the forecast of a sales value for the next planning year. It is based on a "forecast

⁵⁷³ See pages 332, 338 and 488 for this procedure. The video is available at www.Inzppla.de/ParameterVariation-INZPLA.avi.

⁵⁷⁴ See page 331 on this quotation.

formula", which is so simple that the forecast value to be determined can be calculated like the sales of the coming year in mind.⁵⁷⁵

From the view of a model user, it is an equation model that consists of one equation, namely the forecast formula. To cite this as the only example of a forecast or planning, which is now faster because of the memory concept, did not only have a "somewhat strange" impression on me as I later found.

I drew Dr. Sinzig's attention to the fact that the introduction of this in-memory concept did not have a major impact on the INZPLA-System. The calculation of the equation model already takes place in the working memory. The advantage of a database in-memory concept would be, in the light of the INZPLA-System, which it would be faster to read the information from the SAP data tableaus at the beginning of the planning to create an INZPLA-model because these tableaus are now directly in the working memory. However, this is not such a relevant criterion, since the read-out would only take place once.⁵⁷⁶ During the further discussion, he said, "*OLAP thinking alone is probably no longer sufficient for planning*". After all, that was a concession. However, the different worldviews are remarkable. I have already formulated my opinion on OLAP thinking elsewhere.⁵⁷⁷ The "*OLAP thinking*" prevents the view of model-based planning and analysis.

Let us just consider the ThyssenKrupp Steel model. The values of the 231,994 model parameters must be stored in a database. However, this does not have to be an OLAP database. The 12 times 2.6 million monthly plan values, the cumulative annual values, do not need to be stored in any (OLAP) database but are only available in the working memory. They are calculated each time you need them by a procedure that takes fifteen seconds. Therefore, they are always consistent in themselves. Storing these values in a database would be senseless.

The values of certain variables generated by the model, such as the values of profit, cost or sales figures, could be stored as multidimensional OLAP data cubes in an (OLAP) database. However, as has been described, the aggregation rules of OLAP hierarchies can generate almost none of the relevant profit hierarchies, such as the much-quoted Agthe-Mellerowicz profit hierarchy.⁵⁷⁸

⁵⁷⁵ A sales quantity to be forecasted for the period 2011, i.e., $F\_S(2011)$ is calculated using the actual sales quantity in 2010, i.e., $A\_S(2010)$, and the forecast value of the same sales quantity already determined from the previous year, i.e., $F\_S(2010)$, using the exponential smoothing formula $F\_S(2011) = P\_S(2010) + GLK \cdot [(P\_S(2010) - A\_S(2010))]$. GLK is the so-called smoothing constant for which a certain value (e.g., 0.1) must be selected.

⁵⁷⁶ At ThyssenKrupp Steel, it takes about ten hours and takes place overnight. In a normal application, only the basic parameters of a planning alternative that has already been determined and is to be used further are retrieved from the database. At ThyssenKrupp Steel, these are the values of the 231,994 basic parameters. This readout is very fast and is done from a database of the INZPLA-System.

⁵⁷⁷ See pages 126f. and 351 and Zwicker, E., *OLAP and Business Intelligence in the Light of the Integrated Target Commitment Planning*, (40 pages) www.Inzpla.de/IN40-2011a.pdf. (Not yet available. Text in German, title translated).

⁵⁷⁸ See page 127. See also Zwicker, E., *What could Alfred P. Sloan have done differently if he had had the SAP system and also the HANA system at his disposal for the operational control of General Mo-*

Dr. Sinzig's invitation by ThyssenKrupp Steel had a specific background. I could no longer support ThyssenKrupp Steel's INZPLA-System, as I have no coworkers available to me for the ongoing support of the entire software system due to my retirement from active service. The representatives of ThyssenKrupp Steel, therefore, clearly indicated that it would be best if the INZPLA-System could be taken over and continued by SAP so that ThyssenKrupp Steel would be able to carry out its operational planning in this way as before. However, Dr. Sinzig did not respond to these remarks in any way. Michael Huypen, the head of operational controlling, said to me afterward: "You couldn't say it more clearly than that".

At the end of the event, when everyone was getting ready for departure, Dr. Sinzig asked me, while we were saying goodbye (and my coworker Andreas Hähre was standing right next to me), if it would also be possible to use equations for developing a finance and balance sheet model. I said, *"But of course, the parameters of a balance sheet and financial planning and its relationships are represented by an equation model just as well as the operating performance planning with the CO module. And we have even already developed the prototype of such a configuration system, which can be linked to an INZPLA cost-performance model such as the ThyssenKrupp Steel model."*

Then he said goodbye to me with the words: *"If I should be back at the HP-Institute (Hasso-Plattner-Institute) in Berlin, then I can get in touch with you sometime"*. I answered *"Yes, gladly"*, and it was clear to me, if this is the man who decides on the planning at SAP, then there is no chance that SAP will work with me in any way. I did not hear anything from him after that.

An insider I talked to about it told me, *"SAP rejects everything that is not developed by us. Software that comes from outside falls into the category 'not invented here' and has no chance with us. It is clear that Werner Sinzig is not pleased with your system. He was responsible for the development of the CO module for many years and is regarded here as our top planning expert. If he presents such a project to us, he can only lose because everyone will ask himself, 'Why didn't he come up with it himself?'" Werner Sinzig is not to be missed unless you can convince Hasso Plattner directly. However, you can't get to him. If Werner Sinzig goes into early retirement in three years, then you can try again"* ⁵⁷⁹.

A few years earlier, two high-ranking SAP employees asked me whether I was interested in starting a company with them and an American company. Apparently, they had at least recognized the relevance of the INZPLA-System. It did not come to this after extensive discussions and votes, because the whole thing seemed too uncertain to me. My goal was to have an established company taking over the system and developing it further with my know-how and that of my co-workers.

And this is where SAP would have been most suitable because the INZPLA-System

tors?, Berlin 2012, (42 pages) www.Inzppla.de/IN43-2012b.pdf. (Not yet available. Text in German, title translated).

⁵⁷⁹ Who has the damage does not need to provide the mockery.

touches the heart of the SAP system. It is used to "outsource" the entire CO planning in the form of a planning model and the CO actual calculation in the form of an actual model. This means that there is actually not much left over but data storage and its connection to the other modules of the SAP system.

When I finally did not want to participate in founding the company, I told the participants: *"We are concentrating all our energies on establishing the system at ThyssenKrupp Steel, and if it then runs successfully there for several years, with a model that is probably one of the world's largest cost-performance models, SAP will be interested in this."*

My interlocutors replied, *"If no more than a hundred users work with an externally developed system, such a system is not of interest to SAP because they want to see sales. For SAP, this is the criterion for a successful system. We have no basic research at the application level. You don't have the slightest chance with your prototype with us, even if your project at ThyssenKrupp Steel should be successful"*. I answered, *"Wait and see."* As a result, they were right. Probably something else was the deciding factor. It always depends on individuals and their specific interests. And I was probably wrong about the top SAP planner.

• A Meeting with Hasso Plattner

In February 2011, I was invited to an event at the Hasso-Plattner-Institute in Potsdam. Did Dr. Sinzig suggest this invitation? It soon turns out that he had nothing to do with it and he was not present (as a planner) either. It was about the in-memory concept developed under Hasso Plattner's leadership, i.e., a method that enabled extremely fast data access. Eight university professors from German-speaking universities took part in this event, who were apparently chosen for their affinity to the SAP system.

Apart from me, all the other invited university teachers were involved in business informatics. With the specialist area of controlling, I was a little out of the ordinary. However, as I had dealt with the SAP-CO system more intensively than probably each of the participants, I already fit into this round.⁵⁸⁰ This had probably spread all the way to Alexander Zeier, a close co-worker of Hasso Plattner and coordinator of the meeting, to whom I owe my invitation.

In addition, a number of professors and fellows from the Hasso-Plattner-Institute as well as representatives from other companies and research institutes and members of SAP AG attended the meeting. The highest ranking SAP representative was Gerhard Oswald as

⁵⁸⁰ I have been working with the SAP-CO module for more than fifteen years, and only to prove the practical relevance of the Integrated Target Commitment Planning. See page 333 for more information. I have supervised six software-oriented dissertations on this topic. From the state of knowledge, I could probably also represent the subject area "business informatics". For this reason, I may have received two calls (Essen and Paderborn) to chairs of business informatics. I had to acquire extensive knowledge in the field of computer science, e.g., the development of an own compiler (see page 627) and a lot more.

COO and member of the SAP Executive Board. So an illustrious society. This event was extremely informative and stimulating.

The aim of the event was the following. At the Hasso-Plattner Institute, a new concept of an in-memory database including a prototype has been developed under the direction of Hasso Plattner and Alexander Zeier.⁵⁸¹ This concept, which carries the name SanssouciDB, was presented to the participants by Hasso Plattner. The system was already marketed under the name HANA.

It is undoubtedly a revolutionary development. SanssouciDB (HANA) comprises a highly sophisticated program system that implements the in-memory concept in an optimal manner. For this purpose, data is stored in columns, and advanced data compression (compression algorithms) methods of an in-memory database are used. Another characteristic is the intensive use of parallel processing methods, i.e., a method in which many calculations are carried out simultaneously (dynamic parallelization) on special computers.

Up to now, a distinction has been made between operational and analytical data storage in application systems. To carry out an analysis, the data were read from the operational data storage systems and processed in a certain form (in a data warehouse). Only this data storage in a data warehouse provide the basis for carrying out certain analytical investigations, also known as "business intelligence".

By using these methods based on a multi-core architecture, the boundary between operational and analytical data storage is removed. The operational data storage that the SAP system transactions access can now be stored in the in-memory database, which reduces response times considerably. The mockery name for SAP's in German "Suche, Antippe, Pause" (search, click, pause), which some critics have presented, is likely to be a thing of the past, because the system is now moving into the performance category, which its architects probably aimed for from the outset in the hope of a later realization.

Hasso Plattner presented the concept with enthusiasm, and the results he had to communicate were also very impressive.

Today, the world's population is about 6.7 billion. If there were a data set with relevant personal characteristics for each inhabitant, SanssouciDB (HANA) would allow the current age distribution of the world's population to be either determined in less than five seconds, globally or differentiated according to regions or other criteria.⁵⁸² That is very impressive.

With all my enthusiasm for the technology, which I do not want to deny, you have to ask yourself what advantages this enormous increase in access times has for the use of an SAP system in practice. The reduction in response times mentioned above is already a blatant advantage for a user. However, of course, one should also ask in individual cases

⁵⁸¹ This procedure is described in the following monograph: Plattner, H., Zeier, A. *In-Memory Data Management: An Inflection Point for Enterprise Applications*, Berlin 2011. Anyone involved in enterprise resource planning (ERP) in any way, i.e., planning, controlling and documenting the use of company resources, should study this work because it opens up completely new application possibilities.

⁵⁸² Message from Alexander Zeier.

whether there are areas of application that benefit particularly from this innovation.

In their work, Hasso Plattner and Alexander Zeier have described some convincing examples of the benefits of this performance enhancement application areas. The participants of the meeting were not only invited to be informed about these developments but also to reflect on projects that could benefit from this impressive technical progress of the SAP system. This was probably the reason why I was invited as an "SAP-CO expert". I responded to the call for proposals in this respect, but only in the area of an operational planning and control, i.e., the area in which the INZPLA-System and the SAP-CO system operate. I will report on this in the following.

The meeting at the Hasso-Plattner-Institute did not end with Hasso Plattner's presentation. Afterward, the participants were invited to ask questions and present their suggestions for the application of the in-memory concept.

I could not hold back from using this opportunity to report about the application of the INZPLA-Connect system for operating planning at ThyssenKrupp Steel. Actually, such a report had nothing to do with the topic, because the topic of the meeting was the fast readout and the quick analysis of data from data sources and not a planning with the CO system.⁵⁸³ The temptation, however, was simply too great to tell the leading architect of the SAP system something about this (as I see it at least) considerable further development of the CO module by INZPLA-Connect and the fast readout of data plays at least a certain role.

All descriptions based on applications at ThyssenKrupp Steel. In a short description: Execution of an annual operational planning with a cost-performance model, four years successfully in use, it describes the costs of manufacturing processes that contain up to 33 production steps. The model has 2.6 million equations and approximately 230,000 model parameters. More than 26,000 parameters have been changed in individual model runs (s.p.332). And then, so to speak, as the highlight of the presentation: The time required to implement a planning alternative, which had previously been eight hours in the SAP-CO system, has now been reduced to fifteen seconds.

Although my descriptions had nothing to do with fast database access, but with a quick calculation, Hasso Plattner listened to me without interrupting me. My intention was to arouse a certain amount of interest at ThyssenKrupp Steel by increasing the performance of the SAP-CO system for calculating a planning alternative by a factor of 1,800.⁵⁸⁴ Because also the "performance increase in the SAP system", however concerning the data access, was the topic of his presentation. From my point of view, the extreme performance increase caused by my INZPLA equation compiler for calculating a plan alternative is not the decisive advance. The same applies to the reconstruction of an SAP-CO application as an INZPLA-model. It took many years, but it was only a necessary step to carry out the Integrated Target Commitment Planning and Control with an already run-

⁵⁸³ Such data sources are so-called data warehouses, data marts, and operational data stores.

⁵⁸⁴ $8(\text{hours}) \cdot 3,600(\text{sec}) / 16(\text{sec}) = 1,800$.

ning SAP-CO application. Only the procedure of the Integrated Target Commitment Planning and Control as an applicable planning and control theory is important to me. However, how do you get it across in a few minutes?

My entire argumentation based solely on the enormous reduction of the time required for a one-step model calculation by one of the world's largest users of the SAP-CO system for a planning alternative.⁵⁸⁵

Hasso Plattner's reaction to my "contribution" signaled exactly what was to be expected, namely "back to the point because of which we are here". It was the interface between the two applications. He asked me how much time the INZPLA-System needs to read the data tableaus of the CO module. The direction of his question was clear: The use of its in-memory concept should greatly reduce the time required for this readout procedure. I answered him about ten hours. This is even somewhat exotic for SAP. And I added that with his SanssouciDB (HANA) system it would probably only take a few seconds. He replied that a little more time would probably be needed at last.

After working with SAP's CO module for so many years, I just did not want to miss on telling the Spiritus Rector of the entire system something about the INZPLA-System and its connection with the CO system.

This meeting showed me that I should probably give up my plan to implement the Integrated Target Commitment Planning via SAP. The train had already left with Werner Sinzig's clear and nearly hostile rejection.

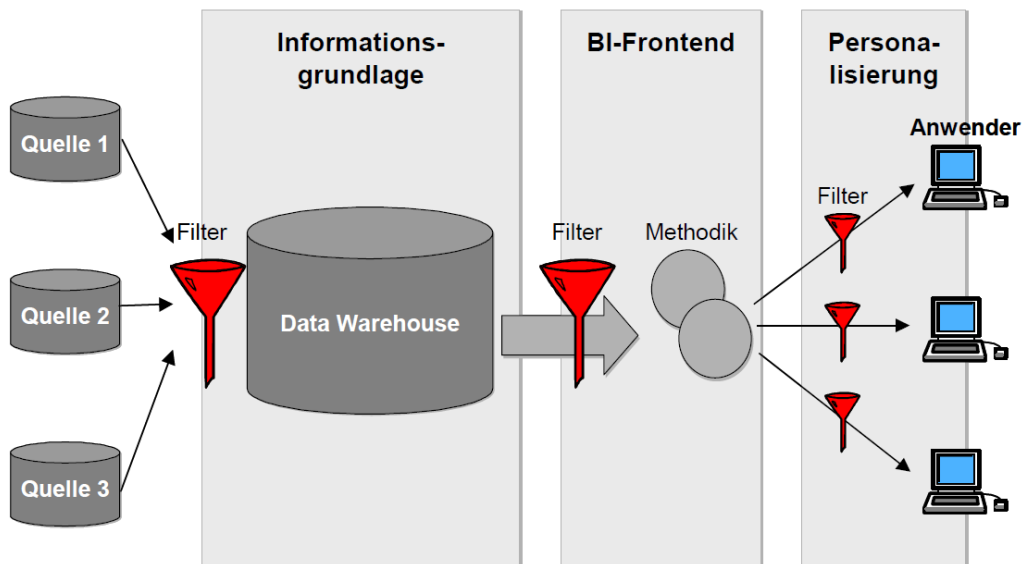


Fig. 64: "Architecture of BI systems" (original signature by Mertens)

After I realized that Hasso Plattner had finished the point and he was already looking for new speeches, I wanted to get rid of another point.

⁵⁸⁵ ThyssenKrupp Steel is not the world's largest steel producer, but the Duisburg plant, whose production process and costs are described in this model, is the world's largest steel location.

I said by speaking directly to Hasso Plattner: ⁵⁸⁶ The name "Business Intelligence" is on everyone's lips today (as in this round) and is always based on the OLAP concept. ⁵⁸⁷ The business intelligence analyses in a company, which have probably the highest level of intelligence, would not be based on OLAP data cubes, but on analyses with the actual and plan equation models of this company. And such intelligent methods of analysis are processes such as sensitivity analysis, target value analyses, variance analyses, etc." Such methods are more "intelligent" than simply "extracting data from a cube" and searching for connections between them.

To claim in this round that the "smarter procedures" are not OLAP-based, but model-based, was somewhat provocative. All those present, none of whom were concerned with equation models, but almost all of whom were more or less concerned with OLAP procedures, were probably of a different opinion. Your own children are always the more intelligent ones.

Hasso Plattner replied to this objection that the analyses based on OLAP systems contain "*also Business Intelligence*", which of course is completely correct. This was a surprising answer for me. After all, if you study the literature on the topic of "Business Intelligence", you will find almost no author who points out that "Business Intelligence analyses" in companies could also take place outside of an OLAP analysis (or not on the basis of a data warehouse). And Hasso Plattner's top planner Werner Sinzig is an eloquent example of an OLAP-and only OLAP assessor.

This "OLAP paradigm" is also clearly illustrated by the structure of BI systems described by Mertens in Fig. 64.⁵⁸⁸ These systems are based on a data warehouse, and this data warehouse is organizing its data in the form of multidimensional matrices, i.e., in the form of OLAP cubes.

The meeting at the Hasso-Plattner-Institute was the deciding factor in the decision to write a text specifically for the experts working in the "OLAP-world" (and these are nearly all of them) in which it is shown how a bridge can be made to the Integrated Target Commitment Planning by "OLAP thinking" and the procedures of "Business Intelligence" based on it. ⁵⁸⁹

The short conversation with the guiding spirit of the SAP system was nevertheless very impressive for me, and I do not want to miss it. In my opinion, Hasso Plattner is a man who is comparable to Henry Ford or Werner von Siemens in his contribution to industrial progress. Henry Ford has revolutionized industrial production with modern vehicle manufacturing techniques. Hasso Plattner has developed the first comprehensive system of integrated data management and data processing in companies. He is one of the people who has shaped today's information age.

⁵⁸⁶ I was sitting directly opposite him at the relatively narrow conference table.

⁵⁸⁷ A Google call of the term "Business Intelligence" on 17.2.11 resulted in 25.3 million references.

⁵⁸⁸ Mertens, P., *Business Intelligence – ein Überblick*, Arbeitspapier Nr.2/2002, Universität Nürnberg, Bereich Wirtschaftsinformatik I., p. 6. Peter Mertens was also one of the eight university teachers invited to this meeting with Hasso Plattner.

⁵⁸⁹ Zwicker, E., *OLAP and Business Intelligence in the Light of the Integrated Target Commitment Planning*, op. cit., www.lnzpla.de/IN40-2011a.pdf. (Not yet available. Text in German, title translated).

If you are interested in applied business informatics, i.e., the development of software systems in companies, you should read the book about Hasso Plattner *"Dem Wandel voraus"* (Ahead of Change). Even more interesting and stimulating are his video lectures on various topics of software development (accessible via the Hasso-Plattner-Institute).

Since the end of my studies, i.e., for almost fifty years now, I have not attended any lectures, except those of Hasso Plattner.

This "visit" took place through these video courses, which can be called up online. I also tried to ensure that my co-workers could take part in his lectures directly in Potsdam, but apart from one exception (Arne Flemming 2004), this could not be realized.

For anyone seriously involved in the development of business software, these lectures are extremely useful. Usually the following applies: *"Whoever can do it does it, who can't do it, teaches it"*.⁵⁹⁰ It's a stroke of luck that the person who has been significantly involved in designing the world's largest software system for business applications is one of the exceptions to this rule. Since I had "participated" in his lectures for hours in picture and sound, I had the curious impression that I was talking to an old acquaintance.

When you call up the various lectures, you will be amazed at the expertise with which he deals with the individual topics. Even today, the SAP system still contains program code that originates from him. After all, the man is seventy years old, and at this age, many of those who have made significant advances in the world's technical progress have turned to private hobbies or other tasks. Bill Gates, who said goodbye to "his child" at the age of 53, is an example of this. And the former "SAP teammates" Hasso Plattner's have also roped down and indulge in their private hobbies.

Hasso Plattner, on the other hand, has written the work together with Alexander Zeier, in which the new procedures of the in-memory concept are presented in detail, and as his lecture showed, he is fully involved in the subject matter. Just the time to sacrifice, to invite eight professors and present them with his in-memory concept, shows a considerable commitment for the matter. For the "added value" of this invitation is quite questionable.

The integration of the in-memory concept he helped to develop into the SAP system is likely to be of great personal significance to him. The SAP system includes integrated data storage and a connected integrated data processing, such as creating reports, analyses, control information, and so on. In many cases, the generation of this information still requires a great deal of time, which is considered inappropriate by users. With the implementation of the in-memory concept, this information is now available "on the tip of your finger". Therefore, the in-memory concept he helped to develop and its implementation by the HANA system is likely to be the crowning achievement of his life's work. According to SAP, HANA stands for **H**igh Performance **A**Nalytic **A**ppliance.⁵⁹¹ It should be called "**H**asso's **N**ew **A**ccelerator". That would hit the mark. He is the one who

⁵⁹⁰ This applies exactly to my colleague whom I spoke to in Cologne about a "practical problem" (see page 626). And my satirical poem on him may also apply to others. www.Inzpla.de/Spottgedicht.pdf.

⁵⁹¹ See http://de.sap.info/hana_newdb_westmere_inmemory/44054.

bears the main responsibility for this huge monolithic software system and thus makes the final decision when it comes to further technical development and the development of new applications. Being permanently responsible for such a child and also wanting to be responsible for it: That's a task.

The meeting with Hasso Plattner resulted in three activities.

It has always been clear to me that in addition to the controlling system, which is used for the generation of a plan-cost and performance accounting and a corresponding actual calculation, SAP offers two other planning software systems, which are to be used for an operational planning. These are the systems BI Integrated Planning.⁵⁹² Later, the *Business Planning and Consolidation* (BPC) system was added by an acquisition.

Since I was working at full capacity with the CO system and never found a user of one of these two systems, I did not spend any more time with them. Now that I had decided to quit "my occupation" with SAP, this meeting led me to look at this planning software and compare it with the CO system and the INZPLA-System. I didn't want Werner Sinzig and other SAP planning experts would tell me that I didn't even know SAP's "actual" planning systems, because under the topic of "operational company planning with the SAP system" I would only have understood "planning with the SAP-CO system". So I asked myself the question: Do these two systems offer more preferable alternatives in the area of an operational company planning? The answer I justify in a text is very negative.⁵⁹³ The CO system cannot be replaced by one of these two planning systems, their use would be a retrograde step, and neither of these systems would be a useful supplement to planning with the CO system.

The two systems are so inferior in terms of an annual operational planning that only anyone can be recommended to carry out a planning that cannot be realized with the CO system, such as the development of a company profit and financial planning model (a CRFI model) with Excel.⁵⁹⁴

In the meantime, SAP has developed a new planning tool called "SAP BPC 10.1 embedded". It is a merger of the *Business Planning and Consolidation System* (BPC) and the *BI Integrated Planning system*, i.e., the two SAP planning systems that were previously used independently from each other. A planning system developed on the basis of SAP BPC 10.1 embedded must always work with a data model-based on HANA.

The BPC system mainly provides the user interface and process control, while the creation of the planning model was adopted from BI Integrated Planning. With this merger,

⁵⁹² The name of this planning system is of recent date. Its planning functions are almost identical to those of the BW-BPS (Business Planning and Simulation) system, which is probably more familiar to some readers.

⁵⁹³ See: Zwicker, E., What do SAP's "Business Planning with SAP NetWeaver Business Intelligence" systems in the "BI Integrated Planning" and "Business Planning and Consolidation (BPC)" versions achieve in the area of operational company planning? Berlin 2011, (35 pages), www.inzpla.de/IN41-2011c.pdf. (Currently not callable. Text in German, title translated).

⁵⁹⁴ For a description of the structure of such CRFI models, see pages 10 and 60. The SAP system does not contain a configuration system for such models. Therefore, no system could be developed for transfer to the INZPLA-system.

SAP has developed a system that, according to its own statements, unites the "best of both worlds". HANA is now connected with a standardized SAP planning tool. Hasso Plattner will be pleased.

However, this does not change anything from the perspective of an operational company planning. This is because the model development is just as incomplete with regard to the development of models for the implementation of an annual operational company planning and control as it was practiced with the *BI Integrated Planning system*. Not to mention the planning, control and other analysis functions available in the Integrated Target Commitment Planning system.

During the meeting with Hasso Plattner, it was very clear that the contributions of the participants were always analyses which based an OLAP data cube. As mentioned above, these statements had prompted me to express to Hasso Plattner the opinion that a truly "intelligent" business application is not to be expected from an OLAP analysis. In retrospect, this meeting prompted me to write a text entitled *"Integrated Target Commitment Planning, OLAP and Business Intelligence"*.⁵⁹⁵ Probably sworn "OLAP thinkers" will not take notice of this. However, it was a necessity for me to work out the differences once again.

The most important suggestion comes from Hasso Plattner's lecture. As mentioned above, he enthusiastically presented the acceleration that HANA is now making possible for all procedures of the SAP system.

As already mentioned, **SAP** was and is in the German-language still mockingly abbreviated to "Search-Click (=Antippe) Pause". This is no longer the case when **H**Asso's **N**ew **A**ccelerator is used in the operational SAP systems. The first reports on the performance improvements achieved in this area are very impressive. However, this enormous acceleration is not my issue.

The question that Hasso Plattner's lecture raised with me went in a different direction. The question was whether HANA could improve a company's operational planning and control as well as certain exploratory model analyses. In his speech, Hasso Plattner mentioned that he asked a group of high-ranking American top managers what advantages it would bring them to be able to retrieve any information and its processing worldwide from the entire data of their databases by a "*tip of the finger*". As he went on to say, this opportunity was described by the top managers interviewed as a kind of quantum leap forward in improving their decision-making.

For me, the question arose as to whether and what this "quantum leap" could be in terms of an operational planning and control? In fact, it can only refer to continuous monitoring or, more generally, to the knowledge of actual data, because only actual data are now available faster than before. Hasso Plattner probably also saw this in the same way, because he pointed out how important actual figures are in a company and therefore it would be very desirable to have them available "in real time".

Forecasts as he explained should not be viewed with great confidence. With the usual

⁵⁹⁵ See: Zwicker, E., *OLAP and Business Intelligence in the Light of the Integrated Target Commitment Planning*, op. cit., www.Inzpla.de/IN40-2011a.pdf. (Not yet available, Text in German, title translated).

"up-to-the-year-forecast", the "forecaster", who is responsible for the figures, would always forecast too optimistically. And such numbers are not very useful.

Thus, he referred to the phenomenon, which is called "*hockey stick effect*" in the literature. Apparently for Hasso Plattner, what counts most is "what is" and a manager should be able to be informed as quickly as possible about it. Such a "primacy of the actual values" is, of course, extremely supported by HANA. It could not be faster.

In view of the so impressive judgment of American top managers on the benefits of fast data access, I remembered an American top manager who is still an icon today. This is Alfred P. Sloan. His work "*My years with General Motors*", in which he describes his corporate philosophy is still one of the standard works of management literature.⁵⁹⁶ The subject of financial control played a major role for Alfred P. Sloan. It describes the figures with which he monitors current business at ten-day intervals. For example, he demanded that the actual sales figures and sales quantities of the car types sold be presented to him every ten days. However, to his regret, it was not possible to determine the actual profit of the individual car types. Why not? Because at that time it was not possible to calculate an actual cost-performance model for General Motors at such a short time. Only with such a model he would have been possible to determine the actual profits of individual articles or article groups.

The comments made by the top managers of the American industry on the "quantum leap" caused by HANA have now led me to make the following considerations in a text. First, I discussed in detail how to determine the actual values of profit sizes using profit systems today. It describes multidimensional hierarchical actual profit systems and the procedures of a step-by-step actual contribution margin calculation. Drill-down procedures are also presented in actual profit systems, which can be used to "drill down" the actual profit into the actual cost areas. Finally, the procedure of an actual primary cost analysis is also described, which is used to drill down the actual costs of the articles that have led to the actual profit into the actual cost elements that are determining the total cost as a negative component of the profit definition.

All procedures are treated under the speculative question, would Alfred P. Sloan really be interested to satisfy his need for actual profit information? (About planning models or the topic "planning" is, therefore, not a word in the text.) Therefore, the text bears the name: "*What could Alfred P. Sloan have done differently if he had had the SAP system and also the HANA system at his disposal for the operational control of General Motors?*"⁵⁹⁷

After the description of these procedures for obtaining actual information, which has to be calculated each time and cannot only be retrieved (at lightning speed) from a database, the question is asked: *Would Alfred P. Sloan have been able to provide the actual values*

⁵⁹⁶ Bill Gates writes about this work in one of the frequently published editions in a cover commentary of such a new edition that it is "*probably the best book to read if you want to read only one book about business*".

⁵⁹⁷ Zwicker, E. *What could Alfred P. Sloan have done differently if he had had the SAP system and also the HANA system at his disposal for the operational control of General Motors?*, Berlin 2012, (42 pages) www.Inzpla.de/IN43-2012b.pdf. (Not yet available, Text in German, title translated).

of the described types of profit and cost and also the associated drill-down analyses in the actual cost area if he would have used the SAP-CO system? The answer is definitely no.

The reason is (I do not dare to repeat it any more) that the SAP-CO system is a “*calculating database*” and, therefore, multiple fast computations of an actual model partly consisting of millions of equations is not possible using the SAP-CO system. Even if one could, however, the corresponding analytical procedures are still missing.

After this negative result, the extended question is asked: Would Alfred P. Sloan have been able to make the actual profit values described and the drill-down analyses associated with them available to the actual cost area if he had used an SAP system working with HANA? The answer is also no.

Top managers as Alfred P. Sloan could use HANA to call up basic data at lightning speed and have it aggregated and evaluated, i.e., everything that can be done with the actual data in an OLAP data cube. But is it important for a top manager for ongoing financial control (this was the restrictive assumption) to obtain up-to-date information about actual sales volume and actual sales quantity?

Isn't it enough how Alfred P. Sloan managed to get this information delivered every ten days? I am not in a position to answer this question satisfactorily. All studies on this question show that it depends very much on the personality of the individual top managers what information they need.⁵⁹⁸ One would have to ask Hasso Plattner how he has held it.

In view of this situation and Hasso Plattner's invitation to the eight professors to think about the possible applications of the HANA system, I came up with the idea of how the HANA system (you can already guess) could be used in conjunction with the INZPLA-System. The motto would be, HANA delivers the actual base values in a flash and INZPLA calculates the actual values that can only be determined by a model calculation (and with no OLAP analysis) in a flash. And here we are again with the actual article profits of Alfred P. Sloan's automobiles.

To put it a little less sloppily: It would be conceivable to carry out a "real-time actual profitability analysis". This would be an actual cost-performance model, which (in principle) is constantly recalculated as soon as one of the previous values of the actual basic parameters changes. If only a change in the actual sales quantity of a product, the actual costs, the actual consumption quantities, etc. is recorded and reported by HANA, the model begins to calculate the latest actual profit values and to provide the desired analyses. Only a system like HANA would be able to deliver this data at lightning speed. As reported, it took us one night to read the plan basic parameters and the structural relationships at ThyssenKrupp Steel from the data tables of the SAP-CO system. And the structure of an actual model and thus also the number of basic parameters contained in it approximately correspond to its planning model.⁵⁹⁹

⁵⁹⁸ See also: Zwicker, E., *Possibilities and Limits of the Application of Executive Information Systems*. In: Führungskräfte und Führungserfolg, Krystek, U., Link, J. (Ed.), Wiesbaden 1995, p. 231f., www.Inzpla.de/EUS-Systeme.pdf. (Text in German, title translated).

⁵⁹⁹ There are some small structural differences between a planning model and its corresponding actual

The demand for realizing such a real-time actual profit calculation sounds simpler than it is. Plan prices are already used in SAP's monthly actual operating result calculation in the CO module, and the actual-plan variances are later directly allocated to the actual operating result.⁶⁰⁰ It is, therefore, not always possible to "feed" the model with the current actual data especially as many actual costs such as wages and rents are not incurred continuously, but at the end of the month. At SAP, for example, 60 percent of its sales is generated with licenses, and their payments are, therefore, received in the last month of a quarter.

It would, therefore, be necessary to develop a "hybrid actual profitability analysis" that combines planned and actual data in such a way that the actual values of the profit sizes and also of the entire actual quantity structure and actual costs, i.e., all variables of the actual cost-performance model, move monotonously and continuously towards the actual monthly results.

In the case of an up-to-date actual profitability analysis, the structure of the actual model for entering and allocating actual values would have to be changed immediately whenever new structural changes that have not yet been taken into account in the actual model used so far occur.

The following case is an example. For the first January of the plan year, the structural equations of the planning model finally formulated in December of the previous year, for example, are used to determine the January actual values corresponding to January plan values and, in particular, the actual operating result. Up to January 15, this actual model was used to determine the actual operating result accumulated up to that point, as well as the actual contribution margins and actual net profits of the articles sold.

If, for example, a cost center is set up on January 15 that has not been considered in the planning model, then the actual model used so far, which is structurally identical to the planning model, must be "redesigned" so that this cost center and the actual costs incurred in it are recorded, and their allocation to the cost objects up to the actual operating result is taken into account. If a new cost center is set up two weeks later or a new article is sold, or a new cost element is introduced for certain cost centers, then a third (usually only slightly modified) actual model must be created.

This results in a chain of linked actual models. Each actual model in this chain is then only valid for the calculation of the actual values (for example, for ten days) until it is replaced by another actual model, which considers the new structural change. INZPLA-Connect would then recognize the structural changes (for example, the introduction of a new cost center with certain actual costs) on the basis of the SAP data tables maintained on an ongoing basis and then generate the new actual equation model, with which the

model. See: Zwicker, E., *Actual Cost-Performance Models: Structure, Semantics and Application*, Berlin 2008, www.Inzpla.de/IN35-2008a.pdf (Text in German, title translated).

⁶⁰⁰ That's the way it's usually done. You can also make a calculation with the "correct" actual prices. However, according to my information, nobody does.

cumulated actual values such as the actual article profits and ultimately also the actual operating result are calculated until a new structural change occurs.

However, I am not sure whether all this makes sense. If Hasso Plattner speaks of "real-time management", which he considers desirable, then this is a real-time recording of the course of selected variables of the actual profit, whose actuality can no longer be increased.

On the part of SAP users, there are at least voices that question the strong emphasis on a business warehouse as the only starting point for planning and analysis. Other users point out that HANA will only be of interest to them if they recognize what it should be beneficial in terms of their needs, which has not been the case until now.

Peter M. Färbing is editor-in-chief of the E-3 magazine, which deals exclusively with the SAP system and is an SAP-independent source of information that has found widespread distribution among SAP users in German-speaking countries.⁶⁰¹

Färbing considers the enormous increase in performance of data provision and evaluation, which is now made possible by HANA, to be a major technical advance. On the application benefits that HANA brings to long-standing SAP customers, who are mainly subscribers to its magazine, he is not only critical but also rather polemic.

*"SAP Hana is a technology that makes many things possible in real time. What is missing is business research. Instead of letting the music group The Beach Boys sing 'Help Me, Hana' for a lot of money or running a Hana café in Silicon Valley (USA), SAP was to establish several chairs at business schools that research and teach under the topic of real-time companies. Professor Scheer's statement quoted above could be the general motto! Instead of surrounding itself with renowned fellows (see IBM and other IT companies), SAP tries to be youthful and gathers hundreds of start-ups around itself. This is the wrong way! It is idiotic to follow start-up trends. Festivals of promoterism do not lead to anything. Sponsoring mentors is more rational. You will not find a mentor program for Real-time companies in the community. But SAP has a responsibility towards long-standing customers that should be managed sustainably with SAP mentors".*⁶⁰²

There is some sharp shooting going on here. Of course, the whole text is aimed at Hasso Plattner and one has the feeling that the grandchildren are upset that the overly sprightly Granddaddy goes to the discotheque with young start-up girlfriends to rock. Leave him alone. Without him, you would not exist. At any age, you have to have fun.⁶⁰³

To the "business research" demanded by Färbing I have something to add from my point of view as a "business researcher".

At the end of 1980, Microsoft developed the MS-DOS operating system. The main memory had an address space of 640 K. Bill Gates had determined it. It soon became apparent that the address space was insufficient. However, no new operating system

⁶⁰¹ See www.e-3.de

⁶⁰² E-3 Mai, 2014 Editorial. HANA is written differently by Färbing with "Hana" than it is usual.

⁶⁰³ At least Färbing cannot avoid calling Hasso Plattner a "technical genius" and "visionary". Editorial July/August 2017, E3-Magazine.

could be developed so quickly. Bill Gates is indeed a pioneer in computer development. However, at that time it was customary to ask the question in journals: How will Bill Gates go down in the history of electronic data processing? Answer: "*as the inventor of the 640k-barrier*". You could work as we did it too around this barrier with some tricks, but every developer was annoyed about it. Bill Gates did everything he could to eliminate this image, and with the development of MS-DOS 5.00 in 1991, he managed to expand the address space with the DOS Extender.

If HANA had not been developed, Hasso Plattner could be described in analogous malice as the inventor of the "search-tip-pause system" called SAP. In my opinion, the development of HANA was a must and would have been necessary even if not a single attractive business case that could only be realized on a HANA basis could have been found for today's SAP users. It is simply a question of the appropriate technical infrastructure of a system and being technologically up-to-date is ultimately even a question of survival.

If Hasso Plattner had been assigned prematurely, HANA would not have been developed. The same applies to the relocation of HANA to a cloud platform. This is also necessary if you do not want to fall back technically in the end. From Hasso Plattner's point of view, this is the only way to act. He has thus secured his child for the long term, at least from a technological point of view. And, of course, he enjoyed the development.

However, users are only interested in technological leaps such as the use of HANA if they ask what benefits they can offer them now and today. This is clearly shown by the study of DSAG (German SAP User Group), an association of German-speaking SAP users with around 3,000 companies and 56,000 members.⁶⁰⁴ In 2014, this group of SAP users conducted an extensive member survey on the use of HANA. Only 16 percent of the companies surveyed said they were involved with HANA. The others see no need for action because they cannot discover any specific additional "value-added" application (a positively assessed "business case").

The result of the study from 2014 is, "*It is important to provide examples of how HANA makes it possible to innovatively improve standard business processes.*"⁶⁰⁵ Nothing has changed, since then. Marco Lenk, CEO of DSAG, puts it in a nutshell: "*Speed alone does not motivate companies to introduce a new product. In order for HANA to be accepted by the market, customers first need the business cases based on it*".⁶⁰⁶

DSAG has various user groups that deal with special SAP topics. With 1,062 members, the "Planning in BI" working group is one of DSAG's largest working groups.⁶⁰⁷ It was founded to deal with "*classic planning tools such as BW/SEM-BPS (Business Planning & Simulation) and BI-IP (BI-Integrated Planning)*" but also "*solutions within the Enterprise*

⁶⁰⁴ This is how DASAG characterizes its concern: "Since 1997, we have been commenting constructively and critically on SAP strategy, products, and services in the service of the community and formulating concrete demands from SAP users and customers", www.dsag.de on 24.10.2014.

⁶⁰⁵ <http://www.dsag.de/news/ergebnisse-der-aktuellen-dsag-studie-zu-cloud-und-hana> on 24.10.2014.

⁶⁰⁶ Rimini Street: SAP S/4 HANA-Umfrage. In: E-3-Magazin, p. 38.

⁶⁰⁷ The only working group dealing with HANA, called HANA Analytics, has 340 members.

*Performance Management portfolio (SAP PC-SAP Business Planning and Consolidation)"*⁶⁰⁸. The integration of HANA into the planning process is also a topic of this working group, as it has set itself the goal of supporting "*customer-oriented development of in-memory planning and simulation solutions with HANA*".⁶⁰⁹ The chairman of this working group, Norbert Deubel, gave an informative video interview on the tasks of his working group in July 2014.⁶¹⁰ He reports there with pride. "*The first success we ever had*" was "*to give SAP the decisive impulse that a planning function belongs in a business warehouse.*"⁶¹¹ I can't believe it. Congratulations. I wonder if Werner Sinzig was the SAP contact person they convinced.

Norbert Deubel notes, "*Setting up simulation models (in HANA) will certainly be one aspect*". That does not sound like much progress. Because one thing must be clear: simulation models are calculation models and, like the 2.6 million equations at Thyssen-Krupp Steel, they could be calculated in seconds even without HANA in the working memory. Therefore, "*building on*" HANA means that parameters are used to simulate a (simulation) model that can only be supplied by HANA in real-time and then used immediately (real in time) for certain model calculations (simulation calculations). The system of a "real-time cost and profit calculation" described by me would be one such case.

But let us return to Peter Färbinger's Hasso Plattner Bashing by accusing SAP (and by this, he means, as I said, Hasso Plattner) that there are no efforts to support professors who "*do research and teach in the field of real-time companies*".

It should be noted that Hasso Plattner invited eight German-speaking university professors to the meeting I described at the beginning of 2011, almost now several years ago, whom he assumed were best suited to contribute to a business application of HANA. And he explicitly asked them to do so and assured them of his support.

However, this is not so easy, even if you have dealt in detail with the SAP system or some of its sub-areas.

One has to come up with a general procedure that many companies consider "worthwhile" and that has never been thought of before. And that is an innovative achievement. If such a process were already known to be desirable and only HANA would have been needed to implement it, SAP would have implemented it long ago. They do not just have OLAP blinkers there.

After my literature research and "website visits", none of the professors invited to this meeting had up to that time contributed something to the development of business applications of the SAP system. Even if Hasso Plattner had offered the eight professors an impressive prize money for those who develop an application procedure based on HANA, nothing would probably have come of it in the area of accounting modules. In my opin-

⁶⁰⁸ <http://www.dsag.de/arbeitsgremien/ag-planung-im-bi/details> on 25.10.2014.

⁶⁰⁹ There is another user group called "AG Business Planning & Consolidation (BPC)" for members who use the planning software "SAP Business Planning and Consolidation".

⁶¹⁰ www.dsag.de/AG-Planung-BI-Film on 24.10.2014.

⁶¹¹ Video time 4.02 minutes

ion, the same also applies to all other professors of business informatics who were not invited at the time.⁶¹²

I am quite familiar with accounting. I have given a great deal of thought to whether a generally applicable and for many companies useful procedure for planning, control or analysis of actual models can only be found in this area on the basis of HANA alone, the realization of which could, therefore, be described as an attractive business case. However, I could not think of anything convincing about it. Even an impressive prize money would not have been able to change that. If someone in the field of accounting really succeeds in developing a new analysis or planning procedure that can be implemented by HANA alone, which is also welcomed in practice and used on a large scale, then I am sure he can be assured of my highest respect.

However, it was right to approach German-speaking business IT specialists, especially when solutions in the area of accounting are under discussion. In this "History..." I have dealt in detail with the relationship of "management accounting" to the Integrated Target Commitment Planning and Control.⁶¹³ Probably no one will read the text. However, if someone does this, he will see that in the English-language literature the internal accounting, i.e. the actual calculation, the plan calculation and the setpoint-actual control and the associated explorative analyses, are in respect to a model-based representation moving on a rudimentary level.

There is no model-based or formalized approach to internal accounting that would be required for a "computerization". The representations are mainly on a "verbal level". From the authors of this publications come certainly no "professorial suggestions", which, as Färbing demands, represent the result of "business research".

To return to my proposal, which appears to be the only outcome of the meeting almost eight years ago. I consider the application of the INZPLA-System to be an innovation based on a sophisticated and application-relevant theory. However, whether many companies would have decided after an audit to use this procedure because of its advantages is not proven and will probably no longer be clarified.

However, my proposal to generate a real-time cost and profit statement on a HANA basis is opposed by the unanswered question of whether this real-time determination of the actual cost and actual success factors is advantageous for the corporate management. Users like Norbert Deubel and the members of his working group, who are open to new developments, should decide this question. Do they deem an accounting system that not only records, systematizes and evaluates large amounts of data in a timely manner (which HANA does) but also calculates quantities such as product costs, product profits, the operating result and even the quantities of the balance sheet and profit and loss statement in a contemporary manner. I am not clear whether this is the aim when Norbert Deubel points out that it is necessary "setting up" simulation model (and, therefore, equation model) on HANA.

⁶¹² There are about 180 chairs of Business Informatics in German-speaking countries.

⁶¹³ See the chapter "Management Accounting in the Light of the Integrated Target Commitment Planning and Control" p. 195- 221 and also p. 184-195 on Kaplan's management accounting activities.

- **What will become of the INZPLA-System?**

The INZPLA-System was developed by me to show that the theory of the Integrated Target Commitment Planning is applicable. And this theory would never be as it is today if its development had not been constantly accompanied by the development of the INZPLA-System.

The system was used for four years in a company that uses one of the world's largest budgeted cost and performance accounting systems. I had hoped to win SAP for the further development of the INZPLA-System. However, it had already failed because of Werner Sinzig, and if he had supported it, his introduction would probably have failed because of the next instance. In the opinion of many who work there, SAP is an immobile aircraft carrier and as mentioned the principle "*not invented here, is not invented*" applies. The software system INZPLA has been developed over several decades, it has been repeatedly reprogrammed, modified, extended and refined (s.p.628). It was fun, but there was also a lot of work and effort involved in this system. Is this the end of the history of the INZPLA-System (but hopefully not of the theory)? It looks like it.

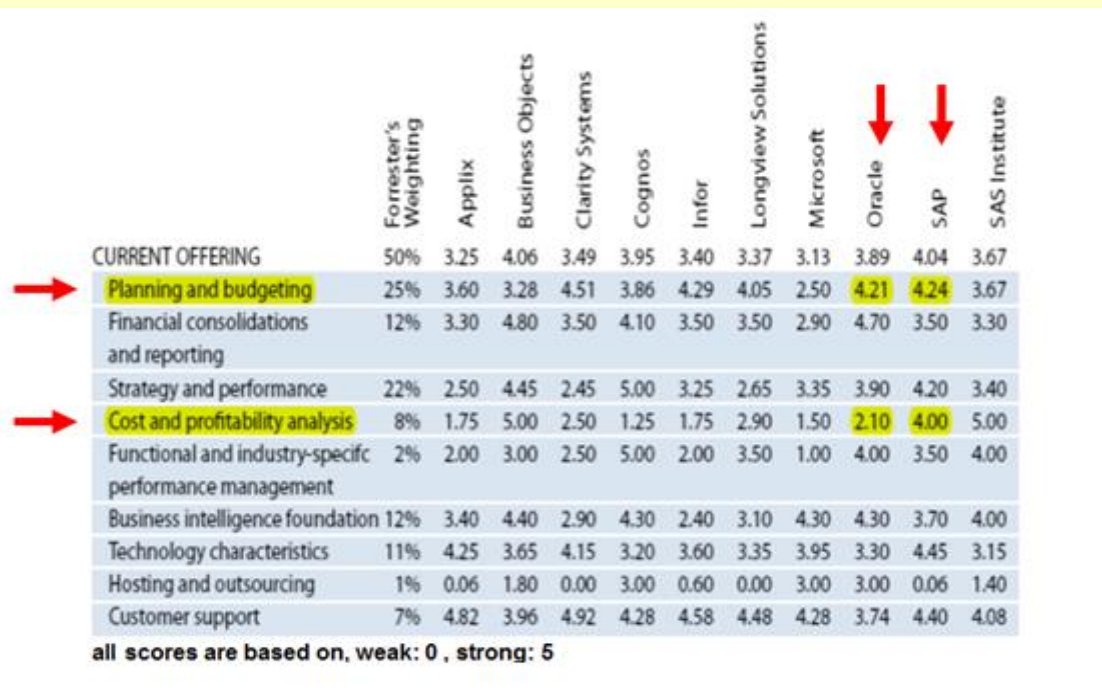


Fig. 65: Forrester Research's assessment of the quality of certain areas of application software from various software vendors ⁶¹⁴

However, that does not knock me down. Who in business administration, as a discipline committed to an application, has formulated and developed in detail a theory that is also applicable in practice and has been successfully applied? And the successful use of this planning procedure by one of the world's largest users of plan cost and performance accounting is a fact. What will happen with this prototype? In order to lead the system to success, I would have to become active in the acquisition process. However, I do not

⁶¹⁴ Hamerman, Paul D., *The Forrester Wave™: Business Performance Solutions, Q4 2007, for Business Process & Applications Professionals*.

have the talent. And to be honest, I have no desire to explain decision makers while they apparently listen with a boring face what is an equation model. In principle, a whole series of companies could be considered that could include such a system in their portfolio. However, what persuasion would have to precede this?

Therefore, I will probably delete all programs after copying them to a data stick. I am still thinking about how to put it into nirvana. However, even if the entire program code were destroyed, the system is (still) in my head, and I could reconstruct everything again (with a development team, of course).

However, there is another problem with regard to practical implementation. If a "superior manager" ordered me to practice a "short solution" for pragmatic reasons, then I would not go along with this if it violates the theory, i.e., inconsistencies occur in the system. As reported, the SAP-CO system is full of such inconsistencies.

In the "Integrated Corporate Planning" working group of the Schmalenbach Society, in which, apart from Dietger Hahn and myself as university lecturers, only head planners from major German companies took part, I often argued: *"It is not the university that has a practical deficit, rather the practice has a theoretical deficit"*. And no one contradicted me, although everyone there spoke their minds frankly and freely.⁶¹⁵ For this reason, however, I would not be willing to develop a system with "theoretical deficits. Because in the end, it's the theory that matters to me. And nothing is more practical than a good theory.

You have to think of everything as a game. Therefore, I would like to develop a scenario, how the INZPLA-System could still experience a spreading because it is "pushed" by a really motivated and at the same time potential interested person.

Larry Ellison is the founder and majority shareholder of Oracle. Ellison has been announcing for some time that he wants to push SAP out of the ranks of business software users. As early as 1998, he announced, *"Everyone will think I'm on drugs, but we will overtake SAP in five years"*.

His efforts to achieve this goal can be observed everywhere. For example, he has launched an action called "OFF SAP" to ensure that SAP users who upgrade their R/3 systems to Mysap ERP or Mysap Business Suite switch to the Oracle Fusion system.⁶¹⁶

In order to outstrip SAP, it has acquired companies with a total value of \$ 34 billion that are active in the area of business software. However, so far he has not managed to overtake SAP.

Larry Ellison uses every opportunity to polemicize and even sue against SAP.⁶¹⁷ He mocked Hasso Plattner because of his propagation of the in-memory concept with drastic formulations.⁶¹⁸ In short: Larry Ellison never misses an opportunity to annihilate SAP.

⁶¹⁵ For my activities in this working group, see page 524.

⁶¹⁶ Oracle Helping SAP Customers to get "OFF SAP", in: www.oracle.com/corporate/press/2005_jun/-sap.html on 11.12. 2006. See also www.oracle.com/goto/sap 1.4.2014.

⁶¹⁷ http://www.youtube.com/watch?v=0Jk_Gztp1aQ&feature=player_embedded.

⁶¹⁸ Hasso Plattner replied in a funny but also informative video in a presentation reminiscent of Lorient.

Since the migration of larger application areas from SAP to ORACLE is out of the question for an SAP user because it would not bring advantages but only disadvantages, Larry Ellison tries to withdraw users from SAP in the form of a "peace meal policy". For example, he advertises the use of Oracle BI Suite EE 10g Rel. 3 with the note that it delivers *"direct access to SAP BW providing users with a powerful tool for analyzing SAP BW data"*.⁶¹⁹

What does all this have to do with the INZPLA-System? There are certain companies that regularly analyze and evaluate the application areas of the relevant software providers. This includes Forrester Research. Forrester Research carried out such an evaluation in 2007 with regard to certain application areas of the providers of "business software". The result of such a study is shown in Fig. 65.⁶²⁰

It can be seen that SAP has a clear advantage over ORACLE in the area of *"planning and budgeting"* and especially in the area of *"cost and profitability analysis"*. At SAP, *"cost and profitability analysis"* takes place completely in the CO-module. This also applies to *"planning and budgeting"*.

The evaluation by Forrester Research can therefore only refer to the CO module. For, as already mentioned elsewhere, the systems "BI Integrated Planning" and "BPC", which may also be suitable for "Cost and Profitability Analysis" and "Planning and Budgeting", can be described as completely inadequate without exaggeration (s.p.350).

In terms of *"cost and profitability analysis"* and *"planning and budgeting"*, these systems are classes worse than the SAP-CO system.

If Larry Ellison now had the INZPLA-Connect system available, he could offer it to any SAP user working with an ORACLE database.⁶²¹ The number of potential customers would be very large. Thus, INZPLA-Connect could run alongside the normal use of the CO module as a kind of bypass system and the users could, but do not have to, make use of INZPLA-Connect.

In a contribution highlighting the qualities of the SAP-CO module, Werner Sinzig, as one of the developers of the system, speaks of the SAP-CO module as *"one of SAP's most widely used products"*.⁶²² This widely used product would then be replaced by the INZPLA-system. And if someone only have a minimum of knowledge in cost accounting and is also willing to use the potential of cost accounting for his purposes, then he will switch to this system with a "tip of his finger". In principle this "tip", would already be a kind of "big-bang migration", because the entire operational planning as well as the control and all other analyses could be carried out in the INZPLA-System or then in an

See "The Double Hasso Strikes Back", <http://www.youtube.com/watch?v=W6S5hrPNr1E&feature=related>. From 3.5.2015.

⁶¹⁹ http://www.oracle.com/corporate/press/2006_oct/openworldsf06-22.html from 2.3.2011.

⁶²⁰ A recent study is not known to me. However, the study of the evaluated software shows that no newer developments have been added that could give rise to a change in the evaluation.

⁶²¹ 67 percent of all German SAP customers use ORACLE database technology. See "ORACLE dominates". In: Computerwoche from 13.4.2011

⁶²² See: Sinzig, W., *Das Integrationsmodell der Kosten- und Leistungsrechnung*, <http://admin-vm6.iwi.unisg.ch/kagermann/index.php?id=47> 27.5.2010.

ORACLE system via this bypass system. This would mean that the SAP System would only be used as a database for the basic run and to store the data determined for output in the general SAP reporting system.

There are problems here in detail, but reading out the data tables, creating the model and calculating it has been tried and tested many times and it works. And the many analysis methods, none of which are available in the SAP-CO module, all work.

This does not rule out the possibility of cases that have not yet been recorded. However, they have to be overcome. My experience is that well-defined goals of software development can always be achieved with a little intelligence, a few good ideas and a lot of perseverance.⁶²³

However, back to a SAP ORACLE migration. It would even be possible to intervene in the configuration of the SAP-CO module. As described above, with the INZPLA configuration system developed by us, at least according to experts, a cost-performance model can be configured more than ten times faster and much clearer using the model tableaus than would be possible with the "customizing system" of the SAP-CO system (s.p.148). This configuration system could at least theoretically (similar to a precompiler) be used as a preconfiguration system during the model development with the result that the actual configuration with the SAP-CO configuration system is performed by this preconfiguration system. Since the SAP-CO module is at the heart of the SAP system, the term bypass system is actually quite appropriate. With such a bypass system ORACLE would bring about a quality leap in the two areas "planning and budgeting" and "cost and profitability analysis" based on an SAP application, which in the eyes of the analysts would not be insignificant. A plus for Larry Ellison.

⁶²³ If I should have any special feature at all, it is perseverance.

25. How to develop a model of the Integrated Target Commitment Planning?

The question arises as to whether there are certain procedures that should be followed in order to develop an Integrated Target Commitment Planning model. If there are configuration systems in the application area in question, such as the SAP-CO Customizing system or the INZPLA configuration system for planning the operating result, you should use these. However, what should we do if such a system is not available? The answer is that one should try to disaggregate the top target of the intended planning by means of definition and hypothesis equations until one reaches model parameters that can be "top target-oriented" influenced by the planner.

It would now make sense to demonstrate this approach in the following using the "operating result" as a top target. However, that is not the following approach. Instead of the operating result we will choose the RoI, i.e., "Return on Investment", as the top target of the disaggregating modeling to be described. The reason for this is that many authors discuss the implementation of a planning system with the RoI as the top target and use the definition equations of the RoI system for disaggregation in order to arrive at a model with which they then intend to plan the RoI. How these authors proceed is described in the following chapter "The RoI concept..."(s.p.366f.) and analyzed in the light of the Integrated Target Commitment Planning.

This chapter only describes how a disaggregation of the RoI as a top target for the development of an Integrated Target Commitment Planning model would have to be carried out. We will refer back to this consideration when the "RoI planning procedures" of some authors with regard to the Integrated Target Commitment Planning are discussed in the following chapter.

That raises the question: How can a company, starting from the RoI as the desired top target of its planning, attain a model of the Integrated Target Commitment Planning without using a configuration system? The disaggregation recommendation already mentioned is to be made even more concrete in this respect. It will read as follows:

"Disaggregate the RoI using definition and hypothesis equations until all basic parameters of the resulting model can be interpreted in terms of the Integrated Target Commitment Planning. If the model generated in this way only has basic targets but no decision variables, you can use this model to realize a pure Integrated Target Commitment Planning. If your model contains basic targets and decision variables, you can carry out mixed optimization basic Target Commitment Planning. And if your model contains only decision variables and no basic targets, then there is a "pure optimization", i.e., the planning procedure known as the classic optimization procedure".

Let us now consider how the furniture model already described could be developed according to this approach, i.e., through disaggregation starting from its top target.

In the furniture model described so far, the operating result (OR) served as the top target (s.p.39). It is now to be replaced by the RoI. In such a case, the RoI can be determined by the definition equation

$$\text{RoI} = \text{OR} / \text{IA} \quad (122)$$

IA - imputed assets (with IA = 3,881,944 €)⁶²⁴

can be defined. This is already the first disaggregation step in a model development leading to the one-equation model (122).

The question arises as to whether the model parameters OP and IA of this model can be used as basic targets or decision variables because an area can be held responsible for their achievement. I suppose that this question could be answered in the negative. The model developer must, therefore, further disaggregate in order to arrive at such a type of model parameters. Let us assume that he now selects the operating result for a further disaggregation and defines it as follows

$$\text{OR} = \text{TCM} - \text{TFC} \quad (123)$$

OR - operating result, TCM - total contribution margin, TFC - total fixed costs.

Thus, the two equations (122) and (123) form the model of the second disaggregation step. The question arises whether the resulting model parameters IA, TCM and TFC of this two-equation model are variables that can be influenced within a range as basic targets. This question must again be answered in the negative. However, they also cannot be used as decision variables and don't have the status of uncontrollable basic parameters.

Then the model developer decides to further disaggregate the entire contribution margin (TCM). This disaggregation leads, it is assumed, to the definition equation

$$\text{TCM} = \text{CMSO} + \text{CMBD} \quad (124)$$

CMSO - Contribution margin sofas, CMBD - Contribution margin beds

As a result of the third disaggregation step, a model consisting of three equations (122) to (124) is available. Also with regard to the newly added model parameters CMSO and CMBD, the model developer does not see (let us assume) any possibility of using them as basic targets or decision variables. But they are also out of the question uncontrollable basic parameters. The model consisting of equations (122) to (124) is, therefore, not suitable for carrying out an Integrated Target Commitment Planning.

For each of the three models a reduced top target equation can be developed, i.e., an equation that describes the top targets, here the RoI, as a function of the model parameters influencing the top target. The reduced top target equation of the first disaggregation step is

$$\text{RoI} = \text{OP} / \text{IA} \quad (125)$$

The reduced top target equation of the second disaggregation step is

$$\text{RoI} = (\text{TCM} - \text{TFC}) / \text{IA} \quad (126)$$

The reduced top target equation of the third disaggregation step is

⁶²⁴ The operating result of the furniture model (OR) was € 279.500. See page 41.

$$\text{RoI} = (\text{CMSO} + \text{CMBD} - \text{TFC}) / \text{IA} \quad (127)$$

If now, as in the model tableau of the furniture model, disaggregation is pursued to such an extent that one arrives at a model in which its model parameters can be interpreted as basic parameters of the Integrated Target Commitment Planning, then one can also derive the reduced top target equation from this model of the Integrated Target Commitment Planning.

In the case of the furniture model already discussed, it has the following shape:

$$\begin{aligned} \text{RoI} = & \\ & [(\text{SP}_{\text{SO}} - \text{PCO}_{\text{AS}}_{\text{SO}} \cdot \text{PCR}_{\text{AS}} - \text{PCO}_{\text{WW}}_{\text{SO}} \cdot \text{PCR}_{\text{WW}} - \text{PCO}_{\text{UH}}_{\text{SO}} \cdot \text{PCR}_{\text{UH}} - \\ & \text{MCR}_{\text{SO}}) \cdot \text{SQ}_{\text{SO}} + (\text{SP}_{\text{BD}} - \text{PCO}_{\text{AS}}_{\text{BD}} \cdot \text{PCR}_{\text{AS}} - \text{PCO}_{\text{WW}}_{\text{BD}} \cdot \text{PCR}_{\text{WW}} - \\ & \text{MCR}_{\text{BD}}) \cdot \text{SQ}_{\text{BD}} - \text{FC}_{\text{SA}} - \text{FC}_{\text{UH}} - \text{FC}_{\text{WW}} - \text{FC}_{\text{AS}}] / \text{IA} \end{aligned} \quad (128)$$

Example of the combinatory definition of the variable names

SP_{SO} = sales price_sofa

Elements of the variable name

SA -	sales area	AS -	assembly
SP -	sales price	PCR -	proportional cost rate
SQ -	sales quantity	UH -	upholstery
FC -	fixed costs	PCO -	production coefficient
WW -	woodworking	BD -	bed
IA -	imputed assets	SO -	sofa
MCR -	material cost rate		

If an Integrated Target Commitment Planning is performed using a reduced equation of a selected top target, then only the basic targets and decision variables are varied during planning. Therefore, in equation (128) it makes sense to replace the basic parameters, which are not basic targets and decision variables, with their numerical values. This leaves only the basic targets and the decision variables in the symbolic form. Such an approach leads to the following reduced top target equation for the furniture model

$$\begin{aligned} \text{RoI} = & \\ & [(3,000 - \text{PCR}_{\text{AS}} - 2 - \text{PCR}_{\text{WW}} - 3 \cdot \text{PCR}_{\text{UH}} - 900) \cdot \text{SQ}_{\text{SO}} + (1,050 - \text{PCR}_{\text{AS}} - \\ & \text{PCR}_{\text{WW}} - 150) \cdot \text{SQ}_{\text{BD}} - \text{FC}_{\text{SA}} - \text{FC}_{\text{UH}} - \text{FC}_{\text{WW}} - \text{FC}_{\text{AS}}] / 3,881,944 \end{aligned} \quad (129)$$

As described, the furniture model has only basic targets and no decision variables. Therefore, all nine symbolic parameters in (129) are basic targets.

In such reduced top target equations of an INZPLA-model, there are always only basic targets and decision variables. If the reduced top target equation contains only decision variables and, therefore, no basic targets, then the name "Integrated Target Commitment Planning" is actually inappropriate. In this case, the reduced top target equation of this "Integrated Target Commitment Planning" degenerates into a "goal function" of the classical optimization theory with the top target as this variable to be maximized.

****In reality, a reduced top target equation is never determined in a realistic model (s.p.36). Rather, the planning of a value of the operating result (OR) depending on certain

values of its basic targets or decision variables is carried out on the basis of the calculation of the equations of the entire model. How should the reduced top target equation of the operating result look like in the ThyssenKrupp Steel model with 2.6 million equations and about 200,000 basic parameters? ***

The following, therefore, applies to a model-based planning of RoI with an Integrated Target Commitment Planning model: As shown in the example, you can only plan the RoI if you have developed a model in which all model parameters can be interpreted as basic parameters of an Integrated Target Commitment Planning.

It makes no sense to stop at the third disaggregation step within the framework of the described model development by disaggregation and to determine the reduced top target equation (127) and then to say that one plans the RoI by using the parameters CMSO, CMBD, TFC and KVM and call them as some authors did as “*correcting variables*”, “*control variables*”, “*adjusting screws*”, “*knobs*” or “*levers of planning*”. Within a model of the Integrated Target Commitment Planning, such designations are only appropriate for the basic targets and decision variables, i.e., those model parameters that can be influenced by the company and for which someone in the company can be held responsible. In the RoI planning procedures to be described in the next chapter and propagated by some authors, however, this necessary controllability of the model parameters is not taken into account.

26. The RoI Target System and other target systems in the light of the Integrated Target Commitment Planning

The "RoI system" is considered in the literature to be of outstanding theoretical and practical importance. It trades under various names such as *RoI concept*, *DuPont ratio system*, *RoI ratio system* or *RoI model*. In the area of German-language controlling, there is virtually no monograph that does not deal with this "system" and describes it as an important instrument for company planning. The textbooks on general business administration also never lack a description of it. The RoI system is a hierarchical system of definition equations with the Return on Investment (RoI) standing at the top. At the level below are the return on sales (RS) and the asset turnover (AT). The decisive characteristic of this definition hierarchy is that the return on investment (RoI) contains the return on sales (RS) and the asset turnover (AT) as definition components. The so-called DuPont definition of the RoI applies

$$\text{RoI} = \text{RS} \cdot \text{AT} \quad (130)$$

The asset turnover and the return on sales are disaggregated downwards by further definition equations.

The DuPont definition of RoI is described by Pfaff and Peters as "*one of the most important formulas of business administration*", which originated from the "*ingenious idea*"

“of a controller.”⁶²⁵ It is not unreasonable to say that the “RoI system” with its DuPont definition in business administration has the status of a sacred cow. It is inviolable, so to speak.

From the point of view from the Integrated Target Commitment Planning, two things are of interest for the “RoI system”. It is a system of equations, which contains variables that could be considered as top targets of an Integrated Target Commitment Planning. Therefore, the question arises under which circumstances a RoI system (with its equations) can be used to carry out an Integrated Target Commitment Planning.

It has already been described with the furniture model (s.p.363) how the RoI can be used as the only top target of an Integrated Target Commitment Planning. The system of equations originally developed by DuPont with the RoI as the top variable contains six endogenous variables and (at the lowest level) nine model parameters. These model parameters are “sales”, “production costs”, “storage costs”, “selling costs”, “administrative costs”, “inventories”, “receivables”, “cash and cash equivalents” and “fixed assets”. They do not allow an interpretation as basic parameters of an Integrated Target Commitment Planning.

Therefore, the ratio system (or equation model of ratios) described by DuPont does not make it possible to perform any Integrated Target Commitment Planning. However, as already described using the furniture model, it should be possible, by disaggregating these model parameters, to arrive at further model parameters that can be used as the basic parameters for an Integrated Target Commitment Planning.⁶²⁶

If only the RoI is to be used as the top target in such an INZPLA-model, the DuPont definition of the RoI is superfluous. The RoI can be defined in the model as the ratio “profit/asset”. The profit and the assets as definition components of the RoI are then disaggregated in the present model by definition and hypothesis equations to such an extent that model parameters are obtained which permit an interpretation as basic parameters of an Integrated Target Commitment Planning.

The question arises under which circumstances the use of the RoI definition is useful or even necessary in the context of an Integrated Target Commitment Planning.

This could be the case if, in addition to the return on investment, the return on sales or the asset turnover were to be chosen as top targets. But in this case the DuPont definition equation (130) is also not necessary.

If, for example, the return on sales is selected as the second top target in addition to the return on investment, then you can define the return on sales as “profit/sales” in addition to the definition “profit/assets” of the return on investment. The components of the two definition equations then have to be disaggregated in order to arrive at parameters that can be interpreted as basic parameters of an Integrated Target Commitment Planning.

⁶²⁵ For more information, see: Zwicker, E., *The RoI Target System and other Target Systems in the Light of the Integrated Target Commitment Planning*, op. cit., p.8, www.Inzpla.de/IN44-2014.pdf. (Text in German, title translated). The quote comes from: Pfaff, D., Peters, G., *Controlling – Das Einmaleins renditeorientierter Entscheidungen*, Zürich 2005, p. 25.

⁶²⁶ This is almost always possible because it is also possible with cost-performance models in which the operating result is used as the top target.

Such a disaggregation was already shown for the RoI as the only top target of the furniture model. One receives then an influence diagram, which is no hierarchy but possess two peaks, i.e. the RoI and the return on sales. Therefore also in this case it is not necessary to use the Dupont definition of the RoI.

That's disappointing. Why is the application of this sacred cow not useful or even necessary in the framework of an Integrated Target Commitment Planning? I have long considered how this famous definition could be useful in the context of an Integrated Target Commitment Planning. I only see one possibility, which has no great practical relevance, but in view of the many "RoI-Definitions fans", such an investigation seemed appropriate to me.

For the application of the RoI DuPont definition equation in the context of the Integrated Target Commitment Planning

If the corporate management has the plan to use more than one top target in its operational planning, then it can carry out a so-called top target relationship analysis (s.p.174). The goal of this procedure is to determine whether a fixed functional target relationship exists between certain top targets during the planning procedure. If this is the case, you can carry out top-target follow-up planning as part of the Integrated Target Commitment Planning.

For this purpose, the case was described on the basis of the furniture model (s.p.179) that such a fixed functional target relationship exists between two top targets, namely the operating result and the RoI. However, it is also conceivable that the corporate management declares three top targets and a top target relationship analysis shows that a fixed functional target relationship exists between these three top targets (TT_1 to TT_3). Assuming the corporate management declares the top targets TT_1 and TT_2 as prime top targets, then TT_3 would be the follow-up top target. This case is described by the fixed functional target relationship

$$TT_3 = F(TT_1, TT_2, UP_1, \dots, UP_n, DP_1, \dots, DP_m) \quad (131)$$

with: UP - uncontrollable basic parameters, DP - decision parameters

If we now assume that no uncontrollable basic parameters (UP) and decision parameters (DP) occur in (131), then we get

$$TT_3 = F(TT_1, TT_2) \quad (132)$$

Such a relationship occurs when the return on investment (RoI), return on sales (RS) and asset turnover (AT) are selected as the top targets of an Integrated Target Commitment Planning. Because these three ratios can be described by

$$RoI = RS \cdot AT \quad (133)$$

that is the DuPont definition of the RoI. If the corporate management decides that the RoI should be chosen as a follow-up top target, then (133) is a concretization of (132).

The furniture model should again serve as an example for this case of "three-top target planning". Up to now, the operating result was used as the top target in the furniture

model (s.p.40). The definitions of the three new top targets (RoI, RS, and AT) are not yet included in the furniture model described by up to now. However, their introduction instead of the operating result does not pose any difficulties. RoI is defined according to (133) and return on sales (RS) and asset turnover (AT) according to their definition equations ⁶²⁷

$$RS = OR / SV \quad (134)$$

and

$$AT = SV/IA \quad (135)$$

with RS - return on sales and AT - asset turnover, SV - sales value, OR – operating result, IA - imputed assets.⁶²⁸

In this case, a (computer-based) top target relationship analysis would determine that there exists a functional target relationship between these top targets and ask the corporate management which of the three top targets should be selected as the follow-up top target. If the corporate management selects the RoI for this, the planning system creates the if-then-calculation tableau shown in Fig. 66.

The top target relationship equation and at the same time the DuPont definition equation of the RoI (133) is listed in the header of Fig. 66 and described there by "3 = 1 • 2". It is determined by the system using an algebraic analysis based on the definition equations of the return on investment (RoI), the return on sales (RS), the asset turnover (AS), i.e., equations (133) to (135). It is, therefore, not necessary to explicitly enter the DuPont definition equation of the RoI somewhere.

*****Since such top target relationships are unlikely to occur when the corporate management determines the top targets for its annual operational planning, such a computer-algebraic top target relationship analysis has not yet been developed. In the INZPLA-System, however, a series of computer algebraic analyses are used, so that the implementation of such a procedure should not pose any major problems.⁶²⁹*****

This describes the only case where the DuPont definition equation of the RoI can be useful in the case of the Integrated Target Commitment Planning. However, the described "three-top target case" should never be encountered in practice. It was also only described to show at least one use of the DuPont definition of RoI in the context of the Integrated

⁶²⁷ Since the three top targets (like the original furniture model) cannot be specified within the configuration system using standard model tableaus, they are entered using so-called connection tableaus. See: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 34f., www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated).

⁶²⁸ The imputed assets (IA) are assumed to be € 3,881,944, as in the case of the top target relationship analysis between the operating result and the RoI (see page 179).

⁶²⁹ See for the application of computer algebraic methods in the INZPLA-System: Zwicker, E., Pleger, A., *Strukturanalyse von Planungsmodellen, (Structural Analysis of Planning Models)* In: Kurbel, K., Mertens, P., Scheer, A.-G. (Ed.), *Interaktive betriebswirtschaftliche Steuerungssysteme*, Berlin New York 1989, p. 77-86, www.Inzpla.de/IN03-1989.pdf, and La, B., *Strukturanalyse gleichungsorientierter Planungsmodelle, (Structural Analysis of equation-oriented Planning Models)*. Diss. TU Berlin 1998.

Target Commitment Planning. Otherwise, from the point of view of the Integrated Target Commitment Planning, you cannot do anything with the DuPont definition equation.

				Prime Top Targets		Follow-up- Top Target
				1	2	3 = 1 • 2
				Return- on Sales (RS)	Asset Turnover (AT)	Return on Investment (RoI)
Responsibility Area	Basic Target	Value Basic Target	Direction of Burden Decrease	0,125	0,578	0,072
Assembly	Proportional Cost Rate Equipment Costs (€/Machine Hour)	250	+	-0,151	0,000	
	Salaries (€)	60.000	+	-0,021	0,000	
Wood Working	Proportional Cost Rate Equipment Costs (€/Machine Hour)	300	+	-0,207	0,000	
	Salaries (€)	72.000	+	-0,026	0,000	
Upholstery	Proportional Cost Rate Equipment Costs (€/Machine hour)	250	+	-0,064	0,000	
	Salaries (€)	72.000	+	-0,026	0,000	
Sales	Sales Quantity Living Rooms (Unit)	240	-	-0,011	-0,032	
	Sales Quantity Bed Rooms (Unit)	1.450	-	-0,122	-0,068	
	Salaries (€)	144.000	+	-0,052	0,000	

Fig. 66: *If-then-calculation tableau of the furniture model with the choice of return on sales (RS), asset turnover (AT) and return on investment (RoI) as top targets and the choice of RoI as follow-up top target.*

However, the DuPont definition equation is not absolutely necessary for planning this "three-top target case". If a top target relationship analysis were not carried out in this case, the central planning would plan the basic targets with regard to the three top targets using the if-then-calculation tableau. The RoI column would then do not contain the DuPont equation in the header, but, like the two other columns, the variator values of the top target (here the RoI) with respect to the basic targets influencing it. The central planning would then plan these three top targets without perhaps noticing, that there is a definite dependence between them according to the DuPont Definition (130).

A supporter of the Dupont definition might object that it is useful for an exploratory analysis of a model. I also failed to find such a "useful" exploratory procedure that works on the basis of a planned or actual cost-performance model and requires the DuPont definition of the RoI.⁶³⁰

Pfaff and Peters as the most important admirers of the DuPont definition equation also explain what the ingenious idea of the controller consisted of, namely to "... *expand the numerator and denominator of the yield formula with the turnover*". In the example presented, the RoI definition equation in column 3 of Fig. 66 would be determined automatically by the algebraic top target relationship analysis. One, as Pfaff and Peters put it, "*of the most important formulas of business administration*" (s.p.366) is in this case not generated by an innovative and groundbreaking controller, but by a computer program that has never "*heard*" anything of the DuPont definition before. To show these I have spent three pages of this "History..." only to show that this "holy formula" has no meaning within the Integrated Target Commitment Planning.

After these considerations on the RoI, one could assume that the topic "*DuPont definition of RoI*" has now been completed. But that is not the case.

⁶³⁰ If you have a suggestion, please let me know. I will make it available as pdf-file here.

The reason for this is that the DuPont ratio system of the RoI belongs to a class of target hierarchies, which I call pseudo-target hierarchies. As the derogatory naming indicates, these target hierarchies (or hierarchical target systems) have some unacceptable characteristics. To explain this in detail, I have formulated a text that identifies the RoI system as such a pseudo-target hierarchy and, on this basis, deals with further target hierarchies developed by a lot of well-known authors who, like the RoI system, prove to be such pseudo-target hierarchies. This text has the same title as this chapter, i.e., "*The RoI Target System and other Target Systems in the Light of the Integrated Target Commitment Planning*"⁶³¹. The motives that led to the development of this text will be explained below.

Definition extensions and pseudo-hierarchies

The DuPont definition of RoI is based on a certain definition procedure, which many authors regard as groundbreaking. This procedure had no name so far and was called by me a definition extension. Such definition extensions are used by many authors to define quantitative variables in hierarchical target systems. These are hierarchical definition equation systems, which, in addition to a target at the top of the hierarchy, contain variables at the hierarchy levels below that can be used in case of a planning as further targets. Target hierarchies developed using such definition extensions were described by me as hierarchical target systems with definition extensions.

Nearly all of the hierarchical target systems discussed in the literature belong to this category. In the text mentioned, they are judged extremely critically and are referred to as pseudo-target hierarchies or pseudo-target systems. Such systems are characterized by the fact that certain model parameters of their (hierarchical) definition equations, which can be arranged in a hierarchy diagram at the basis of the hierarchy, have no influence on the target at the top of the hierarchy. In many cases, however, these model parameters do not even have an influence on the targets that are below the target at the top of the hierarchy. The non-existent influence of such uninfluential model parameters on the target at the top of the hierarchy is characterized by the fact that these model parameters of the hierarchical definition equation system can be shortened in the reduced equation of the top target.⁶³²

Definition extensions are used in the RoI system but also in hierarchies with other top targets than the RoI. Hierarchical target systems with definition extensions generated in this way serve authors such as Pfaff, Adam, Dellmann and Coenenberg as the starting point for certain normative and explorative analyses.

All contributions of the newer business literature to the planning and analysis of quantitative target systems are based on the application of such pseudo-target hierarchies. Following the "target theory" (s.p.182) presented by Edmund Heinen about fifty years ago with

⁶³¹ See: Zwicker, E., *The RoI Target System and other Target Systems in the Light of the Integrated Target Commitment Planning*, op. cit., www.Inzpla.de/IN44-2014.pdf. (Text in German, title translated).

⁶³² For example, an uninfluential model parameter occurs in the reduced equation of a hierarchy variable in the form "+X - X" or "...• X•.../ X•... ". These shorten able parameters indicate the presence of definition extension. See an example in: Zwicker, E., *The RoI Target System...*, op. cit., p. 23 www.Inzpla.de/IN44-2014.pdf. (Text in German, title translated).

the RoI as the top target of a target hierarchy, I have only found contributions on the topic "*quantitative target hierarchies in the area of an operational company planning*", which work with such pseudo-target hierarchies. That was one of the reasons to deal with them. The normative and explicative considerations made on the basis of these pseudo-target hierarchies are misleading and inadequate from the point of view of the Integrated Target Commitment Planning.

This applies in particular to the two-stage optimization process propagated by Pfaff and Peters, in which the asset turnover and return on sales of the RoI target hierarchy are used as sub-targets to be maximized in operational planning.⁶³³ So far, no one has bothered to use such hierarchies.

To what extent such pseudo-target hierarchies are accepted without criticism by the scientific community can also be seen from the fact that a contribution to operational planning based on such hierarchies and emphasizing precisely this hierarchy formation as the innovation of this contribution has received the Erich Gutenberg Prize, which is awarded for theories that "*further develop business administration on a clean methodological basis*". In this contribution, three pseudo-target hierarchies are developed in which the cash flow in each of these hierarchies is the top target. The "planning" carried out on the basis of these hierarchies can no longer be surpassed in absurdity.⁶³⁴

The largest of the pseudo-target hierarchies described in the literature is the ZVEI ratio system. This system of ratios, which works in an extreme way with extended definitions, is treated in many German-language book about "quantitative business administration". Its authors emphasize that it is "*particularly suitable for the purposes of planning and control*". However, the opposite is the case.⁶³⁵

The problem of such pseudo-target hierarchies can be characterized by the fact that it is always possible to construct a (pseudo-) target hierarchy (or a hierarchical definition equation system) that contains the targets you want to have. They must only be formulated in the form of quotients.

The development of such definition extensions in hierarchical definition equation systems initially spread through imitation. But finally, such pseudo-target hierarchies were categorized by one of the renowned German author (s.p.502), Hans Ulrich Küpper, as "*logically derived ratio systems*", which are so desirable because they achieve the "*highest degree of closeness*".⁶³⁶

A brief criticism of these constructs using the example of the RoI system or the ZVEI ratio system would hardly convince many readers who have "anchored" such hierarchies as a fixed part of their knowledge in business administration. Therefore, these hierarchies

⁶³³ Zwicker, E., *The RoI Target System*..., op. cit., p. 14, www.Inzpla.de/IN44-2014.pdf. Text in German, title translated).

⁶³⁴ Zwicker, E., *The RoI Target System*..., op. cit., p. 24f., www.Inzpla.de/IN44-2014.pdf.

⁶³⁵ See on the quotation and the discussion of the ZVEI ratio system: Zwicker, E., Zwicker, E., *The RoI Target System*..., op. cit., p. 31f., www.Inzpla.de/IN44-2014.pdf

⁶³⁶ See Küpper's two quotations: Zwicker, E., *The RoI Target system*..., op. cit., p. 34,

and the related criticism are discussed in detail in the mentioned text.

To repeat: I do not know of any top target hierarchy described in the literature that is not a pseudo-target hierarchy.⁶³⁷ In my opinion, such pseudo-target hierarchies or even more general hierarchical pseudo-ratio systems should only be described as a misguided path in the history of business administration. Whether this will happen, however, is questionable, since the development of such (pseudo) target hierarchies is simply too tempting, and if Küpper, as the most frequently quoted expert representative of internal accounting and business administration, points out that such hierarchies achieve the "*highest degree of closeness*", who should then have anything against their development? My rigorous criticism of such target hierarchies with the "*highest degree of pseudo closeness*" will not remain unchallenged. I am curious to see what counterarguments potential opponents will put forward. These will, if their authors agree, be available in the mentioned paper "*The RoI Target System...*" as pdf texts.

⁶³⁷ If someone knows a hierarchy in which the target T1 of an operational planning at the top is connected with other potential targets T2, T3.... of an operational planning by definition and hypothesis equations, and the reduced equation of T1 does not contain any uninfluential model parameter, then please send me a pdf file. This will be available here.

27. Microeconomic company planning and the Integrated Target Commitment Planning

The Integrated Target Commitment Planning is a normative planning theory that makes people responsible for the fulfillment of certain parameters of a planning model, i.e., the basic targets. Neoclassical microeconomics is a discipline of economics that deals with the behavior of individual companies. The question, therefore, arises to the relationships between the neoclassical microeconomics describing the behavior of individual companies and the Integrated Target Commitment Planning.

In the following, price theory will be discussed in more detail, while production theory will be touched upon only briefly. In addition to price and production theory, consumer theory is one of the three fundamental areas of neoclassical microeconomics. It is not relevant for the following considerations.

Microeconomic price theory describes pricing in markets with different forms of competition. Here only the case of a monopolistic market is to be considered. In this case, microeconomic price theory assumes that a company knows the cost and price-sales functions of its sold articles and chooses a sales price for these articles that maximizes the profit as the difference between sales minus costs.

Microeconomic price theory is an empirical theory. For it claims that a company in this market knows the cost and price-sales function of an article and on this basis, chooses the sales prices of this articles in such a way that the profit is maximized. Microeconomic price theory is, therefore, not a (normative) planning procedure but describes the (assumed) optimizing behavior of companies.

The Integrated Target Commitment Planning prescribes as a normative theory (or procedure) against it, how a company should behave, and delivers no statements about how it will actually behave or has behaved. However, if microeconomic price theory is not a normative theory (or normative procedure), why is it necessary to compare it with the Integrated Target Commitment Planning. The descriptive microeconomic price theory, which claims that companies behave in a way that they maximize their profit, can also be "normatively turned ". In such a case, it is assumed that the companies know their cost and price-sales-quantity function and, under this condition, follows the requirement to choose their sales prices in such a way that the profit is maximized. This is the case of an optimizing planning with their sales price as a decision variable.

This makes it possible to compare the Integrated Target Commitment Planning with another planning procedure, namely with such a "normatively turned" microeconomic price theory. This is assumed in the following.

In order to be able to compare such a „normatively turned“ price theory with the Integrated Target Commitment Planning, an INZPLA-model must exist, which has a cost function but also a price-sales-quantity function of the articles to be sold. It is possible to formulate such a three equation cost-performance model of one article as an INZPLA-model. It contains the cost function and a price-sales-quantity function of this article as hypothesis equation and the definition equation of the profit as the difference between

the sales and costs.⁶³⁸ The price-sales-quantity function of an article is used in the system of the Integrated Target Commitment Planning if sales planning is carried out in the form of a so-called multiple price-sales-quantity commitment. The price-sales-quantity target commitment function describes the (multiple) combinations of price and sales quantity to which the sales area manager has committed himself to realize them. This price-dependent sales quantity commitment suggests that the term "multiple price-sales-quantity commitment" should be used in this case.

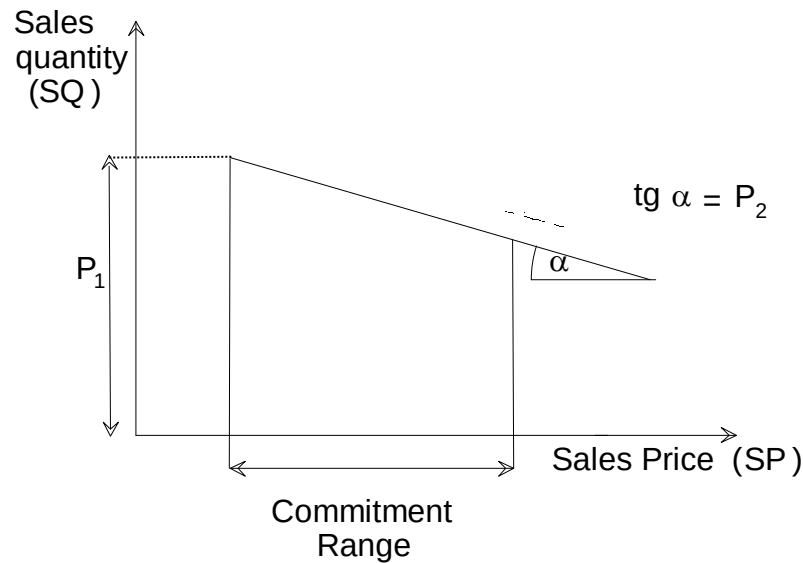


Fig. 67: Example of a price-sales-quantity target commitment function

If such a multiple price-sales-quantity commitment is made, the sales area commits itself, within an interval (the commitment range), not to fall below a certain amount of the sales quantity (SQ) for each value of the sales price (SP) specified there.⁶³⁹

If these alternative price-sales-quantity commitments can be described by a linear function (whatever is assumed), then the linear price-sales-quantity target commitment function shown in Fig. 67 is obtained. It has the form

$$SQ = P_1 - P_2 \cdot SP \quad (136)$$

SQ - sales quantity, SP- sales price, P_1 , P_2 - parameters of the price-sales-quantity target commitment function. The definition of the sales value (SV) is

⁶³⁸ In microeconomic price theory, the function $SP = F(SQ)$ is referred to as the *price-sales function*. In the system of the Integrated Target Commitment Planning, however, the inverse function for this price-sales function, that is, $SQ = F(SP)$, is used and is referred to as the *price-sales-quantity function*. When using this function, as Fig. 67 shows, the price corresponds to the abscissa and the sales quantity to the ordinate of the coordinate system used.

⁶³⁹ It is the counterpart of the so-called *singular price-sales-quantity commitment*. This procedure of sales planning, that is, sales planning in the form of a singular price-sales-quantity commitment, will be discussed later (see page 381). For a description of both methods see: Zwicker, E., *Integrated Target Commitment Planning and Sales Planning*, Berlin 2002, p. 2 and 27, www.Inzpla.de/IN21-2002g.pdf. (Text in German, title translated).

$$SV = SP \cdot SQ \quad (137)$$

The hypothesis parameters P_1 and P_2 in the hypothesis equation of the sales quantity (136) are basic targets of the sales area.

Microeconomic price theory works with factual or conjectural price-demand functions.⁶⁴⁰ The conjectural price-demand functions are subjectively assumed by companies.⁶⁴¹ They serve a company for the price decision described by the microeconomic price theory. The factual or conjectural price demand functions of the microeconomic price theory in the case of a monopolistic provider are contrasted in the system of the Integrated Target Commitment Planning with the described price-sales-quantity function in the form of a target commitment function.

The question arises as to how the price-demand functions of the microeconomic price theory differ from the price-sales-quantity target commitment functions of the Integrated Target Commitment Planning.

In the literature on microeconomic price theory, a function of the form $SP=F(SQ)$ is called a price-demand function, while its inverse $SQ=F(SP)$ is referred to with the same name or also as inverse price-demand function. Only the second variant $SQ=F(SP)$ can be interpreted as a hypothesis equation with the price as the explanatory variable. This form $SQ=F(SP)$ is therefore assumed when such a comparison is made.

The type of a conjectural price-demand function is most similar to the definition of a price-sales-quantity target commitment function. This function (or hypothesis) of the Integrated Target Commitment Planning bases as is in the case of a conjectural price-demand function on a subjective assumption of "the company". However, in contrast to the conjectural price-sales function, "the company", represented by the central planning or another representative of the company, cannot only subjectively assume it. Instead, the head of the sales area responsible for the sale of the article must commit himself in his negotiations with the central planning to "comply" with this function. This makes it a target commitment function.

If the parameters of the price-demand function P_1 and P_2 are determined by the corporate management and are regarded by it as uncontrollable, i.e., as uncontrollable basic parameters, then (136) is an uncontrollable hypothesis equation.⁶⁴²

Cost functions. The cost functions with which microeconomic price theory works can also be non-linear functions. In the system of the Integrated Target Commitment Planning, a linear cost function of the following form is used:

$$CO = FC + VUC \cdot SQ \quad (138)$$

⁶⁴⁰ Erich Schneider uses both the term "factual price-demand function" and "conjectural price-demand function". Schneider E., *Einführung in die Wirtschaftstheorie*, Part 2, 13th Ed., Tübingen 1972, p. 344. The term "actual price-sales function" is not defined by him any further. It is also used undefined in this text.

⁶⁴¹ It is also often referred to only as "demand function".

⁶⁴² For this type of a structural equation, see page 31.

CO - costs, FC - fixed costs, VUC - variable unit costs, SQ - sales quantity.

In the following it is assumed that a single-product company exists.⁶⁴³ The „normatively turned“ microeconomic descriptive price theory now claims that a company selects the sales price (SP) of the article in such a way that the profit is maximized. Such profit maximization is carried out in the same way in the system of an Integrated Target Commitment Planning if a price-sales-quantity target commitment function exists or if the price-sales-quantity function in question is also regarded as an uncontrollable hypothesis equation. The sales price (SP) of the article, which functions as an explaining variable of the price-sales-quantity target commitment function or of a price-sales-quantity hypothesis that cannot be controlled, has always the status of a decision variable.

If we equate the profit of the microeconomic price theory with the operating result (OR), then we get

$$OR = SV - CO \quad (139)$$

and with (136) to (139) follows

$$OR = SP \cdot (P_1 - P_2 \cdot SP) - FC - VUC \cdot (P_1 - P_2 \cdot SP) \quad (140)$$

The sales price (SP) is now to be chosen in such a way that the operating result (OR) in (140) is maximized. The price maximizing the operating result (OR) would normally be determined in the INZPLA-System (as in the case of all other optimization cases with decision variables occurring there) with the help of a computer-aided optimization procedure.

In this case, an optimal decision rule can be found using the infinitesimal calculus to determine the sales price of the finished product sold which maximize the operating result, depending on the numerical values of the VUC, P_1 and P_2 . This decision rule has the form:⁶⁴⁴

$$SP^{OR-max} = (P_1 + VUC \cdot P_2) / (2 \cdot P_2) \quad (141)$$

It can be entered directly into the model as a structural equation and, depending on the values of P_1 , P_2 and VUC described in each model, ensures that the operating result is always maximized by selecting the (Cournot) sales price in accordance with (141).⁶⁴⁵

The status of the price-sales-quantity function used as a form of a target commitment function compared with the conjectural price-demand function of the microeconomic price theory has already been highlighted. However, what about the status of the linear cost function (138) when compared with the cost functions used by the microeconomic

⁶⁴³ The extension of the consideration to a multi-product company does not cause any difficulties.

⁶⁴⁴ This decision rule for determining the maximum profit sales price has already been discussed on page 301. In the terminology of the microeconomic price theory, the price that maximizes profit (the operating result) is called as already mentioned (s.p. 301) the "Cournot price". See Gutenberg, E., *Grundlagen der Betriebswirtschaftslehre*, 2nd Ed. 1955, p. 170.

⁶⁴⁵ For further information on their determination, see: Zwicker, E., *Integrated Target Commitment Planning and Sales Planning*, op. cit., p. 34, www.lnzpla.de/IN21-2002g.pdf. (Text in German, title translated).

price theory to determine the Cournotian sales price? The microeconomic cost function of a product is "delivered" by the microeconomic production theory. It results from a production function that is valued with prices. It is assumed that for each possible production quantity of an item (as an abscissa value of the cost function) there is a cost-minimal combination of the input factors. The derivation of various cost functions depending on the production conditions on the assumption of such an optimal combination of production factors is not to be further pursued here.⁶⁴⁶

In any case, all factor-optimal cost functions thus obtained differ from the cost functions of an Integrated Target Commitment Planning in terms of their hypothesis creation. This specific status of a cost function in the Integrated Target Commitment Planning is discussed in the following.

In order to be able to correctly assess the status of the cost function (138) of an Integrated Target Commitment Planning, it must be pointed out that the fixed costs (FC) and variable unit costs (VUC) of the sold finished product that appear in it as explanatory variables are almost always not basic parameters, but endogenous variables of the cost-performance model of an Integrated Target Commitment Planning. The structural equations (136) to (139) and (141) described so far, therefore, almost never form a complete cost-performance model for the Integrated Target Commitment Planning.

In order to obtain the complete INZPLA-model, further structural equations of the model would have to be added to the structural equations (136) to (139) and (141), which directly or indirectly influence the fixed costs (FC) and the variable unit costs (VUC) of the sold finished product in (138).

As already described, these can be in the cost-performance models used in practice thousands of equations, which, in turn, contain a large number of basic parameters, which are described in a large number of model tableaux.⁶⁴⁷ The variable unit costs (VUC) and the fixed costs (FC) of a sold finished product are in large equation models often influenced by thousands of basic parameters. The influence of these basic parameters on the variable unit costs (VUC) and the fixed costs (FC) can be conceptually characterized by an equation, which describes both cost quantities as a function of these basic parameters. This equation are the reduced equations of the fixed costs and the variable unit costs of the sold finished product.⁶⁴⁸ These reduced equations show that in practice-relevant standard cost-performance models of the Integrated Target Commitment Planning, that the reduced equations of the variable unit costs and the fixed costs of a sold finished product in a cost function of the form (138) usually consist of a very large number of chain elements (cost chains) to be summed. In the case of the reduced equation of the variable unit costs

⁶⁴⁶ See the chapter: *Die Produktionsfunktion als Grundlage der Kostenplanung*. In Schneider E., Einführung in die Wirtschaftstheorie, op. cit., p. 171f. (*The Production Function as the Basis for Cost Planning*).

⁶⁴⁷ See the synopsis of the number of equations, basic parameters and model tableaux in some selected models Fig. 40 on page 150.

⁶⁴⁸ For the definition of a reduced equation, see page 37.

(VUC) of the finished product in question, these have the form⁶⁴⁹

$$PP \cdot M_1 \cdot \dots \cdot M_n \quad (142)$$

PP is the procurement price and M_1 to M_n are quantity multipliers of the sales quantities such as consumption rates, scrap rates and production coefficients.⁶⁵⁰ In the case of the fixed costs (FC), the chain elements have the form.⁶⁵¹

$$PP \cdot M_1 \cdot \dots \cdot M_n \cdot FSQ \quad (143)$$

FSQ - fixed consumption quantity.

The quantity multipliers M_1 to M_n can be basic targets (e.g., a consumption rate of 15 kWh/machine hour) or uncontrollable basic parameters (e.g., 2 machine-hours/generated unit). The reduced equations of the fixed costs (FC) and the variable unit costs of a sold finished product (VUC) in (138) can contain thousands of such chain elements⁶⁵².

However, what is the status of the cost function (138) of an Integrated Target Commitment Planning in the light of this "chain reduction"? If all basic parameters in the chains were basic targets, then the cost function (138) would be a pure secondary target commitment function.⁶⁵³ However, if the chains also contain uncontrollable basic parameters one can no longer speak of a pure target commitment function. As described above, someone is always responsible for forecasting the values of the uncontrollable basic parameters, and since there is always a person responsible for meeting the basic targets, one can speak of a responsibility-related cost function with regard to this "general responsibility for parameters". It is contrasted by the cost function of microeconomic price theory, which is based on the assumption of a minimum cost factor input and does not fall into the category of such a responsibility-related cost function.

The maximization of the operating result by the profit maximizing decision rule (141) described so far on the basis of an Integrated Target Commitment Planning corresponds, therefore, to the procedure of a normatively applied microeconomic price theory for the determination of the Cournotian sales price.

However, how can the procedure of the Integrated Target Commitment Planning be presented on the basis of such a "Cournotian Profit Maximization"? So far, it has only been

⁶⁴⁹ These chains have already been described on page 96. For a more detailed analysis, see: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 75f., www.lnz-pla.de/IN34-2007.pdf. (Text in German, title translated).

⁶⁵⁰ The model of ThyssenKrupp Steel contains 47,527 such quantity multipliers and 137,431 fixed consumption quantities, which can occur in several chains at the same time. See Fig. 7 on page 43

⁶⁵¹ A reduced equation of the variable unit costs (VUC) can contain further elements in addition to the elements described by (142), which only consist of a proportional cost rate. A reduced equation of the fixed costs (FC) can contain further links in addition to the links described by (143), which only consist of a cost value. The ThyssenKrupp Steel model has 3,864 proportional cost rates and 36,043 cost values.

⁶⁵² The reduced equations of fixed costs (FC) and variable unit costs (VUC) of the 37 end products of the Kilger model, for example, have a total of 52,654 chains with up to eight links, as already mentioned. See page 99.

⁶⁵³ The primary target commitment functions are those hypothesis equations to whose compliance the divisions are directly committed. Their parameters appear in the chains as basic targets.

shown how profit maximization can be achieved using an Integrated Target Commitment Planning model (analogous to the „normatively turned“ price theory of microeconomics). Therefore, so far only the case of an optimizing planning was discussed, which can occur during the execution of an Integrated Target Commitment Planning (or together with the realization of a target commitment planning).

In order to show the Integrated Target Commitment Planning in its relationship to the maximization of the operating result described so far, it is necessary to consider the basic targets of the model, which, as described, influence the VUC and FC in (138). They occur in the reduced equations of VUC and FC added to equations (136) to (139) and (141). This gives you a complete INZPLA-model. This model is only condensed compared to the original plan cost-performance model with its large number of equations by the introduction of the reduced equations of VUC and FC. Let us now assume that the reduced equation of the variable unit costs (VUC) contains only one chain element as an explanation component, i.e.,

$$\text{VUC} = \text{BT}_1 \cdot \text{BT}_2 \cdot \dots \cdot \text{BT}_n \cdot \text{PP} \quad (144)$$

Furthermore, it is assumed that the procurement price (PP) is an uncontrollable basic parameter that is to be forecasted by the purchasing department (with a forecasting responsibility). The basic parameters in the chain, i.e., BT_1 to BT_n , on the other hand, are basic targets for the realization of which certain areas (with a fulfillment responsibility) are responsible.

During the planning procedure, various planning alternatives are determined as described. These are the one-time bottom-up planning, the planning alternatives that are used during a top-down planning to determine the predefined (top-down) threshold value of the operating result, and finally the planning alternatives of the confrontation step.

These planning alternatives are characterized by the fact that the cost-performance model is calculated with different values of its basic targets up to the operating result. In the present case, these basic targets influence the operating result via three endogenous variables, i.e., sales quantity (SQ), variable unit costs (VUC) and fixed costs (FC). However, if the basic targets (BT_1 to BT_n), which influence the variable unit costs (VUC), and the basic targets of the price-sales-quantity target commitment function (P_1 and P_2) are changed, then the Cournotian sales price (SP), which maximizes the operating result, also changes because of (141). This makes it possible to reconcile the maximization of the operating result described above by determining a Cournotian sales price with the planning steps of the Integrated Target Commitment Planning.

As a result, a mixed optimization basic Target Commitment Planning is obtained.⁶⁵⁴ It was claimed that in the practice of an operational company planning with cost-performance models, optimization is almost never carried out, but rudimentary approaches of a target commitment planning can always be observed (s.p.26). But how does this

⁶⁵⁴ For this case, see 1.1.2.2 in Fig. 38 on page 144 and also the crossing point of line 2b and column 12 in Fig. 39 on page 145.

fit in with the Cournotian planning of the sales price described here, which always represents an optimizing planning?

The procedure described for sales planning with a price-sales-quantity target commitment function was initially referred to (s.p.375) as a multiple price-sales-quantity commitment. In practice, sales planning is carried out almost exclusively in the form of a singular price-sales-quantity commitment. It alone is used in practice (s.p.294) to plan the prices and sales quantities of the articles. In this type of sales planning, the central planning or other decision makers "somehow" determine the sales price of a product as an input outside the model. In this way, it represents a decision parameter (which cannot be changed during the planning steps) in the model. It is the value which serves as the "business basis" for the sales quantity commitments of the sales manager at the beginning of the bottom-up planning. In the light of the described price-sales-quantity target commitment function, this function, therefore, "shrinks together" to a coordinate point.

All users who plan sales quantities and sales prices in the SAP-CO system can only assume a certain price to be planned and a sales quantity corresponding to it. This means that in the SAP-CO system it is not possible to formulate a price-sales-quantity target commitment function for an annual operational planning. Even if this would be possible, an optimization fails because the SAP-CO system does not have any suitable optimization algorithms that allow such an optimization ⁶⁵⁵ The example of the determination of the profit maximizing (Cournotian) sales price shows the similarities and differences between the „normatively turned“ neoclassical microeconomic price theory in the case of a monopolistic market and the Integrated Target Commitment Planning. At the same time, however, this example also shows how optimizing planning (here with the sales price as the only decision variable) can be consistently combined with the execution of the Integrated Target Commitment Planning.

28. The normative Agency Theory and the Integrated Target Commitment Planning

The normative agency theory has already been mentioned several times in this text. Thus, it was pointed out in the introduction that the Integrated Target Commitment Planning could be reconstructed as a variant of the normative agency theory. However, as the Integrated Target Commitment Planning is also compatible with the (optimizing) decision theory and can be interpreted as a normative turn of Simon's theory of satisficing behavior, a rather ambitious sounding assertion was formulated in the introduction (s.p.4)

With the Integrated Target Commitment Planning and Control, a theory was developed that unifies the classical decision theory, the „normatively turned“ Simonian theory of a satisficing decision maker, the normative agency theory and the concept of "planning through target commitment" to a comprehensive operational normative planning and

⁶⁵⁵ How you can also carry out optimizing planning when using a price-sales-quantity target commitment function, that is, a target commitment planning is discussed on page 293.

control theory of companies. And this theory has proven itself in practice.

The assertion that the Integrated Target Commitment Plan can be interpreted as a (new) variant of the normative agency is now to be justified.

Teemu Malmi points out in his proposals for the development of a normative theory of management accounting that a whole series of the theories propagated for this field and in particular the agency theory are not sufficiently sector-specific (s.p.208). As far as the agency theory is concerned, one can fully agree with his statement. The variant of the normative agency theory, which is regarded in the literature as relevant for the area of controlling, is the hidden-action agency theory. Their hypotheses, however, are so general that they have no relevance in the area of controlling without further concretization. This assessment was already justified (s.p.308) on the occasion of Küpper's comments on the treatment of the normative agency theory. The assessment made there that Küpper's comments on normative agency theory turn out to be completely irrelevant with regard to controlling is nearly identical repeated.

Küpper's *"reflections on the hidden-action agency theory as a normative theory of controlling move on the general level of an agent-principal relationship and work with terms such as "actions of the agent", which are marked with the symbols a_1 to a_n , or the "financial result", which is described by the symbol x . The empirical content of the optimization model developed by Küpper is described by three hypotheses that have not been further substantiated. First, the probability distribution $\phi(x|a_i)$, which shows the probability with which an action of the agent (a_i) leads to a financial result (x). Küpper also uses the compensation function $s = F_s(x)$ of the agent, which prescribes what compensation (s) the agent is to receive as a proportion of the financial result (x) he has generated, and finally the effort function $V = F_v(a_i)$, describing what effort the agent (V) takes on by performing an action (a_i)."*

I will describe later how, after meeting Alfred Wagenhofer in Graz, I arrived in Munich, and immediately went to the bookstore Hugendubel where I read Küpper's text on the hidden-action agency theory for the first time. This gave me the idea (s.p.399) whether Küpper's three hypotheses on the hidden-action agency theory described above could perhaps be substantiated in such a way as to arrive at a cost-performance model with which a (normative) planning corresponding to the (normative) hidden-action agency theory could be carried out. I have tried to develop such a model. However, some assumptions had to be made which can only be described as quite unrealistic. They should be briefly described below.⁶⁵⁶

Developing a hidden-action agency version of a cost-performance model. The corporate management acts, which is obvious, as a *principal*. A somewhat less realistic assumption was that there is only one area in the company to be described in which the area manager acts as an *agent*. This assumption was necessary because the hidden-action

⁶⁵⁶ See for a detailed description of this procedure: Zwicker, E., *The hidden action Agency Planning, demonstrated with the Example of simple Cost-Performance Models*, (52 pages) Berlin 2011, p. 15f, www.Inzpla.de/IN38-2011a.pdf. (Text in German, title translated).

agency planning is based on only one agent. It was also assumed that the area manager (*agent*) knew the concrete course of his effort function $V = F_v(a_i)$ and the corporate management (*principal*) knew this course too. Neither assumption is very realistic.

The hidden-action agency theory assumes that the corporate management (*principal*) has no way of finding out the (actual) values of the actions (a_i) realized by the area manager (*agent*). They are "hidden" for the corporate management (*principal*). Thus, the value of the quantitatively describable alternative (a), with which the area manager (*agent*) has realized the "*financial result*" (x), is not known to the corporate management (*principal*). This assumption does not apply when working with a cost-performance model in which an alternative is described by the value of a model parameter or the values of several model parameters. The corporate management (*principal*) can find out the actual values of all model parameters of a plan cost-performance model, whose different quantitative characteristics can be considered as alternatives for the area manager (*agent*) without any procurement burden.

Contrary to this statement, I assumed that the corporate management (*principal*) does not know the (actual) value of the action variable realized by the area manager (*agent*). I also assumed that the effort function of the area manager (*agent*) can be described by a square function and his compensation function has a linear course. As it turns out, the central hypothesis of the hidden-action agency theory, i.e., the connection between the financial result (x) and the action variable of the agent (a) can be described by a linear function in the developed cost-performance model. The "*financial result*" is defined as the operating result plus the compensation due to the area manager (*agent*), while the (only) action variable of the area manager (*agent*) is the sales quantity to be realized by him.

With the plan cost-performance model developed in this way, it was possible to carry out a hidden-action agency planning, i.e., a planning that corresponds exactly to the procedure required by this planning procedure in the form of a two-stage optimization.

A numerical example was used to describe the planning procedure. Therefore, it was shown that under the unrealistic assumptions described a hidden-action-agency planning with a cost-performance model could be carried out. But there was only one conclusion to be drawn from this: Since in realistic cases of an operational planning with a cost-performance model both the hidden-action assumption and the assumption that the course of the agent's effort function is known are never available, it is also never possible to use the regulations of a hidden-action agency planning in a real company to carry out an operational planning with a plan cost-performance model. The entire reconstruction and discussion of inapplicability are described in detail in a text entitled: "*The hidden action Agency Planning, demonstrated with the Example of simple Cost-Performance Models*".⁶⁵⁷

In fact, the description of the completely unrealistic assumptions required to carry out a hidden-action agency planning using a cost-performance model should suffice to con-

⁶⁵⁷ Zwicker, E., *The hidden action Agency Planning, demonstrated with the Example of simple Cost-Performance Models*, op. cit., p. 15f, www.Inzpla.de/IN38-2011a.pdf. (Text in German, title translated). This text does not only describes the implementation of a hidden-action agency theory within the framework of a cost-performance model but also discusses certain variants and develops a systematization of these variants.

clude that there is not the slightest chance that this type of planning can be used in a company in the form of an operational planning. However, a highly absurd consequence should be pointed out if the described hidden-action agency planning were to be applied. In the developed example of a hidden-action agency planning, as already mentioned, a square effort function and a linear compensation function of the area manager (*agent*) were assumed. And the third hypothesis contained in the model, i.e., the relationship between the action variable and the financial result, was described by a linear function, as already mentioned.

The procedure of the hidden-action agency planning, which is part of a two-stage maximization of the corporate management's (*principal's*) utility, cannot be described here because it takes up too much space. It is described in detail in the mentioned text.⁶⁵⁸ However, at least the maximization approach of the second-stage should be described. In the case of this second optimization stage, the goal function of the cost-performance model of the hidden-action agency planning to be maximized has the form:

$$\max_{\text{RSAC}} \text{OR} = [\text{RSAC} \cdot (\text{SP} - \text{VUC}) / (2 \cdot \text{PEF})] \cdot (1 - \text{RSAC}) \cdot (\text{SP} - \text{VUC}) - (1 - \text{RSAC}) \cdot (\text{OFC} - \text{FC})$$

With

- E - Effort of the agent
- FC - Fixed compensation of the agent. Parameters of the compensation function
TC = FC + VC
- FR - Financial result FR = OR + TC
- OFC - Other fixed costs = total fixed costs less fixed compensation (FC) of the agent
- OR - Operating income OR = FR - TC
- PEF - Parameter of the effort function $E = \text{PEF} \cdot \text{SQ}^2$ (SQ = Sales quantity)
- RSAC - Relative share of the agents (area managers) total compensation (C) on the
financial result FR.⁶⁵⁹
- SP - Sales price of the single article
- SQ - Sales quantity
- TC - Total compensation of the agent (area manager) TC = FC + VC
- VC - Variable compensation of the agent VC = RSAC • FR
- VUC - Variable unit costs of the finished product

The relative share of the area manager (*agent*) according to the operating result, i.e. $\text{RSAC}^{\text{OR-max}}$ is to be determined by a maximization. It is the share that the corporate management (*principal*) offers the area manager (*agent*) as a share in relation to the financial result (FR) since with $\text{RSAC}^{\text{OR-max}}$ he maximizes his utility, i.e., the operating result, in comparison with all other available shares. The (optimal) decision rule, which states which value is to be selected for $\text{RSAC}^{\text{OR-max}}$ depending on the values of the model pa-

⁶⁵⁸ For a detailed description of this maximization process, see: Zwicker, E., *The hidden action Agency Planning, demonstrated with the Example of simple Cost-Performance Models*, op. cit., p. 15f., www.Inzpla.de/IN38-2011a.pdf. (Text in German, title translated).

⁶⁵⁹ The compensation of the agent is described in the following text by the symbol "C", which deviates from Küpper's up to now (s.p. 309) designation "s". Likewise, the effort of the agent is described in the following text by the symbol "E", which deviates from Küpper's designation "V".

parameters PEF, OFC, SP, and VUC, has the form: ⁶⁶⁰

$$RSAC^{OR-max} = (PEF \cdot OFC) / (SP - VUC)^2 + 0.5. \quad (145)$$

On the basis of this decision rule it can be shown that with a positive unit contribution margin, i.e., $SP - VUC > 0$ and not zero other fixed costs, i.e., $OFC > 0$, the share of the financial result (FR) to be left to the area manager (*agent*) by the corporate management (*principal*) must always be greater than 0.5.

This is independent of the choice of the parameter value PEF in the area manager's (*agent's*) effort function. The area manager (*agent*) therefore always receives a share of more than fifty percent of the financial result (FR), i.e., the operating result (OR), which is increased by the area manager's (*agent's*) total compensation (C).

The operating result (OR) can be defined with

$$OR = FR \cdot (1 - RSAC^{OR-max}).$$

With

$$FR = OR + TC$$

follows

$$OR = TC \cdot (1 - RSAC^{OR-max}) / RSAC^{OR-max}$$

and with $RSAC^{OR-max} > 0.5$ it results

$$OR > TC$$

This means that the agents total compensation (TC) is higher than the operating result (OR) that the principal will receive. This is no very plausible conclusion. ⁶⁶¹

Development of the hidden effort agency theory as a variant of the Integrated Target Commitment Planning.

However, the development of the cost-performance model of the hidden-action agency planning led for me to an important insight regarding the effort function $E = F(a_i)$ used in this theory. I concluded that the effort function of an agent coincides with the burden function of an area manager in the system of the Integrated Target Commitment Planning. ⁶⁶² Thus, a bridge was created between the normative agency theory and the Integrated Target Commitment Planning. ⁶⁶³ And this bridge gave me the idea that the Integrated Target Commitment Planning can be systematized as a variant of the normative agency planning.

This transition from the hidden-action-agency planning to the various variants of the Integrated Target Commitment Planning and even to a pure optimizing planning of the de-

⁶⁶⁰ For more information on the determination, see: Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory*, op. cit., p. 24 www.Inzpla.de/IN46-2015.pdf. (Text in German, title translated). For a brief summary, see, www.Inzpla.de/AT-Rechn-2.pdf.

⁶⁶¹ For this absurd implication see also page 419.

⁶⁶² On the burden function of an Integrated Target Commitment Planning see page 37.

⁶⁶³ See my description of how the link between Integrated Target Commitment Planning and the normative agency theory came about p. 397. The connection of the Integrated Target Commitment Planning with the work burden function is described in particular on page 402.

cision theory was demonstrated by me using the classification scheme in Fig. 68. It is described in detail in the text: “*The Integrated Target Commitment Planning as a procedure of the normative agency theory*”.⁶⁶⁴

Classification criteria of plan cost-performance models		A	B	C	D	E	F	G
K1	Agent action variable (basic target) is							665
	a) hidden	X						
	b) non-hidden		X	X	X	X	X	
K2	Number of agent action variables (basic targets)							
	a) one	X	X	X	X			
	b) several					X	X	
	c) none							X
K3	Utility of the principal (corporate management target), i.e., the operating result is planned in form of a							
	a) pure optimizing planning	X	X			X		X
	b) pure satisficing planning			X	X			
	c) combined optimizing- satisficing planning						X	
K4	Agent effort (burden of the area manager) is described by a hypothesis equation?							
	a) yes	X	X					
	b) no			X	X	X	X	X
K5	The compensation of the agent (the area manager) depends on his action variables (basic targets)?							
	a) yes	X	X					
	b) no			X	X	X	X	X
K6	The planning model contains the utility of the agent (of the area manager) as an endogenous variable?							
	a) yes	X	X					
	b) no			X	X	X	X	X
K7	Hypotheses of the planning model are							
	a) expected value hypotheses	X	X					
	b) pseudo deterministic hypotheses			X	X	X	X	X
K8	Number of agents involved (area managers)?							
	a) one agent	X	X	X	X			
	b) several agents					X	X	
	c) none							X
K9	Planning model contains at least one decision variable?							
	a) yes	X					X	X
	b) no		X	X	X	X		

Fig. 68: Differentiation of cost-performance models and the associated procedures of an agency planning type A to F according to nine classification criteria.

⁶⁶⁴ Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory*, op. cit., www.Inzpla.de/IN46-2015.pdf. (Text in German, title translated).

⁶⁶⁵ Criterion K1 cannot be applied to type G, since G is not agency planning and there are, therefore, (see K2-c) no agent action variables.

A: Hidden-action-agency-planning

B: Non-hidden-action-agency-planning (first-best-solution)

C: Pure Integrated Target Commitment Planning with one area manager and one basic Target

D: Pure Integrated Target Commitment Planning with one area manager and one basic target in the form of a basic target-dependent top-down optimization.

E: Pure Integrated Target Commitment Planning with several area managers and several basic targets of the area managers (= multi-agent hidden-effort agency planning)

F: Mixed optimization Integrated Target Commitment Planning with several area managers and several basic targets of the area managers.

G: Pure optimizing planning

The classification K1 to K9 of the different variants is based on both the terminology of the normative agency theory and the Integrated Target Commitment Planning. The plan cost-performance model I have developed for a hidden-action agency planning corresponds to the variant shown in column A.

The action variable of the area manager (*agent*) is hidden, i.e., it applies the characteristic attribute K1-a. The planning consists in maximizing the *utility of the principal* (the operating result). The characteristic attribute K3-a, therefore, applies. Both the effort function and the compensation function of the area manager (*agent*) are included as hypothesis equations in the planning model.

This also applies to the agent's utility (AU), which is defined as

$$AU = C - E$$

That is compensation (C) less effort (E). Therefore, the characteristic attributes K4-a, K5-a, and K6-a apply.

The plan cost-performance model used for a hidden-action agency planning was then changed in several steps. This step-by-step change leads to various types of plan cost-performance models and the planning procedures associated with them. The letters C to F in Fig. 68 identify these plan cost-performance models, which represent certain variants of an INZPLA-model.⁶⁶⁶ Case G, on the other hand, describes a pure optimizing planning on the basis of the deterministic decision theory. Based on this transition one can recognize that the Integrated Target Commitment Planning can be interpreted as a variant of the normative agency theory. This variant is called multi-agent hidden-effort agency planning. The transition from variant A to variant F, which is described in detail in the already mentioned text "*The Integrated Target Commitment Planning as a procedure of the normative agency theory*" and demonstrated using a numerical example, is only briefly explained here.

The plan cost-performance model originally developed to carry out a hidden-action agency planning (variant A in Fig. 68) is changed with regard to certain attributes of the characteristics K1 to K8, as mentioned above. The following changes were made in variant C compared to the original model of the hidden-action agency theory, i.e., variant A.⁶⁶⁷

⁶⁶⁶ Variant B is a modification of the hidden-action agency theory, which makes itself "non-hidden."

⁶⁶⁷ Variant B is not discussed here because of its practical irrelevance. However, it is not uninteresting from a theoretical point of view because it describes the light of the agency theory the so-called "first-

1. The *effort* of the agent (the burden of the area manager) is not described in the model of variant C, i.e., the characteristic attribute K4-b applies.
2. The compensation of the *agent* (area manager) is already determined before the start of planning. Therefore, there is no compensation function in the model of the new variant that depends on the *agent action variable* (the basic targets) of the *agent* (area manager), that is, the characteristic attribute K6-b applies.
3. The actual values of the *agent action variables* (of the basic targets) of the *agent* (the area manager) are accessible to the *principal* (corporate management), i.e., they are none hidden. Therefore, the characteristic attribute K1-b applies.

The resulting variant C is a pure Integrated Target Commitment Planning with one agent (area manager) and one *agent action variable* (one basic target), i.e., the characteristic values K2-a and K8-a still apply.

You can use this model to carry out an Integrated Target Commitment Planning. There is also the *principal* (corporate management), whose utility is the operating result. The agent remains the area manager as before. He also suffers by an *effort* (a burden) that results from the realization of its (only) *agent action variable* (its basic target).

However, the *effort* (burden) is no longer described in the model, that is, the attribute K4-b applies. The assessment of the *effort* (burden) in dependence on the values of the *agent action variable* (basic targets), i.e., the *effort function* (the burden function) exists only in the head of the *agent* (area manager) if he defines the bottom-up values of his *agent action variable* (the basic targets) at the beginning of the bottom-up planning. And during the confrontation with the *principal* (corporate management), the *effort* (burden) caused by the values of different action commitments (*basic target commitments*) plays an important role for the *agent* (area manager).

The *principal* (corporate management) does not know the *effort function of the agent* (burden function of the area manager). However, since each *agent action variable* (basic target) in the Integrated Target Commitment Planning model has a *direction of effort* (direction of burden), the *principal* (corporate management) at least knows whether a change of an *agent action variable* (of a basic target) in question leads to an increase or decrease in the *agent's effort* (the area manager's burden).⁶⁶⁸

If one starts from the terminology of the normative agency theory, as practiced here, then the synonymous terminology of the Integrated Target Commitment Planning is used from variant C, because this is a procedure of an agency planning that is identical to the Integrated Target Commitment Planning. This shows the following conceptual agreements:

principal	→ corporate management
agent	→ area manager

best solution" of the hidden-action case A in. It is, therefore, dealt with in detail in: Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory*, op. cit., p.44f. www.Inzpla.de/IN46-2015.pdf. (Text in German, title translated).

⁶⁶⁸ To the direction of burden, see page 37.

action variable of the agent	$a_1, \dots, a_n$	→ basic target
effort of the agent	E	→ burden of the area manager
effort function of the agent	$E = F(a_1, \dots, a_n)$	→ burden function of the area manager
direction of effort	dE/da_i	→ direction of burden
utility of the principal	UP	→ top target of the corporate management

In the following, the terminology of the Integrated Target Commitment Planning is primarily used when discussing variants C, D and F. The synonymous terms of the normative agency theory are from now put in brackets.

Variant C of an Integrated Target Commitment Planning with one area, i.e., the attribute K8-a, and one basic target (*agent action variable*), i.e., the characteristic attribute K2-a, can easily be extended any number of basic targets, i.e., the attribute K2-b, because the burden function of the area manager (*effort function of the agents*) depends, and this is the normal case, on several basic targets (*agent action variables*).⁶⁶⁹ The transition to the case where several area managers (*agents*) negotiate their basic targets (*agent action variables*) independently of one another with the corporate management (*the principal*), i.e., the realization of the characteristic value K8-b, can be carried out without further ado. The models of an Integrated Target Commitment Planning are characterized by the fact that the burden function of the area managers (*effort function of the agents*) do not depend on a change of the basic targets (*action variable of the agent*) of the other area managers (*agents*) (s.p.39). This leads to the general case of a pure Integrated Target Commitment Planning with several area managers (*agents*) and several basic targets (*action variables of the agent*) marked with E in Fig. 68.⁶⁷⁰

Variant F corresponds to a mixed optimization basic Target Commitment Planning. It distinguishes itself from the pure Integrated Target Commitment Planning (variant E) by the fact that its plan cost-performance model also contains decision variables in addition to the basic targets. This is indicated by attribute K9-a. Decision variables are characterized as described by the fact that they can be changed like a manipulated variable in a control loop without changing the burden (*effort*) of an area manager (*agent*).⁶⁷¹ A plan cost-performance model containing basic targets (*action variables of the agent*) and decision variables is used for a combined optimizing-satisficing planning, which is characterized by attribute K3-c in Fig. 68.⁶⁷²

Pure optimization models

If a plan cost-performance model only contains decision variables and no basic targets (*agency action variables*), then variant G occurs. In contrast to variant F, it has the

⁶⁶⁹ See page 37.

⁶⁷⁰ Variant D is also a procedure of the Integrated Target Commitment Planning, which is not dealt with here because of its practical irrelevance. For an explanation of this irrelevance see: Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory*,... op. cit. p.43f.

⁶⁷¹ For this marking, see page 59 and 28.

⁶⁷² See the case described in column 2.2.1 and line 1b in Fig. 39 on page 145 for its systematization as a procedure of the Integrated Target Commitment Planning.

changed attribute values K2-c and K3-a. In such a case, a pure optimizing planning is carried out. It is no longer part of the Integrated Target Commitment Planning and is to be carried out solely in accordance with the regulations of the decision theory.

However, even in this case, the characteristics of the normative agency theory can still be recognized.

There is the corporate management (*principal*) whose utility variable in form of the top target (*utility of the principal*) is to be maximized. And the person who has to realize the decision variables of this maximization without changing his burden (*effort*) is an area manager (*agent*). The maximization is initiated by the corporate management (*principal*). In the light of the Integrated Target Commitment Planning, the area manager (*agent*) has the so-called realization responsibility.⁶⁷³ Several area managers (*agents*) can also be responsible for implementing the values of the decision variables resulting from the optimization.

Cognitive status of hypotheses

The seventh classification (K7) has not yet been commented. It differentiates according to whether the planning model used works with expected value hypotheses or pseudo-deterministic hypotheses. The hidden-action agency planning (variant A) only works with expected value hypotheses. If a hidden-action agency planning model is formulated in the form of an equation model, then it is a stochastic equation model. In this model, the stochastic parameters occurring in these equations are then replaced by their expected values, which leads to a quasi-deterministic model in the form of a so-called expected value equation model (s.p.400).

However, one can also assume that the planning model to be used is not based on a stochastic model, but that the hypotheses of this planning model are so-called pseudo-deterministic hypotheses. All models of the Integrated Target Commitment Planning work with such hypotheses.

The cognitive status of such pseudo-deterministic hypotheses in the system of an Integrated Target Commitment Planning is extremely important for the foundation of this planning procedure. It will, therefore, be discussed in detail elsewhere because it also clarifies the logical planning status of this normative planning and control theory (s.p.404).

Effort, burden, stress and "pressure"

The "*effort of the agent*" or the "*burden on the area manager*" which are identical with each other may or may not be included in the plan cost-performance model according to criterion K4. The burden (*effort*) of the area managers (*agents*) is not described in the system of the Integrated Target Commitment Planning by a burden function (*effort function*) in the model. However, one feature can be identified, as already mentioned, because it applies to all basic targets (*agent action variables*); the more a basic target (*agent ac-*

⁶⁷³ See on realization responsibility as one of the three types of responsibility of an Integrated Target Commitment Planning, p. 78.

tion variable) of an area is changed in its direction of an increased burden (*increased effort*), the more the total burden of the area manager (*effort of the agent*) increases (s.p.37). During the negotiations, between the area manager (*agent*) and the corporate management (*principal*) the burden (*effort*) that arises for the area manager (*agent*) is the criterion for whether he should enter into a target commitment or not. This burden (*effort*) is known to the area manager (*agent*) as a (subjective) assessment, but the corporate management (*principal*) does not know this assessment, it is not accessible to it, and therefore it is "hidden" for the corporate management (*principal*). For this reason, the name hidden-effort agency planning is used. In this case, which is typical for the agency planning, there is also an asymmetric information situation between the area manager (*agent*) and the corporate management (*principal*).

As will be explained later, the Integrated Target Commitment Planning can be interpreted as a „normatively turned“ theory of Herbert Simon's theory of satisficing behavior (s.p.471f.). As will be further described there, Simon's theory was combined by Bonini with Cyert and March's descriptive "*behavioral theory of the firm*". In Cyert and March's theory, the behavior of the participants of an organization under "*pressure*" is described. As will be mentioned later, Charles Bonini describes this "*pressure*", which is exerted during the planning procedure on the members of a company to increase productivity, by using of a comprehensive simulation model (s.p.474). Bonini's model, in which the "*pressure*" exerted on certain persons in a company is quantified as a "*pressure index*", has led me to the conclusion that "*the burden on an area manager*" is nothing other than the "*pressure*" exerted on the members of an organization to increase their productivity according to the "*behavioral theory of the firm*". However, since I concluded, as explained above, that "*the burden of an area manager*" is identical to the "*effort of an agent*", this also bridges the gap between the normative agency theory and the "*behavioral theory of the firm*".

Theoretical implications

With the described transition from the hidden-action agency planning to the Integrated Target Commitment Planning, a new variant, the multi-agent hidden-effort agency planning, has been added to the system building of the normative agency theory. However, that is not all. There is also an assertion of relevance, which should not be ignored. Because I claim that, only this variant of the normative agency planning (the *normative agency theory*) is of practical importance in the field of an operational company planning. However, this classification of the Integrated Target Commitment Planning as an application-relevant and area-specific variant of the normative agency theory is not sufficient.

In addition, I also maintain that with the presentation of the Integrated Target Commitment Planning as a variant of the normative agency planning (*normative agency theory*), the system of the normative agency theory (in the case of an operational company planning) can be consistently combined with both the classical decision theory and Herbert Simon's „normatively turned“ theory of a satisficing decision maker. This means that the hidden-effort agency planning (see criterion K3-b) can also be described as satisficing planning.

With this linkage the relevant normative approaches discussed today are unified into a normative theory of an operational company planning, and this is the Integrated Target Commitment Planning or the hidden-effort agency planning.

I am aware that the assertion that the Integrated Target Commitment Planning (in the field of an operational company planning) represents a missing link between the normative agency theory, the „normatively turned“ version of Simon's theory of limited rational behavior and the classical decision theory, could be perceived as rather presumptuous. Therefore, I have tried to develop my arguments in a detailed form and to demonstrate the new procedure of an agency planning in comparison to the established so-called hidden-action agency planning by means of a detailed numerical example.⁶⁷⁴ This should at least provide a sound basis for every opponent to refute this claim.

Theoretical and practical relevance of the agency planning

The normative agency theory is a normative theory that attempts to "optimally" shape the relationship between a *principal* as the client of a service and the *agent* as the person who is to perform this service in the sense of the *principal*. It is assumed that there is an "asymmetric information situation" between the *principal* and the *agent*, which must be taken into account in the optimization calculation. The agency planning (or the normative agency theory) is often attacked with the argument that it does not have the slightest practical relevance.

Meinhövel, for example, notes that "*the normative branch*" of the agency theory is characterized by an "*immanent lack of a practical application*". He further points out: "*If one cannot serve with recommendations to take action, an apparent practical reference is built up*"... "*The considerations of risk and control, developed with an immense apparatus of formulae, thus gain in the eye of a fleeting observer a closeness to the reality which he rightly did not expect them to have before*".⁶⁷⁵

In general, even theories that cannot be directly operationalized can serve to better understand and classify real interrelations. The homo oeconomicus is an example of this.

Until now, the hidden-action agency theory was the only variant of the normative agency theory that was considered in the area of an operational planning and control. Therefore, the following considerations apply only to its application in companies.

As a general normative approach that applies to a particular decision situation, the hidden action agency theory undoubtedly has its justification. For someone who is fundamentally concerned with the decision theory, it is a normative approach that expands the spectrum of possible decision situations, and above all, it shows how different information states between a *principal* and an *agent* can be taken into account in the optimization calculus. With regard to the operational planning of companies, however, it is so superfluous that it does not even deserve mention in any monograph on the "state of the art" as a "background theory" of such an operational planning.

⁶⁷⁴ See Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative agency Theory*, Berlin 2015 (61 pp.), www.lnzpla.de/IN46-2015.pdf. (Text in German, title translated). And: Zwicker, E., *The hidden Action Agency Planning, demonstrated with the Example of simple Cost-Performance Models*, Berlin 2011, (52 pp.), www.lnzpla.de/IN38-2011a.pdf. (Text in German, title translated)

⁶⁷⁵ Meinhövel, H., *Defizite der Principal-Agent-Theorie*, Lohmar, Köln 1999, p. 214.

What comes out of not taking this into account can be seen from the considerations of Ewert and Wagenhofer in their book “*Interne Unternehmensrechnung*” (Internal Corporate Accounting). All considerations that are carried out there and are based on the hidden-action agency theory are superfluous because they are so far removed from the reality of an operational planning and control that it is not worthwhile to deal with it.

In my opinion, the discussion with Alfred Wagenhofer (s.p.416), which will be described later, also shows that the variants of the normative agency theory developed so far cannot contribute to a better realization of an annual operational planning and control.

For me personally, the study of the hidden-action agency theory led to further insights that improved the recognition of the irrelevance of this normative theory. These insights were obtained in the areas of “*performance-based compensation*” and “*variance analysis*”. These two topics and my findings in this were briefly discussed.

On the profit contribution-based compensation system. The hidden-action agency planning examines the question of how an optimal compensation function for the *agent* (area manager) can be designed. In view of the completely unrealistic assumptions of the hidden-action agency planning, the procedure used to determine the optimal compensation of the *agent* (area manager) is not feasible.⁶⁷⁶ The question of how to determine a (possibly optimal) compensation function during the planning procedure does not arise in the hidden-effort agency planning. In other words, a profit contribution-based compensation system is not required to carry out an Integrated Target Commitment Planning. However, without the hidden-action agency planning question, I would not have thought of asking myself the question; “*How could a performance-related compensation system be connected with the hidden-effort agency planning or with the Integrated Target Commitment Planning?*” The proposed solutions developed for this purpose are discussed in a separate article. In my opinion, however, there is no “optimal solution.”⁶⁷⁷

To the variance analysis. The consequences resulting from the application of the hidden-action agency theory regarding the performance of a variance analysis have encouraged me to reject this planning procedure. The variance analysis of the Integrated Target Commitment Planning was already done many years before I became involved with hidden-action agency theory. Now, as I “entered” the world of thought of the normative agency theory, I thought, if it is a planning procedure, then it is actually obvious that some kind of variance analysis would have to be carried out afterward, on the basis of which one can recognize “what went wrong” or who is responsible for which variances. However, it was really very surprising when it turned out that this was not the case. To put it clearly: If a hidden-action agency planning is carried out, then a variance analysis in regard of the fulfillment responsibility is not necessary because the variances that have

⁶⁷⁶ See also the considerations on page 383.

⁶⁷⁷ Zwicker, E., *Integrated Target Commitment Planning and Performance-Based Compensation System*, Berlin 2011, www.Inzpla.de/IN39-2011b.pdf.

occurred are always actual-plan variances caused by environmental parameters and no *agent* (area manager) is responsible for not having achieved these (uncontrollable) parameters.

However, the principal even cannot determine the actual-plan variances of these environmental parameters. In this sense, Wagenhofer points out: "*The problem in the basic agency model is that neither the work input nor the environmental state is observable by the principal*".⁶⁷⁸

This insight was very amazing for me; it is a compelling consequence of this planning procedure, but a knockout argument in terms of its practical relevance.

As described, the system of the Integrated Target Commitment Planning can be classified as a variant of the normative agency theory. This variant is not applicable to every appearance of an agent-principal relationship, but where it is applicable, namely in the case of a company's annual operational planning, it proves to be a concretization of the normative agency planning that goes down to the individual case. Up to now I could not find in the literature such a variant of an agency planning, which on the base of an own hyperstructural hypothesis system of a company, allowed a concretization to an individual company.

The extensive considerations on hidden-action agency theory have enabled me to get a better overview of the interrelationships. To what extent someone should deal with the hidden-action agency theory in the same way is questionable. For me however, whose goal was to work out the relationships of the Integrated Target Commitment Planning to other normative theories as clearly as possible, this effort was necessary and from my point of view also successful. Because it led to the declaration of the Integrated Target Commitment Planning as a normative theory of operational planning and control of companies that unites all currently relevant normative approaches.

The hidden effort agency planning is no normative agency theory.

The assertion that the Integrated Target Commitment Planning can be classified as part of an agency planning is likely to be rejected. For it is a strongly modified variant of today's relevant agency planning (normative agency theory), and I would not be surprised if representatives of the current normative agency theory such as Alfred Wagenhofer would say, "*Such a planning procedure can no longer be attributed to the normative agency theory*".

Wagenhofer defines the agency theory as follows: "*Agency theory is a certain form of a game with asymmetrically distributed information*".⁶⁷⁹

Two statements and one question. The first statement is, with the hidden-effort agency

⁶⁷⁸ For this argumentation, see Wagenhofer in: Zwicker, E., *Wagenhofer's Contribution to normative Agency Theory in the Field of Cost-Performance Accounting*, Berlin 2011, rev. 2015, p. 7, www.In-zpla.de/IN47-2015.pdf. (Text in German, title translated).

⁶⁷⁹ See: Wagenhofer, A. *Abweichungsanalysen bei der Erfolgskontrolle aus agency theoretischer Sicht*. In: Betriebswirtschaftliche Forschung und Praxis, (1992a), p. 319. (*Variance analyses for success control from an agency theoretical point of view*).

planning (*Integrated Target Commitment Planning*), there is an asymmetrically distributed information between the principal (*corporate management*) and the agents (*area managers*) with regard to the effort of the agents (*the burden of the area managers*). The second statement says that there is also a game situation. It is not without reason that Eliasson calls the negotiation of commitments a “number game“ (s.p.478).

The question is what is behind Wagenhofer's so-called “*certain form*” of these games? Wagenhofer does not comment on the characteristics of this definition of what should be “determined” in these games.

If the “hidden-effort agency planning” procedure according to Wagenhofer's definition is not part of the normative agency theory, and you as a reader of this text follow this definitional interpretation, then I suggest that you simply call this planning procedure “*Integrated Target Commitment Planning and Control*” as before.

Agency planning with cost-performance models in the literature

After my unsuccessful attempts to reconstruct the hidden-action agency theory as a realistic method of an operational planning with a cost-performance model, it was time to conduct a careful and comprehensive literature analysis. I had to clarify whether the literature contained considerations on the link between “controlling” and an agency planning that goes beyond Küpper's remarks on this topic. As described above, Küpper describes the formal approach of the hidden-action agency planning and postulates its relevance for management accounting (in German “Controlling”) without pointing out the slightest approach of applicability (s.p.308f).

Tableau 1. Some important applications of agency research in management accounting.

Subject	Representative authors	Representative articles
Capital budgets, including residual income	Antle, Fellingham, Eppen, Reichelstein, and Rogerson	Antle & Fellingham (1997). Rogerson (1997)
Aggregation of performance measures	Banker, Datar, Feltham, and Xie	Banker & Datar (1989) Feltham & Xie (1994)
Controllability of performance and relative performance evaluation	Antle, Demski, Dye, Baiman, and Noel	Antle & Demski (1988) Baiman & Noel (1982) Dye (1992)
Use of non-financial measures	Hemmer, Ittner and Larcker	Hemmer (1996) Ittner et al. (1997)
Additional performance measures including stock-based performance margins	Bushman, Indjejikian, Banker, Datar, Dutta, Feltham, Reichelstein, and Xie	Bushman & Indjejikian (1993) Banker & Datar (1989) Dutta & Reichelstein (2005) Feltham & Xie (1994)
Transfer pricing and boundaries of the firm	Baldenius, Baiman and Rajan	Baldenius (2000) Baimann & Rajan (2002)
Cost allocation	Demski, Magee, and Wagenhofer	Magee (1988) Wagenhofer (1996)

Fig. 69: Overview of the most important contributions to the agency theory in the field of “management accounting” until 2007 according to Bromwich

Even before my model-based reconstruction of the hidden-action agency planning using a cost-performance model, I had already searched the literature to see if anything could be found on this topic. However, it was not a systematic study of all literature and I restricted myself (like Küpper) on the hidden-action-agency theory.

But now I have developed and systematized another variant of the normative agency theory, namely the hidden-effort agency planning, or more precisely, the Integrated Target Commitment Planning as a variant of the normative agency theory. Therefore, the question had to be clarified whether other variants of the normative agency theory have not already been described in the literature and whether one of these variants is even the hidden-effort agency theory already described elsewhere. My aim was to clarify whether there are contributions to the "concretization" of the normative agency theory in the literature especially for the area of cost-performance accounting or operational planning (*budgeting*). In general, English-speaking authors attach great importance to the relationship between management accounting and the normative agency theory.

Lambert notes "*Agency theory has been one of the most important theoretical paradigms in accounting during the last 25 years.*"⁶⁸⁰ This is a very decisive statement. However, the question arises which "concretization" of the normative agency theory can be found in the literature in the field of "*management accounting*". Concretization is not to be understood as a concrete application in a company. From my point of view, it would already be sufficient if an author restricts his normative approaches to certain fields of an application in a company and provides certain operational definitions of such terms as "*effort of the agent*" or "*financial result*". Such a normative approach would thus already have a somewhat "higher degree of concretization" with regard to its application than the definitions and hypotheses of the hidden-action agency planning described at the beginning.

My research was based on the contributions listed in a review article by Bromwich (see Fig. 69), which were supplemented by the literature published afterward.⁶⁸¹

It turned out that there are no normative considerations based on models whose variables are described by structural equations that only apply to cost-performance models.⁶⁸²

Only two German-language contributions by Wagenhofer could be used because they dealt at least with the area of cost-performance accounting.⁶⁸³ These contributions, which are missing in the overview of Bromwich, are relatively old, but after them, as my researches showed at least, no more publications could be found on this topic. Wagenhofer's articles are discussed in the text "*Wagenhofer's contribution to normative the agency theory in the field of cost-performance accounting*", which can be accessed online.⁶⁸⁴

⁶⁸⁰ Lambert R. A., *Agency Theory and Management Accounting*. In: Handbook of Management Accounting Research, Chapman, C. S. Hopwood, A. G., Shields, M. D. (Ed.), Vol.1, Amsterdam, 2005, p. 247

⁶⁸¹ Bromwich, M., *Economics in Management Accounting*. In: Handbook of Management Accounting Research, Ed. Chapman, C. S. Hopwood, A. G., Shields, M. D., Vol.1, Elsevier 2007, p. 155.

The research was carried out until May 2016. The last relevant article on this subject is, in my opinion: Kilfoyle, E., Richardson, A. J., *Agency and structure in budgeting: Thesis, antithesis and synthesis*, In: Critical Perspectives on Accounting, 22(2011), p. 183-199.

⁶⁸² Structural cost-performance models are equation models that allow the determination of the numerical values of their endogenous variables when their parameters are numerically specified.

⁶⁸³ Wagenhofer, A., *Kostenrechnung und Agency Theorie*, in: Jürgen Weber (Ed.), Zur Neuausrichtung der Kostenrechnung - Entwicklungsperspektiven für die 90er Jahre, Stuttgart 1993, p. 161-181 and Wagenhofer, A., *Abweichungsanalysen bei der Erfolgskontrolle aus agency theoretischer Sicht*, in: Betriebswirtschaftliche Forschung und Praxis 1992, p. 319-338.

⁶⁸⁴ Zwicker, E., *Wagenhofer's Contribution to normative Agency Theory in the Field of Cost-Per-*

I had already read both contributions before the development of a cost-performance model of the hidden-action agency planning, but afterward, they appeared to me in a completely new light, so that I rewrote an already existing text about them. This revised text is briefly mentioned below.

Wagenhofer's goal is to show *"to what extent the agency theory provides valuable insights for cost accounting"*. *"Cost accounting" ... "in this context includes cost and performance accounting"* (p.162). Since the normative agency theory works with hypothesis and definition equations, Wagenhofer's comments can be considered under the question of whether he says something about how planning and control can and should be carried out with a cost-performance model in accordance with the regulations of the normative agency theory. Since Wagenhofer bases the considerations in his text on the hidden-action agency theory, this question can be limited to this type of an agency theory.

Wagenhofer notes that so far *"there is no closed theory of cost accounting based on the agency theory"* (p.179). In his two publications, he tries to contribute to this. However, the result of my considerations is that he does not make any contribution towards such *"a closed theory of cost accounting based on the agency theory"*. His contribution and this is the main point of criticism, does not even show how to proceed in order to arrive at such a *"closed theory"*.

A cost-performance model, used to perform a hidden-action agency planning, must contain all hypotheses of the hidden-action agency theory in the form of structural equations. That this is necessary to develop a hidden-action *"agency theory in the area of cost-performance accounting"* is not mentioned by Wagenhofer. And in the minimum case it would at least have to be pointed out that for the development of the still outstanding *"agency theory in the area of cost-performance accounting"* an equation model of *"cost management accounting"* would have to be developed, which would have to contain the terms and hypotheses of this *"agency theory"*.

Since all this is not covered and what is covered is rather confusing and meaningless, it would have been better not to publish these contributions. For they only confuse and clarify nothing.

As mentioned above, I tried repeatedly, but almost without success, to discuss my theory with colleagues (s.p.503). In particular, I have tried to address colleagues whom I thought were particularly competent and might be interested in such a topic with regard to their activities to date.

One of these representatives was Alfred Wagenhofer. He offered himself as an interlocutor because, together with Ralf Ewert, he wrote a very well-known and comprehensive monograph on internal corporate accounting, i.e., an area that also includes operational planning with cost-performance models.

When I asked Alfred Wagenhofer in 2008 in Graz, the location of his home university, whether he was interested in discussing my approach to operational company planning,

he answered straightforwardly that the topic did not interest him and he would have to spend his limited time on other things. That was a clear answer and I accepted it immediately without a reservation. Because a conversation only makes sense if both parties benefit. However, one thing that really impressed me about this conversation was the calmness and sovereignty with which he rejected my request. Only someone who is entirely sure of himself can perform this way.

He had hardly finished speaking when the thought came to my mind: If he is not interested in "my" theory, then I should at least once be interested in "his" theory. And this is, according to its own statement, *"the application of analytical models of the agency theory"*.⁶⁸⁵

So far, I had avoided the agency theory because it seemed "too theoretical" and "too detached" to me for someone whose goal was to develop a computer-supported, applicable theory for an operational planning and control that could in principle be carried out by any company.

But the confident and unambiguous appearance of Alfred Wagenhofer, who, according to my impression, was on a higher "theoretical level" with his agency theory than I was with my Integrated Target Commitment Planning, gave me a real "push" to now "enter" the agency theory, regardless of which mathematical methods should stand in my way. Perhaps something could even jump out in favor of the Integrated Target Commitment Planning.

I had the plan to interrupt my train journey from Graz back to Berlin for two days in Munich to visit my son and his family and to go to the German Museum of Technology. Instead of going through from the main station to Oberhaching, I left the S-Bahn at the Stachus to visit the bookstore Hugendubel. My aim was to read Ewert and Wagenhofer's book on "Internal Corporate Accounting" to learn more about the agency theory and its connection with internal accounting.

The question that interested me was, how does Alfred Wagenhofer bring agency theory, i.e., the focus of his research, to the readers of a work that is regarded as a *"high-level-textbook"* in the "scientific community"? There is probably no better forum for him than to present his research area, i.e., the theory and its application, in such a work. My expectations have been raised because I believe that the more someone knows about an area, the better he will be able to explain it to a beginner.

Therefore, I entered the bookstore with high expectations. Unfortunately, the book was not available at Hugendubel.

On the shelves I only found Hans-Ulrich Küpper's monograph *"Controlling: Concept, Tasks and Instruments"*, which contained a section on the agency theory as the theoretical

⁶⁸⁵ The exact quote reads: *"Research at the Institute is methodologically predominantly shaped by the application of analytical models of the agency theory and information economics"*.
<http://www-classic.uni-graz.at/iuc/forschung.htm> at 23.11.2011.

foundation of controlling. I, therefore, made myself comfortable in Hugendubel's reading area and decided not to leave it before I had read everything Hans-Ulrich Küpper had to report on the agency theory. The concerns expressed against Küpper's statements in a previous section of this text were already expressed during reading: unclear, erroneous and not the slightest hint of an application.⁶⁸⁶

Then I sat helplessly on one of the comfortable red leather sofas in Hugendubel's reading area and thought: "This can be fun. In view of such a description of the agency theory, how should I establish a connection to the Integrated Target Commitment Planning?"

Küpper's text did not bode well. My plan to enter Wagenhofer's area and "get out" something fruitful for the Integrated Target Commitment Planning seemed to vanish into thin air. It was, therefore, to be hoped that Wagenhofer's primary works on the agency theory and in particular, his contributions proved to be somewhat more enlightening.

However, Küpper's text already let me see the direction of the further procedure. Küpper uses in his agency planning model an stochastic action-result hypothesis of the form $\phi(x|a_i)$, i.e., a probability distribution of the financial result x depending on different (discrete) actions a .⁶⁸⁷

It is, therefore, an agency planning with discrete actions. The $\phi(x|a_i)$ probability distribution as the decisive empirical hypothesis contains almost the entire empirical content of the agency planning model described by Küpper. Already at Hugendubel it was clear to me that this model must be transferred into my presentation form, i.e., the description with equations. To achieve this, it was necessary to describe the link between the financial result x and the actions a , i.e., the $\phi(x|a_i)$ probability distribution through a system of definition and hypothesis equations. The "actions" a_i must be described using different values of certain quantitative action variables. It is, therefore, an agency planning with quantitative action variables.

Stochastics must be applied in the equation model in that some of the basic parameters of the model are stochastic variables, i.e., they can only be described by probability distributions. While Küpper's approach contains only the $\phi(x|a_i)$ probability distribution, in my model this would be replaced by thousands of equations and also thousands of basic parameters in these equations, assuming that a company's cost-performance model could be interpreted as an agency planning model.

Would I be able to make that bow? The "equation equivalent" to Küpper's $\phi(x|a_i)$ probability distribution would be obtained if it were possible to derive from these equations a reduced equation (a so-called x - a hypothesis) that connects the quantitative action variables of the agent (a) with the financial result (x).

Since the hidden-action agency theory uses expected values as target values for its opti-

⁶⁸⁶ See footnote on page 309.

⁶⁸⁷ See in detail: Zwicker, E., *The hidden action Agency Planning, demonstrated with the Example of simple Cost-Performance Models*, Berlin 2011, p. 6f., www.lnzpla.de/IN38-2011a.pdf. (Text in German, title translated).

mizations, a corresponding equation model must be developed for the developed stochastic equation model, whose endogenous variables correspond to the expected values of the endogenous variables of the stochastic equation model. In the best case, such a corresponding model is obtained by replacing the stochastic model parameters in the stochastic model with their expected values.

However, I also was aware that in this approach the endogenous variables of such a model do not always have to correspond to the expected values of the endogenous variables of the corresponding stochastic model. However, I started from this assumption.⁶⁸⁸ An equation model that describes these expected values should, as I already decided at Hugendubel, be called an "expected value equation model".

If the task at hand were to be formulated as a thesis topic, it would read, "Expected value equation models of the normative agency theory and their application within the framework of operational plan cost-performance accounting".

With these thoughts, I left Hugendubel's bookshop to go on to Oberhaching.

Subsequently, I was concerned with the question of whether it is possible to use some of the four types of basic parameters of an Integrated Target Commitment Planning model as if they would be the basic parameters of a model of the normative agency theory (or what I called "*agency planning*"). If this were the case, then it would probably be possible to carry out an agency planning with a model that was previously used for an Integrated Target Commitment Planning.

It was clear that "*the principal*" in a plan cost-performance model as well as in the system of the Integrated Target Commitment Planning is always the corporate management and "*the agent*" should, in my opinion, be considered as the area manager of an Integrated Target Commitment Planning.

The decision alternatives of the hidden-action agency theory, as Küpper describes them, can be divided into two types: On the one hand in the (discrete) actions (a_i) of the agent (area manager) and on the other hand in certain alternative function types of the compensation function $s = F_s(x)$, which are described by a functional.⁶⁸⁹ I quickly realized that these actions are to be described in an expected value equation model by the expression of certain action variables a_1 up to a_n . As already mentioned (p.383), I described them as the action variable of the agent.

Working with functionals as decision alternatives for an optimization requires the application of the calculus of variations. That seemed far too complicated and completely inappropriate to me. I, therefore, assumed that the compensation functions of the *agent* (area manager) originate from a certain type and that their alternative courses can, therefore, be entirely described by the alternative values of the parameters of this type. I described these parameters as action variables of the principal because only the principal uses them to maximize his utility.

⁶⁸⁸ As it turned out later, this assumption also applies to standard cost-performance models.

⁶⁸⁹ The term compensation is presented in this sentence with $s = F_s(x)$ in the form used by Küpper (s.p.309). In this text however, compensation is referred to as "C".

Both types of action variables (of the agents and the principal) would have to be reflected in an INZPLA-model in the form of certain basic parameters. Whether it would be successful and how it could be possible to identify these two types in an Integrated Target Commitment Planning model, however, was quite unclear to me.

Aside from these two types of basic parameters (model parameters), there are only environmental parameters in a hidden-action agency planning model. At least one of the environmental parameters must be stochastic; otherwise, no stochastic model would be available. Stochastic parameters in the sense of the agency theory could, therefore, only come from the group of the uncontrollable basic parameters, if one starts from an INZPLA-model. That was obvious. However, where can *the agent's* (area manager's) action variables be identified in an Integrated Target Commitment Planning model? That was the question that was really bothering me.

Action variables of the *agent* (area manager) of a hidden-action agency planning are characterized by the fact that their actual values are known only to the *agent* (area manager) and not to the *principal* (corporate management). In a standard cost-performance model, however, all basic parameters for which actual and plan values are by definition not equated are directly or indirectly "observable", both for the *agent* (area manager) and the *principal* (corporate management).⁶⁹⁰

One could object that in a hypothesis equation of the form

$$Y = a + b \cdot X \quad \text{with } a \text{ and } b \neq 0$$

the parameters a and b are "not observable". This is true, but this non-observability of the basic parameters applies to both the *principal* (corporate management) and the *agent* (area manager), and since - as described - the actual value of Y , i.e., Y^A , is compared with its setpoint value Y^{SP} determined by the target commitment function, these model parameters, which cannot be observed by both parties, are no obstacle to an effective actual-plan control.⁶⁹¹

It soon became clear to me that the basic prerequisite in using a hidden-action agency planning with cost-performance models does not exist: There are no basic parameters in a cost-performance model that can be observed by the *agent* (area manager), while the *principal* (corporate management) is not in a position to bring them into experience (without procurement costs). Therefore, it was inevitable to conclude that a hidden-action agency planning as a planning procedure with a cost-performance model is not possible.

I came to this conclusion relatively quickly and wondered whether I should write Alfred Wagenhofer a letter asking him whether he would not know a cost-performance model, for which the hidden-action assumption of the hidden-action agency planning applies

⁶⁹⁰ Basic parameters that are equated in the plan and actual model are, for example, depreciation rates or interest rates of imputed interest. For a detailed analysis of the plan and actual status of the basic parameters of plan cost-performance models and their corresponding actual models, see: Zwicker, E., *Actual Cost-Performance Models: Structure, Semantics and Application*, Berlin 2008, www.Inzpla.de/IN35-2008a.pdf, p. 7f. (Text in German, title translated).

⁶⁹¹ For this type of control, by using the explained variables of a target commitment function as control variables and not its parameters, see page 79.

with regard to one of the model parameters used. Since I was now acting in "his realm," he might have answered me.

But I refrained from doing so because I had the idea to assume from the counterfactual assumption that certain basic parameters of the cost-performance model should only be known to the *agent* (area manager) and not to the *principal* (corporate management). The question, which then arose, was: Would it be possible to practice a hidden-action agency planning using a cost-performance model at least under these assumptions, which contradict reality?

This question, in turn, depended on the further question of whether a cost-performance model could contain basic parameters to which the characteristics of the action variables of an *agent* (area manager) apply in case of the hidden-action agency planning. From the perspective of the Integrated Target Commitment Planning, only the decision variables or the basic targets offered themselves as potential candidates.

Decision variables. The decision variables serve to maximize the operating result. And that was good because the action variables of the agent (area manager) are also used to carry out a maximization. However, the agent (area manager) maximizes his utility, and this is not the operating result.

The maximization of the operating result is only carried out within the framework of the second stage of the two-stage optimization of a hidden-action agency planning by the *principal* (corporate management). The *principal* (corporate management) selects the combination of the parameters p_1 to p_n which maximizes his utility (the operating result) in relation to all the maxima of the agent's utility $UA^{\max}$ determined by the *agent* (area manager) and described by the optimal decision rule by $UA^{\max} = F(p_1, \dots, p_n)$. $UA^{\max}$ depends on the parameters p_1 to p_n of the compensation function, which is offered by the *principal* (corporate management) to the *agent* (area manager). As these parameters $p_1, \dots, p_n$ of the compensation function $C = F(p_1, \dots, p_n)$ are to be determined by the *principal* (corporate management). He selects the values from p_1 to p_n which maximize his utility, e.g., the operating result.⁶⁹²

Decision variables in a cost-performance model of an Integrated Target Commitment Planning, are never the parameter of the compensation functions of the *agents* (area managers). A standard cost-performance model contains not even such compensation functions.

A decision variable in a cost-performance model of an Integrated Target Commitment Planning is not associated with any *effort* (burden). It is determined by the *principal* (corporate management) to maximize his operating result. The *agent* (area manager) is commissioned by the *principal* (corporate management) to realize it, and he does it without any effort. The *principal* (corporate management) checks the realization by means of a setpoint-actual comparison.

⁶⁹² See in detail: Zwicker, E., *The hidden action Agency Planning, demonstrated with the Example of simple Cost-Performance Models*, Berlin 2011, p. 19f. www.lnzpla.de/IN38-2011a.pdf. (Text in German, title translated).

In two ways, these relationships proved to be bad for using decision variables of an Integrated Target Commitment Planning as the action variables of an agency planning. The realization of the *agent's* (area manager's) action variables is always connected with the emergence of an *effort* (burden) and this does as already mentioned not apply to the decision variables of an Integrated Target Commitment Planning. Furthermore, it is not possible for the *principal* (corporate management) to find out the setpoint-actual variances of the action variables, because they are "hidden". And this setpoint-actual control is always possible and necessary with decision variables of an Integrated Target Commitment Planning.

Basic targets. A similar conflict arose with the basic targets. They are realized by the areas, and their realization leads to different *efforts* (burdens). That was good. This is because the same applies to the action variables of the *agent* (area manager). Only here it is possible to speak of the *effort* (burden) that arises for the *agents* (area managers). The action variables of the *agents* (area managers) serve, however, as mentioned in the first optimization step, to maximize their utility. In the system of the Integrated Target Commitment Planning, however, the values of the basic targets are negotiated with the areas and not used for maximization. And that was bad, at least in terms of using a basic target as the *agent's* (area manager's) action variable.

In view of this situation, it came to my mind that a connection between the two normative theories would only be possible if I developed a modified variant of the normative agency theory that was consistent with the procedure of the Integrated Target Commitment Planning and Control. I could not let go of that thought. However, it was not so easy to implement it "cleanly" because two basic assumptions of the hidden-action agency theory stood in the way of this project.

Arguments had to be developed to show that it makes sense to propagate a "normative agency theory" in which these basic assumptions should not apply.

The rejection of the maximization requirement

The first basic assumption of the normative agency theory assumes that the action variables of the *agent* (area manager) together with the action variables of the *principal* (corporate management), i.e., the parameters of the compensation function are used to optimize both the maximization of the utility of the *agent* (area manager) and the maximization of the *utility of the principal* (here the operating result) in a two-step process. In the new variant, the values of the *action variables of the agents* (the basic targets of the area managers) are negotiated with the *agents* (area managers) using a specific procedure and are not used for an optimization.⁶⁹³

The second optimization, which is required by the hidden-action agency planning, should also no longer apply. The basic parameters of the compensation function, which in the second step of the principal planning serve as decision variables for the *principal* (corporate management) to determine the optimal compensation function, are no longer to be used for an optimization. They can no longer be varied at all during the planning proce-

⁶⁹³ This is indicated in Fig. 67 on page 386 by the characteristic value K3-b of a "pure satisficing planning" instead of K3-a of a "pure optimizing planning".

dure. Instead, their numerical values should be defined before the planning procedure begins. The determination of the optimal compensation function of the agent $C = F^{\max}_s(x)$, which optimize the utility of the *principal* (corporate management), has so far been a core element of the normative agency theory. This core element is no more relevant.

However, I asked myself whether the new variant of the agency planning to be developed should not include a compensation function for the *agent* (area manager) whose parameters, however, are decision parameters. This would have to be a compensation function in which the variable compensation of the *agent* (area manager) depends on the setpoint-actual variances of the *agent's action variables* (basic targets).

It turned out, however, that this does not make sense. The result of these considerations is described in a separate text. Various proposals are made as to how to proceed.⁶⁹⁴ However, none of these proposals is satisfactory. According to my current assessment, no satisfactory solution will be found either, because the *effort* (burden) of an *agent* (area manager) cannot be determined and this would be necessary.

The distortion of stochastic hypotheses

The second basic assumption that is violated is the assumption that stochastic hypothesis equations are to be used in a hidden-action planning model. This assumes that in the case of the hidden-action agency planning the utility of the principal (corporate management) is always a stochastic variable whose expected value is to be maximized using an expected value equation model. Instead of the expected value hypotheses in the system of the Integrated Target Commitment Planning so called pseudo deterministic hypotheses are used. This characteristic of the planning models of an Integrated Target Commitment Planning was already mentioned in the classification scheme of Fig. 68 under the characteristic value K7-b "pseudo deterministic hypotheses" and it was pointed out at the discussion of this scheme (s.p.390) that this distinction would be dealt with in detail later. This is now the case.

Why pseudo determinist hypotheses are used in the models of the Integrated Target Commitment Planning

The use of pseudo deterministic hypotheses is an essential characteristic of an Integrated Target Commitment Planning model. It is also important for the evaluation of this procedure if a comparison with the stochastic models of the normative agency planning would not be required at all. The question of the status of pseudo deterministic hypotheses and the justification of their use is, therefore, discussed in relative detail below.

The hidden-effort agency planning or the Integrated Target Commitment Planning is characterized by another feature that distinguishes it from the variants of an agency planning (normative agency theory) developed so far and discussed in the literature. It is supposed to be a non stochastic normative approach of an agency planning, whose cognitive status has yet to be explained.

Some representatives of this normative concept are unlikely to agree to such a "de-

⁶⁹⁴ Zwicker, E., *Integrated Target Commitment Planning and Performance-Based Compensation System*, Berlin 2011, op. cit., www.Inzpla.de/IN39-2011b.pdf. (Text in German, title translated).

stochastisation" of an agency planning (normative agency theory). The use of stochastic variables in a model of the normative agency theory, is a basic assumption that, to my knowledge, no author has ever questioned.

When formulating the definition and hypothesis equations that connect the agent's action variables (a_1 to a_n) with the principal utility (UP), it is always assumed as described that the stochastic model parameters occurring in the equations are replaced by their expected values. A model formulated in this way can thus be represented by algebraic equations or difference equations. It was called as an expected value equation model. This model is still a stochastic and not a deterministic model from a cognitive point of view, although there is no difference in the syntax of the structural equations.

The difference, however, lies in the semantics. After formulating such an expected value equation model of the hidden-effort agency planning, the *principal* (corporate management) could say: *"For the stochastic model parameters P_1 to P_z , we have accepted that their expected values are included in the equations of our planning model. With this, we want to achieve that the expected value of the probability distribution of the operating result (caused by the stochastic parameters) is described on the basis of the equation model used"*.⁶⁹⁵

But now the *principal* (corporate management) changed his mind and said, *"We changed our minds. When assessing the probability distribution of the operating result depending on the alternative characteristics of the action variables of the agents (the basic targets of the area managers) a_1 to a_n , we would like to use not only the expected value of the operating result (the principal utility) as a criterion but also its "standard variance"*.

In such a case it would be necessary to formulate a further formula context which describes the standard variance of the operating result as a function of the *action variables of the agents* (basic targets of the area managers) a_1 to a_n .⁶⁹⁶

In the case of the hidden-effort agency planning or the Integrated Target Commitment Planning propagated here; however, such a case is excluded because the parameters previously referred to as "stochastic model parameters" should have a cognitive status that does not permit such a stochastic interpretation.

One could now object: *"What an elaborate justification to renounce stochastics. Then the model parameters are deterministic parameters, and the cognitive assumptions of the deterministic decision theory are used."*

However, it is not that simple. This is because the cognitive status of the model parameters and hypotheses is rather unclear when using a non stochastic and thus a deterministic model of an operational company planning.

To show this, the cognitive status of an Integrated Target Commitment Planning model

⁶⁹⁵ As already mentioned (see page 409), an expected value of the operating result cannot always be determined, but it should be assumed here that such a model is available.

⁶⁹⁶ Such an approach, which leads to a system of stochastic equations and allows the planning of the probability distribution of the operating result, is described for the present cost-performance model in: Zwicker, E., *The hidden action Agency Planning, demonstrated with the Example of simple Cost-Performance Models*, Berlin 2011, p. 41, www.Inzpla.de/IN38-2011a.pdf. (Text in German, title translated).

should be described in more detail. It is to be shown that the Integrated Target Commitment Planning is based on certain "pseudodeterministic hypotheses" whose identification cannot be found in the deterministic decision theory, which simply use the term "safe knowledge".

If it should be possible to convince a reader that the use of such "pseudodeterministic hypotheses" to carry out an annual operational planning is appropriate, then the only question remains whether the planning procedure thus applied can still be described as an agency planning procedure in the light of an agency planning (or the normative agency theory).

This is in my conceptual understanding the case because an essential feature of the normative agency theory, namely the existence of an asymmetric information situation between the *principal* (corporate management) and an *agent* (area manager), still applies. The resulting agency planning is the hidden-effort agency planning, which thus represents "de-stochastised agency planning".

After these preliminary remarks, the "pseudo-deterministic planning" that distinguishes the Integrated Target Commitment Planning is to be dealt with in more detail. To this end, we consider the planning logic status of the individual types of basic parameters of an Integrated Target Commitment Planning.

The basic parameters of an Integrated Target Commitment Planning model can be divided into three groups: Firstly, completely controllable, secondly not completely controllable and thirdly uncontrollable basic parameters (s.p.28).

The first group, i.e., the completely controllable basic parameters, can, in turn, be divided into decision parameters and decision variables. The corporate management (or central planning) determines the decision parameters before the planning procedure begins. The decision variables, on the other hand, are changed during the planning procedure and serve to maximize the operating result. Since these variables (such as the determination of a sales price) can be fully influenced by the corporate management or other areas and are, therefore, realized exactly as they are planned, it would be absurd to use them as stochastic variables in the model.

The second group, i.e., the not completely controllable basic parameters, requires a more precise labeling. These are the basic targets of an Integrated Target Commitment Planning. They are characterized by the fact that an area manager undertakes to adhere to a certain final plan value after completion of the planning. If an area manager has made this commitment, it would be absurd to regard these parameters as stochastic. Finally, it is assumed that they have entered into a commitment to meet the target value of a basic target.

The basic targets can almost always be interpreted as parameters of a so-called target commitment function so that one can also say that the area managers have committed themselves to adhere to the course of certain target commitment functions (s.p.31). Such target commitment functions are, for example, cost functions or price-sales-quantity functions.

If a stochastic model is to be formulated, then it is often assumed that its stochastic hy-

potheses are represented by an equation describing the expected value, whose explained variable is "stochastically contaminated" by an additive stochastic (shock) variable. In the case of a linear cost function, its stochastic representation then looks like this:

$$CO = FC + VUC \cdot EP + \varepsilon$$

with CO - costs, FC - fixed costs, VUC - variable unit costs, EP - employment, ε is a stochastic model parameter, which is assumed to be normally distributed and has an expected value of zero. However, if this cost function is a target commitment function, such a "stochastic description" is inappropriate.

As potential candidates for a stochastic description only the parameters of the third group remain, i.e., the uncontrollable basic parameters. An example of this would be the exchange rate. The question arises as to whether this type of model parameter should not be described by a probability distribution in an INZPLA-model.

If one (analogous to the normative agency theory) demands that the corporate management should regard the expected value of the operating result as the utility variable of its planning, then, as already mentioned, one could replace the stochastic model parameters occurring in this stochastic planning model with their expected values and determine the expected value of the operating result. This would be based on the resulting expected value equation model assuming different numerical values of the basic targets. One would then have a stochastic Integrated Target Commitment Planning, although the procedure looks like a deterministic planning.

However, this is not how things are done in practice. When determining such uncontrollable basic parameters, a planner does not assume a probability distribution from which he then determines his expected value. To put it plainly: I claim that a planner does not "estimate" his forecast values, which he needs for planning as uncontrollable basic parameters, using probability distributions, i.e., he does not make a stochastic forecast.

In his fundamental study of formal planning in sixty companies, Eliasson found that the sixty companies he surveyed "*with a few exceptions*" do not use probabilities to determine their forecast figures in their planning. And "*the argument was that uncertainty could not be specified numerical in a meaningful way*".⁶⁹⁷

Keen and Scott-Morton found that "probability thinking" does not suit practitioners. They refuse to evaluate alternative events with probabilities.⁶⁹⁸ Instead, they use an "estimated value" which they determine without using a specific forecasting method. One could now assert that with such an "estimate", "the estimator" would unconsciously select the expected value or the most probable value of his subjective probability distribution.

However, such an assertion on "saving the probability" is not an acceptable empirical assertion. Because how could this assertion be falsified? And that is the criterion of their acceptance of being an empirical assertion.

As described in more detail elsewhere, for twenty years I was a member of the "Integrat-

⁶⁹⁷ Eliasson, G., *Business Economic Planning- Theory, Practice and Comparison*, Stockholm 1976, p. 46.

⁶⁹⁸ Keen, P. G., Scott Morton, M. S., *Decision Support Systems. An Organizational Perspective*, Reading, Mass. 1978, p. 129.

ed Corporate Planning" working group of the Schmalenbach Society, in which the head planners of the largest German companies, were members (s.p.524).

With regard to the exchange rate, I have tried to find out how these practitioners determine the values of exchange rates as an uncontrollable (uninfluenceable) basic parameter of their planning models. For exporting companies, it is essential to determine an exchange rate as part of their operational planning. None of the participants I asked mentioned that the probability distribution of the exchange rate plays any role.⁶⁹⁹ It is "estimated" on the basis of historical values and certain subjective considerations of the economic development.⁷⁰⁰

Of course, everyone who does so is aware that the "estimated" value will not occur. This is why it is a "pseudodeterministic forecast". For the time being, however, it is assumed that the value will occur as long as no other information is available. The revision of this estimate is based on an up-to-the-year forecast, which is sometimes even carried out on a monthly basis and is carried out during the annual planning period for the remaining months.⁷⁰¹

The one-time estimation of a probability distribution is, therefore, replaced by a rolling "point estimation", which is carried out on the basis of certain considerations but without the use of probability distributions. Whether the subconscious of these forecasters, without them noticing it themselves works "in the background" with subjective probability distributions, is, as mentioned, irrelevant.

In an Integrated Target Commitment Planning system, only the requirement to "somehow" estimate a value of the uncontrollable basic parameters applies. The estimation of a probability distribution and the calculation of its expected value derived from it is not foreseen because nobody does it in practice.

A scientific expert like Alfred Wagenhofer, who bases his entire research program on the stochastic agency theory, could argue against my "because argument" that this reference to the usual procedure in practice would really be no argument.⁷⁰² This would be in line with the claim: "Where it is custom, you put the cow to bed".

This is where I have my objections. Not for the cow. The only conclusion I find inappropriate is that this example suggests. Traditional behavior should be thoroughly analyzed to see whether it does not possess an acceptable "inner logic".

Within the framework of the classical planning theory, i.e., decision theory, it is always

⁶⁹⁹ See my conversation with Alfred Wagenhofer p. 423 and also p. 409.

⁷⁰⁰ The head of the planning at Siemens at that time, M.T. Commes, showed me an overview in this connection, which had been made by his staff. On a time chart running over several years, it showed the estimated values of the \$/DM exchange rate from the four most important German economic institutes and thus correspondingly the actual values that occurred. The variances are so incredible that I have quoted this time diagram here. www.Inzpla.de/Wechselkurs-Prognose.pdf.

⁷⁰¹ On this procedure, which is also practiced within the framework of the Integrated Target Commitment Planning, see: Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, Berlin 2010, p.14, www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated).

⁷⁰² See Wagenhofer's research activities in this area: Zwicker, E., *Wagenhofer's Contribution to normative Agency Theory in the Field of Cost-Performance Accounting*, Berlin 2015, www.Inzpla.de/IN47-2015.pdf. (Text in German, title translated).

required that the planning is to be carried out in the form of an optimization. In practice, however, it can be seen that no optimization is carried out in the companies' annual operational planning. Rather, a satisficing planning is practiced in a more or less clear form by entering into target commitments.

These target commitments must be met by certain areas that are subordinate to the company's management. Adherence to the agreed target commitments has the consequence that a certain level of aspiration is not fallen short of a profit target planned by the corporate management (e.g., an operating result of € 10 million). This observation formed the starting point of the Integrated Target Commitment Planning. It was an attempt to formulate this procedure in normative terms and to develop a self-contained planning procedure from it, which is not an optimizing planning. The practice should not be underestimated.

The rejection of the assumption of stochastic hypotheses in an operational planning model and their replacement by what I call "pseudodeterministic hypotheses" has a longer history.

Already during the development of the system of the Integrated Target Commitment Planning, I was aware that the planning models to be developed could be formulated as deterministic as well as stochastic models. As soon as only one basic parameter in the model is described by a probability distribution, i.e., is a stochastic parameter, the model is "stochastically contaminated", with the consequence that the operating result can also only be described by a probability distribution.

In such a case, it can be assumed that the expected value of the operating result is the top target of the *principal* (corporate management), thus again creating a situation similar to deterministic planning. However, the *principal* (corporate management) could also as mentioned (s.p.405) determine the total probability distribution of the operating result (by means of a Monte-Carlo simulation) for each alternative calculation and use the course of this probability distribution as an assessment criterion. The possibility of such a "stochastification" of the Integrated Target Commitment Planning was discussed and rejected by me in a text.⁷⁰³

The arguments put forward are debatable. One assertion, however, is indisputable: The annual operational planning carried out in practice is never stochastic, but always "deterministic". The procedure to be observed in practice is a kind of pseudo-deterministic planning, and such a procedure is also practiced in the system of the Integrated Target Commitment Planning.

The use of pseudo-deterministic hypotheses is a basic assumption of the Integrated Target Commitment Planning, which is justified by the approach in practice. Such pseudo-deterministic hypotheses should (so my demand) now also apply to the modeling of the relationships between the principal's utility (here the operating result) and the *action variables of the agent* (the basic targets) a_1 up to a_n of an agency planning model, with which the hidden-effort agency planning propagated here is to be carried out.

My decision not to work with stochastic models in the case of annual operational plan-

⁷⁰³ See: Zwicker, E., *Integrated Target Commitment Planning and stochastic Planning*, Berlin 2004, www.Inzpla.de/IN31-2004.pdf. (Text in German, title translated).

ning of companies was quite difficult because I had to overcome a kind of paradigm. Over many years, I have been teaching a course on decision theory in basic studies. And in this event, I mainly dealt with stochastic decision theory. Together with Hans Poser I conducted a "research seminar" on stochastic decision theory and its scientific theoretical foundations (s.p.533).⁷⁰⁴ For a long time, the almost irrefutable assumption was valid for me that the relationship between an alternative decision and the size of the utility it produces must be described stochastically and this size of utility must be maximized.

It seemed absurd to me to model deterministic relationships, because what events are certain to happen? My dictum was: Reality can only be described "appropriately" through stochastic relationships.

This is the view of many other experts in the academic field who are concerned with the topics of planning and decision theory. Therefore, it is unlikely that the representatives of the established normative agency theory will agree to the proposed de-stochastisation (and also the de-maximization) of this decision-making procedure (or planning procedure), even if, as here, it is a variant of the normative agency theory that can be only used for the annual operational planning of companies.

On the way to the development of the Integrated Target Commitment Planning, I came to the conclusion as described that the top targets on which operational planning is to be oriented should not be "maximized", but rather that a "satisficing planning" is to be carried out according to certain regulations by a target commitment in order to "plan" this top target.

The utility-maximizing for the field of an operational company planning, which is regarded by the decision theory as the only relevant procedure, is rejected with this procedure. However, as has been shown, the optimizing planning of the decision theory, if decision variables in the sense of the decision theory can be found in a developed cost-performance model, can be linked without contradiction with the propagated satisficing target commitment planning (s.p.45).

The next step, however, was the rejection of stochastic relationships, i.e., de-stochastisation. When I started to study the planning models described in the literature (s.p.8), it became clear that all the models described there were "deterministic" or more precisely described by algebraic (and not stochastic) equations. However, my stochastic view of the world was not shaken by this. I simply assumed that the hypotheses that appear in the models, such as a cost function or a price-sales function, are "expectation value equations". In such a case, the hypothesizer simply consciously or unconsciously starts from the "expected value relationships" of a stochastic connection. The econometricians also work with such "determinized" relationships of their original stochastic models.⁷⁰⁵

⁷⁰⁴ Hans Poser (now emeritus) was a mathematician and professor of philosophy at the TU Berlin and temporary chairman of the German Society for Philosophy.

⁷⁰⁵ However, this transition from a statistically estimated stochastic model to its "expected value form" is based on well-founded justification (linear model with normally distributed shock variables and the mean value 0). There is no such justification if the hypotheses are interpreted as expected value hy-

However, at some point, I developed the idea that deterministic hypotheses can be used even if it is not assumed that they "actually" describe a stochastic relationship. In this case, they simply describe "the formulator's view of the hypothesis", and when formulating a hypothesis in question, he does not think of a stochastic relationship simply because he is often unaware of the basic concepts of probability theory.

Furthermore, it became clear to me (s.p.406) that in the light of an Integrated Target Commitment Planning, only the uncontrollable basic parameters could be considered as stochastic model parameters (and, therefore, as stochastic "model contaminants"). Thus, I realized that only for hypotheses that contain uncontrollable basic parameters as hypothesis parameters, the question of their stochastic character arises. This applies, for example, to the exchange rate hypothesis

Sales-in-Euro = Euro-Dollar exchange rate • Sales-in-Dollar,

with the "Euro-Dollar Exchange Rate" as an uncontrollable basic parameter.

But also with regard to such hypotheses with uncontrollable basic parameters (hypothesis parameters), I have come to the conclusion that their model parameters should not be described as stochastic parameters in models of an Integrated Target Commitment Planning. As a result, no stochastic hypotheses are contained in the models of the Integrated Target Commitment Planning. All hypotheses, which are formulated there in the form of algebraic equations, are not to be interpreted as (determinized) expected value hypotheses. Rather, they have the status of pseudo-deterministic hypotheses.

How does an approach to develop such pseudo-deterministic hypotheses look from the perspective of a model developer?

Assuming that a model developer formulates a hypothesis in the system of the Integrated Target Commitment Planning with uncontrollable basic parameters, which serves to forecast the value of the explained variables of this hypothesis for the upcoming planning period. This hypothesis leads to a pure forecast because its parameters (as uncontrollable basic parameters) cannot be influenced by the model developer and planner. The model developer (or the planner) knows that the predicted numerical value will not occur. Nevertheless, he assumes this assumption of a "quasi certainty". The so-called conjectural price-demand function, which is used in microeconomics, falls (s.p.376) also into this category.

However, how can such a pure forecast be "justified"? Can they be traced back to some kind of established inductive procedure (such as a least squares estimation)? I am not aware of any justification. The only "justification" would be the statement given to me by M.T. Commes, then head of planning at Siemens AG, in the "Integrated Corporate Planning" working group of the Schmalenbach Society: *"We must assume some kind of forecast; otherwise we could not plan at all"*.⁷⁰⁶

Whether such pseudo-deterministic hypotheses are among the hypotheses of the deterministic decision theory is a question of definition. Thus, Laux, Gillenkirch, and Schenk-

potheses in a planning model.

⁷⁰⁶ See page 408.

Mathes define deterministic decision models in their standard work in this way: ⁷⁰⁷ *"The deterministic decision models take only one characteristic into account for each decision-relevant date"*. This statement is immediately followed by a kind of justification for its application: *"Such models may result from the fact that the nature of the decision-relevant data is certainly known...."*. This is hardly the case with the hypotheses (such as the exchange rate hypothesis) with parameters that cannot be influenced. The sentence goes on: *...but also from the fact that although there are multi-valued expectations about these characteristics, for reasons of simplification certain values are assumed in each case and thus calculated as if they were (quasi) "safe"*.

From this labeling, one could conclude that the pseudo-deterministic hypotheses (and only those with uncontrollable hypothesis parameters) are a type of hypothesis permitted by the deterministic decision theory.

Bamberg, Coenenberg and Krapp, who have written another standard work on decision theory, remark on the epistemological status of deterministic models: *"In the decision theory these simplifications are unsatisfactory; only if the uncertain expectations are explicitly recorded in the model is it possible for the decision maker to analyze the risks and opportunities associated with the individual actions and thus arrive at a decision appropriate to the actual situation and his risk propensity"*.⁷⁰⁸

Here it becomes clear that Bamberg, Coenenberg, and Krapp see deterministic models only as simplifications of the reality to be depicted.

I do not share this view. My demand for the exclusive use of pseudo-deterministic hypotheses in operational planning models, which is not regarded as a makeshift solution, "prohibits" any use of probability relationships in these models. And only such non stochastic models are used by companies to carry out their annual operational planning without the need to "stochastise" them. The SAP-CO system is a significant example of this.

My "turning away from probability" was not easy, as reported, especially since my academic environment was and is largely attached to "probability thinking". That is why it really did me good when I stumbled upon an interview with Reinhard Selten, a man whose scientific achievements were honored with a Nobel Prize. He gave an answer to this very question, which seems to me to be the right one.⁷⁰⁹ *"People do not form a probability distribution in their minds. If they form expectations, then perhaps these are point expectations or qualitative expectations, although it is not at all said that they form expectations at all."*

This closes the loop to the encounter with Alfred Wagenhofer, from whom everything

⁷⁰⁷ Laux, H., Gillenkirch, R-M., Schenk-Mathes, H.Y. *Entscheidungstheorie*, 8th Ed., Berlin 2012, p. 52. The authors' reference (p.53) *"Stochastic models are at the forefront of this book"* is characteristic of the focus of all literature in this field.

⁷⁰⁸ Bamberg, G., Coenenberg, A.G., Krapp, M. *Betriebswirtschaftliche Entscheidungslehre*, 14. Ed, München, 2008, p. 40.

⁷⁰⁹ Institutional-Money, Issue 3/2010 http://www.institutional-money.com/magazin/theorie-praxis/artikel-/test-4/?tx_ttnews%5Bpointer%5D=3&cHash=93634d636006006c91ffec73129044c4 from 1.4.2010.

started. In retrospect, I should actually be grateful to him for rejecting my request to discuss my approach with him. Because his refusal finally led me (at least from my point of view) to establish a conclusive link between the normative agency theory and the Integrated Target Commitment Planning.⁷¹⁰ By proving to be a specific variant of the agency planning (or the normative agency theory), the Integrated Target Commitment Planning can seamlessly combine the entire normative agency theory with Simon's approach of bounded rationality and the classical deterministic decision theory. Thus, the Integrated Target Commitment Planning or the hidden-effort agency planning actually proves to be exactly what Wagenhofer declares as the primary goal of his research (s.p.398), namely as a contribution to the "*application of analytical models of the agency theory*".

⁷¹⁰ See also page 578.

29. Wagenhofer's view of the normative agency theory and its application

As reported, Alfred Wagenhofer told me at a meeting in Graz in 2008 that he was not interested in taking a closer look at the system of the Integrated Target Commitment Planning (s.p.398). Since he represents the field of controlling and the Integrated Target Commitment Planning is an operational control system, the attempt to arouse his interest in this system was not entirely unfounded. However, everybody has to set priorities even in his own field. In retrospect, I could only rejoice at his rejection, as it has led to the reconstruction of the Integrated Target Commitment Planning as a procedure of the normative agency theory. This reconstruction, which was only briefly described here, was carried out in the mentioned text *"The Integrated Target Commitment Planning as a Procedure of the normative agency Theory"*⁷¹¹.

One can imagine that I was very interested to know what Alfred Wagenhofer would say about this reconstruction. Because now I had landed in his area, so to speak. That which did not interest him so far should, so my claim, now prove to be the only application-relevant normative agency theory. In view of the fact that, as Wagenhofer himself expressly emphasizes, he is researching the application of models of the agency theory, he should now be interested in this approach.

Alfred Wagenhofer was, at my request actually, willing to talk with me about the connection between the Integrated Target Commitment Planning and the theory of the normative agency theory and I sent him a copy of this "History...", which still contained the now-more outsourced text *"The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory"*.

I had asked Alfred Wagenhofer to discuss this new variant of the agency theory with him. However, this would also mean talking about the planning procedure of the Integrated Target Commitment Planning. For it has now been systematized as a variant of the normative agency theory called *"hidden-effort agency theory"*. In my estimation, however, it could only be a controversial discussion. For he could hardly accept the "de-stochastisation" and "de-maximization" of the currently relevant agency theory that I propagated. I was already looking forward to the fact that it would now go into detail.

The top of my hubris, however, as already mentioned, was to claim that with the Integrated Target Commitment Planning and Control a normative theory was created which in the case of an operational annual company planning, combines the decision theory, the normative agency theory and the normative theory of satisficing planning in a single normative theory.⁷¹²

Such a not very modest assertion could only be accepted with extreme skepticism by all

⁷¹¹ Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory*, op. cit., www.Inzpla.de/IN46-2015.pdf. (Text in German, title translated).

⁷¹² See pages 4, 413 and 506.

those working in this area. And among all my colleagues, Wagenhofer seemed to me to be the most suitable person to articulate this skepticism in a coherent way.

In early November 2014, I flew from Berlin to Graz to have this conversation with him. It started the next morning after my arrival punctually at 8.30 o'clock, and it was planned 90 minutes. I already knew Alfred Wagenhofer from meetings and conferences and was as impressed by his appearance as before.

He looks extremely young at 55. A slim, tall and sporty appearance, similar to a well-trained handball player. Due to his intellectual habitus, combined with his youthful appearance, he could be considered a private lecturer in theoretical physics. His friendly and trustworthy charisma gives the impression that he probably gave him the reason to call him a mother-in-law type in younger years.⁷¹³

However, the youthful appearance should not deceive. Wagenhofer is one of the most important, if not the most important representatives of today's business administration. His activities, members, honors and scientific achievements are unparalleled and extremely impressive. They are also documented in the fact that he was appointed to the Austrian Academy of Sciences, an honor that is bestowed only on very few. The appreciation of his person, which precedes the text of his (and Ewert's) work "Internal Corporate Accounting", shows his many activities and awards (s.p.441).

However, this appreciation, impressive as it may be, does not reveal Wagenhofer's influence on the scientific community in the field of accounting.

As the editor of two journals (Zfbf and SBR) and a member of several editorial boards of top English-language journals, such as the only German speaker in the *Review of Accounting Studies*, he has an immense influence on the publication possibilities of his colleagues in German and English-language journals. He also influences the level of knowledge of English-speaking experts on controlling research conducted in German-speaking countries by writing an overview article on the subject of "Management accounting research in German-speaking countries" in the relevant journal "Management Accounting Research". The Handbook of Management Accounting is the representative state-of-the-art work of English language management accounting. There he published (with Ewert) an article entitled "Management accounting theory and practice in German-speaking countries". It is not expected that its potential to make the contributions of German controlling research in the English-speaking area known or not known will change in the future.

With regard to Wagenhofer's assessment in the scientific community, it is worth mentioning that he is a member of the "Corporate Accounting" committee of the Association for Social Policy. This committee is, so to speak, the *crème de la crème* of university teachers in accounting. Members are accepted (as at the *academie francaise*) only by co-optation. The committee has (2014) no website, so the names of the members are not of-

⁷¹³ Judge for yourself: <https://www.google.de/search?q=alfred+wagenhofer&sa=X&biw=1280&tbm=isch&tbo=u&source=univ&ei=wiAwVej3NovYapSIgagJ&ved=0CDsQsAQ&bih=975>. This assessment is not intended to be offensive. I myself was often referred to as a mother-in-law type, which was true.

ficially known.⁷¹⁴ It is the dream of many university teachers of accounting to be accepted into this exclusive committee.⁷¹⁵

Wagenhofer's influence in the scientific community is also documented by the fact that, together with Küpper, he is the editor of the "*Hand-dictionary of corporate accounting and controlling*". He thus decided who of the large number of potential candidates was allowed to make a contribution in this "state-of-the-art work" and he will, therefore, also decide in the future who will be considered for this in further editions. According to Blohm's evaluation procedure (s.p.501), he heads German business administration together with Küpper.

All in all, Wagenhofer dominates the scene by far in front of everyone else. And no one who still has ambitions in the field of accounting should mess with him.

The conversation.

It was a most unusual conversation as I have never experienced it in this form. Wagenhofer spoke about ninety percent of the time. And it was difficult to interrupt his flow of speech to steer the conversation in a direction that interested me.

Talking and expecting others to listen is an occupational disease of many university lectures. However, you can recognize a star by the fact that colleagues also listen without contradiction, although they would also like to talk. Because he has speech priority. This is the communicative pecking order in a scientific community. Usually I do not put up with this, but in this case, I may have been somewhat prejudiced by the effort of the travel to Graz and my expectations.

I would like to divide the discussion into three sections and add a commentary. These sections are 1. *Wagenhofer's ban on concretization*, 2. *De-stochastisation* and *de-maximization* and 3. *Showing where the hammer hangs*.

Wagenhofer's ban on concretization

According to the *variété* principle, namely the principle: '*the best*' should always be brought last'; this point should actually be treated last. Because it is the most interesting with regard to Wagenhofer's credo as the authoritative expert representative of the agency theory. However, the order here is chronological and "the best" actually came first.

As mentioned I had sent Alfred Wagenhofer a version of this text in which he could read how I have reconstructed the Integrated Target Commitment Planning as a normative procedure of the agency theory. And I had asked him to discuss this procedure with me.

⁷¹⁴ However, the chairman is mentioned by name on the website of the *Verein für Socialpolitik*. It concerns (in 2014) Dieter Pfaff. In my private name storage, he is called the "RoI-Pfaff" because he considers (for me not understandable) the DuPont definition of the RoI as "*one of the most important formulas of business management*", which originated from the "*ingenious idea*" of a controller (see page 366f.). Dieter Schneider and Hans-Ulrich Küpper can also be identified as members of this committee in this "Group picture without a lady", which can be called up online if their appearance should be known to the user. See: <http://www.bwl.uni-muenchen.de/personen/emmerprof/ballwieser/forschung/socialpolitik/index.html>. They also appear in this "History...". See page 306 for Küpper and page 452 for Schneider. Meanwhile (2018), the chairman, and also the names of the members are visible.

⁷¹⁵ According to the last edition of the list of members (2014) of the Association of University Professors of Business Administration, 338 university professors have assigned themselves to the subject "Accounting" (see page 618f. of the list in this edition).

At the very beginning of the discussion, however, he blocked this discussion with what I would describe as '*Wagenhofer's ban on concretization*'.

For Alfred Wagenhofer first made it clear that it was not the aim of normative agency theory to concretize its normative models in such a way that they could be applied to individual cases.

To hear such a demand from a specialist whose primary research objective, I must repeat, is "*the application of analytical models of the agency theory*", I found this almost sensational. Then I asked him, "*but somehow the normative agency theory must nevertheless be connected to reality?*" He replied, "*There are already feedbacks*".⁷¹⁶ Then I asked him what feedback there are which lead "*downwards*".

He replied that the agency theory could help people to become aware that information costs something, that different information situations exist, that everyone tries to maximize his utility and that one has to try to achieve that the objectives coincide as much as possible, and so on.

I thought to myself, my God, these are all insights that can be agreed upon immediately. To arrive at such trivial conclusions, one does not need such voluminous stochastic optimization models which the agency theorists of management accounting use.

I then interrupted his general remarks (it was a lecture), which normative approaches of the agency theory could serve managers to accomplish their tasks, with the remark that I could agree to everything. However, I would only be interested in a small area that a normative agency theory could cover with its "*feedback downwards*", namely the area of annual operational planning and control.⁷¹⁷

Then I asked him what specific instructions could, in his opinion, be provided by the normative agency theory to central controlling and also to the area managers to support their planning and control? Thereupon he stagnated at first and then said, "*No direct*". Then I asked which indirect ones? He said that such theories could be useful to recognize that there are area managers in the negotiations who want to hide information and that strategies need to be developed to obtain this information, etc. This was the "application" of the normative agency theory in the context of an operational company planning. The topic of "application" was thus over for him. And as a result, he was obviously no longer prepared to say a word about my "applications" of the normative agency theory. It was the same situation as at our first meeting when he told me that he was not interested in the procedure of the Integrated Target Commitment Planning (s.p.398). Only this time he gave a reason for it. And this could be deduced from his behavior. It reads: Since the models of the normative agency theory should not be concretized down to an individual case, I am not interested in the models you are trying to use.

Wagenhofer had thus set up an astonishing methodological prohibition sign. And that was the most important message of the conversation.

In view of Alfred Wagenhofer's rejection, however, a distinction still needs to be made.

⁷¹⁶ He certainly spoke of "*feedback*". As soon as certain names such as "*feedback*", "*interdependencies*", "*coordination*" or "*system drivers*" come up in a conversation, my attention increases by leaps and bounds. For me, these are terms with which I associate fixed model-based ideas. For the use of the term "*interdependencies*" at Küpper and its model-based assessment, see page 317.

⁷¹⁷ But he's not that small. According to the study quoted elsewhere (see page 317), operational planning, control, and reporting take up about 90 percent of the working time of controllers.

The hidden-effort agency planning, which is identical to the Integrated Target Commitment Planning, differs from Wagenhofer's agency planning through a "de-maximization" and a "de-stochastisation." For Wagenhofer, whose entire system of "*analytic modeling*" is based on the two paradigms "maximization" and "stochastisation", this can only be an unbearable imposition (s.p.410).

It was, therefore, obvious that Wagenhofer rejects the hidden-effort agency planning (or the Integrated Target Commitment Planning) as a variant of the normative agency theory for which he is not responsible, and which, therefore, does not need to interest him.

However, as reported, I also developed a plan cost-performance model for the hidden-action agency planning.⁷¹⁸ And this is a model which represents a concretization of Wagenhofer's hidden-action-agency theory hypotheses however without any empirical content.⁷¹⁹ According to Wagenhofer's view, however, such a model must not be developed either, because, as already mentioned, it is not the goal of the normative agency theory to drive down its normative procedural rules and model hypotheses to the individual case by concretizing them.

What a pity that Wagenhofer, therefore, did not consider it necessary to comment on or criticize this hidden-action agency model. With this model a two-stage optimization takes place exactly in line with the hidden-action agency theory. So the *principal* (corporate management) selects an alternative that maximizes its utility i.e., the operating result.

The alternative space of this maximization is formed by these alternatives which, depending on the parameters of the compensation function, lead to a maximum utility for the agent and result in a compensation for him which corresponds to the $RSAC^{OR-max}$ multiple of the financial result (s.p.385). The utility variables of the *agent* and the *principal* are stochastic variables whose expected values are used. Everything takes place in Wagenhofer's world of the hidden-action agency theory, a world of optimization and stochastics.

However, as mentioned (s.p.385) the whole example was connected with an unpleasant result. Because it turned out that with plausible assumptions regarding the three hypotheses (compensation hypothesis, effort hypothesis, and x-a-hypothesis) the agent's compensation is higher than the operating result. This is such an absurd consequence of an (optimal) hidden-action agency planning that one can only reject the entire planning approach based on such a result.

The concretization of the general hidden-action agency theory I practiced is certainly to be criticized. One could object, for example, that the agent's action variables used in the plan cost-performance model represent an impermissible concretization of the term "action variable" of the general hidden-action agency theory.⁷²⁰ If this objection were justi-

⁷¹⁸ See: Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory*, op. cit., p. 32, www.Inzpla.de/IN46-2015.pdf. (Text in German, title translated).

⁷¹⁹ On the concept of empirical content and its relationship to falsifiability, see: Zwicker, E., *Grenzen und Möglichkeiten einer empirisch fundierten Betriebswirtschaftslehre (Limits and Possibilities of an empirically founded Business Economics)*. In: Steinmann, H. (Ed.), *Betriebswirtschaftslehre als normative Handlungswissenschaft*, Wiesbaden 1978, p. 266f. www.Inzpla.de/Grenzen-BWL.pdf.

⁷²⁰ For a discussion of this objection, see page 402.

fied, then a discussion of this absurd result would be superfluous.

However, Wagenhofer had not yet made a proposal as to how the agent's action variable could be introduced as a model variable in a cost-performance model of the hidden-action agency planning. Since his two articles from 1992 and 1993 (s.p.397), which were judged to be rather inadequate, he has apparently not come to any further conclusions as regards the specification of agency models in the area of cost-performance accounting. Unless one regards his ban on concretization as a higher kind of increase in knowledge.

Wagenhofer's ban on concretization, therefore, applies not only to the "degenerate" because "de-maximized" and "de-stochastised" (Zwicker's) hidden-effort agency models but also to (Wagenhofer's) models of a normative hidden-action agency theory, i.e., his central field of activity when it comes to the topic "agency theory" and its application in the area of cost-performance accounting.

It would have been very interesting to take a closer look at the agent's "over fifty percent share". Wagenhofer has written a fundamental article on the methodical procedure of "analytic modeling". In this article, he points out: *"The best justification for the use of a model is if the result is surprising relative to prior knowledge"*.⁷²¹

The result that an agent always receives a share of over fifty percent of the operating result under the assumption of a square effort function of the agent and a linear compensation function is indeed an extremely *"surprising relative to prior knowledge"*. However, it is by no means *"the best justification for the use of a model"*, but *"the best justification for the rejection of the use of this hidden action agency model"*. However, Wagenhofer's ban on concretization does not allow such a review.

Wagenhofer's view of methods

The situation created by Wagenhofer's ban on concretization reminds on a story told about the German philosopher Friedrich Wilhelm Hegel. After one of his lectures, a student approached Hegel and said, *"Professor Hegel, your theory does not agree with the facts at all"*, to which Hegel replied, *"All the more regrettable for the facts"*.

In a similar way, a student could address Alfred Wagenhofer after a lecture with the words: *"Professor Wagenhofer, the rules of conduct that you derive from your agency models are so little concrete that they cannot be applied to individual cases at all"*. Then Wagenhofer: *"All the more regrettable for the individual cases"*.

Wagenhofer's feedback downwards examples are in no way *"surprising relative to prior knowledge."* Therefore, it's maximizing and stochastising normative agency models in the area of controlling, i.e., a discipline ultimately oriented towards an application, must also be assessed as irrelevant.

The ancient Romans already knew the saying: *"The mountain was in labor and has born a mouse."* However, this does not apply to Wagenhofer's model analyses. What comes out of them are his *"feedback downwards-insights"*, however, these insights do not need to be born because they are already well known.

⁷²¹ Wagenhofer, A., Accounting and Economics: What We Learn from Analytical Models in Financial Accounting and Reporting. In: Leutz, C., Pfaff, D., Hopwood, A., (Ed.) *The economics and politics of accounting*, Oxford, 2004, p. 26.

Wagenhofer's justification theory that the "*best justification*" for the "*use*" of a model is a "*surprising result*" for the user also fails. Whether the result of a model analysis is "surprising" or "not surprising" is by no means a criterion for the "*use*" or more precisely the applicability of a model. A model can only be accepted as a forecast model if it can be falsified, i.e., if observable circumstances can be stated which, if present, indicate that the forecast carried out with the model is false.⁷²²

However, such falsifiability is not possible at the abstraction level chosen by Wagenhofer for his agency models. They do not have the concretization degree of the planning models of an annual operational planning. And such a concretization, which could make a theory falsifiable and thus verifiable, is prevented by Wagenhofer's ban on concretization.

In ancient Rome, it was customary for a bridge builder to have to place himself under the bridge he had built when it was released for use through the passage of several heavy goods carts. Wagenhofer's agency constructs are airlifts. He can stand confidently under them, for they cannot collapse. They do not need a bridge test (or an empirical justification) by applying it to the individual case.

If one recalls Wagenhofer's ban on concretization and then also his attempts to be "somehow" connected to reality through "*feedback downwards*", then one can already get an idea of what his "agency world" looks like. However, when he then explains on his website - I must repeat it again - that the focus of his research is on the "*application of analytical models of the agency theory*".... what else can we say?

But when someone says, "*The Zwicker can criticize well. But what about the empirical relevance of his theory?*" Principally it is not necessary to be a good shooter in order to determine whether someone has hit the mark. However I would still like to address this question. However, the final assessment of my contribution as I see it will be made later (s.p.505).

I have tried at least with some success to apply the Integrated Target Commitment Planning models in practice. This was done by parameterizing a hyperstructure model comprising a potentially infinite number of application cases into numerically concrete planning models that describe an individual case. And this procedure is nothing else than the concretization of a hypothesis system with a potentially infinite range of individuals of an empirical theory to a singular hypothesis system, which describes an individual case.

The singular hypothesis systems of individual companies generated in this way (in the form of equation models) also served to implement a specific planning procedure.⁷²³ At Thyssen-Krupp Steel, the probable world's largest plan cost-performance model was modeled in the categories of the Integrated Target Commitment Planning (or the hidden-effort agency planning). And this model was used to carry out the annual operational planning of Thyssen-Krupp Steel for four years.⁷²⁴

And a "normative theory" or the planning logic to be practiced with these INZPLA-models has been developed. However, not as with Wagenhofer in the form of an expecta-

⁷²² See pages 30 and 241.

⁷²³ See page 498.

⁷²⁴ See in detail page 336.

tion value maximization of models that are not connected with reality. The “normative theory“ is a "new planning logic" in the form of a target commitment planning. It contains a planning step whose rules prove to be a normative version of Simon's theory of a satisficing decision maker.⁷²⁵ And this normative theory of the Integrated Target Commitment Planning is also compatible with the norms of the classical deterministic decision theory so that it can also be applicate in the form of a mixed optimization basic Target Commitment Planning.

Finally, I reconstructed and systematized the whole procedure as a "de-stochastised" and "de-maximized" variant of the normative agency theory (called hidden-effort agency theory). The Integrated Target Commitment Planning, therefore, proves to be the only normative agency theory in the field of an operational planning that is relevant in practice (and, therefore, defies Wagenhofer's ban on concretization).

De-stochastisation and de-maximization

From the very beginning, I was quite sure that the representatives of the previous agency theory and thus also Alfred Wagenhofer will not accept any normative agency theory that does not work with stochastic models and whose planning was not based on maximizing the principal utility.

With extensive considerations (s.p.415) I tried to justify that an operational planning can be carried out with cost-performance models which are based on a normative and even practice-relevant agency planning. However these models must be "de-maximized" and "de-stochastised". This demand of a de-maximization and a de-stochastised can certainly not meet Wagenhofer's approval. A fish in an aquarium would also not be pleased if you would drain the water in which it moves.

After the ban on concretization had been so explicitly formulated, it was clear to me that he was no longer prepared to discuss my hidden-action concretization and certainly not to my attempt to interpret the Integrated Target Commitment Planning as a further variant of the normative agency theory (s.p.416). Therefore, it could only be my goal to talk to him about certain single points. And that was not so easy, because as already mentioned, he talked (or rather lectured) ninety percent of the time, and I usually had to interrupt him directly in order to steer the conversation in a different direction.

For me, it was now only a matter of "maximization" and "stochastisation" as necessary or not necessary elements of planning.

Maximization. As described, the system of a pure Integrated Target Commitment Planning does not maximize, but only treats target commitment alternatives with regard to achieving a top target value and in particular a value of the "operating result".

As part of the top-down planning, i.e., the second planning step of an Integrated Target Commitment Planning, the central planning tries (which does not always succeed) to determine certain target commitments of the areas that lead to a certain utility level of the corporate management utility, i.e., a certain value of the operating result, not being undershot.

⁷²⁵ Simon received the Nobel Prize for this descriptive theory of a satisficing decision maker, see page 480.

Therefore I asked Alfred Wagenhofer whether the attempt (as with the Integrated Target Commitment Planning) to carry out planning in such a way that a certain aspiration level, such as a value of the operating result, is not undershot, i.e., no maximization is carried out, could not also be a planning procedure.

He replied that such an approach was also a kind of maximization, it would be a maximization that would be stopped beforehand, namely if the intended level of aspirations of the target quantity in question had been reached. With this argumentation, he had categorized the aspiration level planning (or satisficing planning) as an "aborting maximization procedure" and thus consistently included it in his "maximization world".

I have not replied to this classification of an aspiration level planning as an early termination of maximization. It would have required a somewhat more detailed explanation, which would have been difficult to attain in view of the linguistic dominance of my interlocutor. In my answer, however, I would have raised the same objection, which is later put forward in an extended form on the occasion of the discussion of Herbert Simon's concept of a satisficing planning (s.p.489) against the planning of an aspiration level as a procedure of an "aborted maximization".

This objection, which is only briefly described here, is based on the assumption that a model is to be used to plan the aspiration level.

This model-based approach is thus in the area which Wagenhofer calls "*analytic modeling*". From this model-based view, an optimization in question is always an optimization based on a decision model that works with quantitative variables. It is characterized by a target function, certain constraints, and well-defined decision variables.

However, if the target value of such a decision model is to be maximized, then it does not make sense for Wagenhofer to stop a search algorithm for certain combinations of values of the decision variables and thus the actions to be realized if a certain value of the target value (such as an operating result of € 10 million) has been reached. What reasonable person would put such an "aborted maximization" into practice?

It would always be appropriate to use a powerful optimization method that determines the combination of decision variables that maximizes the target quantity (e.g., the operating result). An "aborted maximization" à la Wagenhofer makes no sense if one uses a decision model.

However, the aspiration level planning, which is implemented in the Integrated Target Commitment Planning system, does not use decision variables to perform (an aborted or not aborted) maximization. Here, the central planning determines as part of the top-down planning step the combinations of the basic target commitments of all areas (the top-down basic targets), which should not fall below an operating result (e.g., € 10 million) specified by the corporate management. Such a satisficing aspiration planning is, in this case, a "reasonable procedure" and an "aborted maximization" in Wagenhofer's sense is not practiced here because of the absence of decision variables. It would have been impossible to raise this objection in view of the hardly interruptible flow of words of my conversation partner.

Stochastic. Then I asked Wagenhofer whether he had looked at my pseudo-deterministic concept of modeling that rejects the use of stochastic models.⁷²⁶ His reply was that the assumption of a stochastic world is the prerequisite for any planning. From this, it can be concluded, which he did not explicitly say, that only a stochastic model could adequately describe this stochastic world. In principle, there are no objections to this view.

I just repeated my claims that companies do not use stochastic parameters such as stochastic production coefficients or stochastic exchange rates in their annual planning models and that the SAP-CO system would not allow any model parameter to be defined as a stochastic parameter, even if one would like to do so.

And then a remark followed, which can be regarded as provocative, because I said, "In the working group 'Integrated Corporate Planning' of the Schmalenbach Society, to which I belonged (s.p.524), were the heads of planning of some of the largest German companies. At one of the meetings, it was discussed in detail how the exchange rates required to carry out an annual operating plan could or should be determined (s.p.411). If I would have said in this context: *'Just estimate a normal distribution of the euro-dollar exchange rate and then take the expected value'*, then I would no longer have been taken seriously."

After this remark, the conversation went in a direction that astounded me a little. For Wagenhofer replied: *"They have always the option to hedge the exchange rate"*. I replied that this is obvious, but such an approach was not under discussion; rather, the participants assumed that it would not be hedged.

Then he said, that since the exchange rate is known, it could be "computationally isolated."⁷²⁷ This is correct if you want to do a variance analysis but it has nothing to do with the demand that the exchange rate in an agency model a la Wagenhofer is to be described in the form of a probability distribution, with whose expected value one can then continue working. And it has nothing to do with the demand that the exchange rate in an agency model a la Wagenhofer is to be described in the form of a probability distribution, with whose expected value one can then continue working.

Wagenhofer clearly stated that for him a normative agency theory without the use of stochastic models was out of the question. This is an essential for him. I pointed out; it is only a question of definition, what one has to understand by a (normative) agency theory. As he agreed with me, I suggested that in the future we could distinguish between Wagenhofer's agency theory (the W-agency theory) and Zwicker's agency theory (the Z-agency theory or the Integrated Target Commitment Planning). This led him to a mild smile.

Finally, in the stochastic discussion, I brought out my "strongest gun", namely Reinhard Selten's (s.p.412) statement, *"People do not form a probability distribution in their minds"*. He replied that Selten had also worked with probabilities in his theoretical investigations. Then the stochastic topic was off the table.⁷²⁸

⁷²⁶ See pages 404 to 409.

⁷²⁷ In the normative hidden-action agency theory, which is the topic of Wagenhofer, it is as mentioned (see page 394) not allowed that an uncontrollable variable (as here the exchange rate) may be "known", because otherwise, (so Wagenhofer) one could conclude back to the work performance (the work input), which is assumed, however, as not known.

⁷²⁸ Neither argument is convincing. Mine was by no means a "strong gun", and thus a compelling factual

Showing where the hammer hangs.

After the stochastic topic had ended, Wagenhofer steered the conversation on a more general path. He said, looking at me almost sympathetically, "*science isn't interested in costing. It is regarded as given*". Since I had not asked him about it at all, I knew what he meant. In a nutshell, it meant, "*what you're doing doesn't interest any scientist, so of course that goes for me, too*". Then he added one more thing by adding in a regrettable tone: "*And the flexible plan cost accounting no longer has any significance today. In most companies, there are almost only 'fixed costs'*". His message was free and frank: "*The whole system you have developed is for nothing*". I already have a feeling for such situations, and that was clearly meant.

I replied that Paul Sharman, the former President and CEO of the *Institute of Management Accountants* (IMA), assessed the practical relevance of the flexible plan cost accounting somewhat differently from him.⁷²⁹ Sharman regards the flexible plan cost accounting system widely used in Germany as an important procedure and resolutely demands its dissemination in the USA. And I pointed out to Wagenhofer that, as I knew, Paul Sharman had met him personally during a visit to Europe, and he would, therefore, probably also know Sharman's view. Wagenhofer reacted to this hint in the following way: yes, yes, I know that.⁷³⁰

For me, these statements were a deliberate affront. It was clear to me that Wagenhofer only judged the flexible plan cost accounting so negatively because it forms the starting point of the Integrated Target Commitment Planning.

However, it is significant that this assessment about the relevance of the flexible plan cost accounting stands in stark contrast to what Ewert and Wagenhofer write in their work "Internal Corporate Accounting" about cost accounting and especially about the flexible plan cost accounting.

In this work, they expressly emphasize the high relevance of cost accounting and quote Männel as saying: "*Cost accounting has developed into a very important instrument of corporate accounting*" (p.11). And later they say: "*Marginal costing*"... "has found a great practical diffusion" (p.697).⁷³¹

argument, but rather an "argument of authority" based on Reinhard Selten's scientific competence and Wagenhofer's counterargument was a so called "tu-quoque argument" against Selten. But that's the way discussions work.

⁷²⁹ See: *An American Perspective on German Controlling, Unexpected Praise for German Controlling Practice, Interview with Paul Sharman, ACMA, President CEO, IMA*. In: *Controlling & Management*, 49 (2005) Issue 5, and Zwicker, E., *Management Control Systems in the Light of the Integrated Target Commitment Planning* Berlin 2016, p. 38 www.lnzpla.de/IN52-2016.pdf. (Text in German, title translated).

⁷³⁰ See also (on page 186) Kaplan's propagated procedure for the determination and elimination of articles as a major innovation in established management accounting. It requires the application of the flexible plan cost accounting.

⁷³¹ Ewert, R., Wagenhofer, A., *Interne Unternehmensrechnung*, 8th Ed., Heidelberg, 2014. The highlighting is done in the original. In the original, the highlighting is locked, and the text is printed in normal font.

The question of the relevance or irrelevance of flexible budgeting was discussed elsewhere.⁷³² Nevertheless, it is to be included here again. It is quite appropriate to discuss the "relevance" of the flexible plan cost accounting. A relevance indicator would be, for example, the ratio of the variable costs of all articles to the sum of their total individual fixed costs or also the ratio of the total variable costs of all articles to their total fixed costs.⁷³³ Even if the variable costs of the articles are "low" in relation to the fixed costs, then they should hardly be neglected when carrying out an operational planning.

Even if there were only fixed costs in a company, it would be possible (which Wagenhofer apparently missed) to use the Integrated Target Commitment Planning to carry out an operational planning. Only the fixed consumption commitments and the cost value commitments would then be available as basic targets. Incidentally, I would like to get to know a production company that has no costs that depend on the sales quantities.

Ewert and Wagenhofer's analyses and decision theoretical considerations are based in their work almost exclusively on the assumption that the marginal plan costs of a product are known. However, you can only determine these using the flexible plan cost accounting. If you delete everything in your work that concerns and presupposes the marginal plan costs, then almost the entire text is superfluous.⁷³⁴

The importance of cost accounting for the training of business economists naturally has nothing to do with what "*interest's science*" and, therefore, Wagenhofer. In this context, however, it is perhaps interesting to examine which areas of business administration are not of interest to "*science*" but are of importance to "*practice*".

From time to time, I had the opportunity to exchange ideas with Harald Wiedmann, then Chairman of the Executive Board of KPMG. In this context, he told me the following: KPMG has around 2,000 academic consultants worldwide who prepare an annual report in which, among other things, the question is to be answered as to what deficits in business management knowledge the consultants were able to identify in practice during their work. Several surveys showed that a lack of knowledge in the area of cost accounting was by far the most important deficit.

If "*science*" is not interested in cost accounting, "*practice*" shows at least a deficit of cost accounting know-how. And this deficit is (as we will see) not only not reduced by the book "Internal Corporate Accounting" by Ewert and Wagenhofer, but rather leads to a wrong focus setting and a confused theory, which does not reduce the observed deficit in the area of cost and performance accounting but increases it even further (s.p.441f.).

⁷³² Zwicker, E., *Management Control Systems in the Light of ...*, op. cit., p.35f, www.lnzpla.de/IN52-2016.pdf. (Text in German, title translated).

⁷³³ The numerical values of the cost sizes required for this comparison can be taken from an overlap diagram generated by the INZPLA-System, of which an example is given in Fig. 36 on page 136.

⁷³⁴ As far as the methods for determining the marginal plan costs in this work are concerned, however, Ewert and Wagenhofer reveal an astonishing ignorance. See page 445 for the somewhat satirical commentary on the conversation between Elisabeth and Günther. The quoted conversation itself comes from the work of Ewert and Wagenhofer.

End of the conversation

The end of the conversation was also somewhat extraordinary. Suddenly Wagenhofer interrupted his speech and pointed out that the conversation was now over because his office hours began. I looked at my radio-controlled wristwatch and was astounded by the sudden and unfinished conversation, and it was actually 10:00 a.m. to the second. This abrupt and above all very determined message, of the end of our conversation, was so surprising for me that I asked him (out of amazement and not irony) if I could still drink up my glass of water. While I did this with his permission, he took from a shelf the latest (8th) edition of his (and Ewert's) work "Internal Corporate Accounting" to give it to me with a dedication.

Passing by the up to now not existing queue of waiting students, I strove towards the next set of seats on the same floor to recapitulate the course of the conversation and to take some notes about it. The conversation was quite unsatisfactory. Although I am an old hand, Wagenhofer had taken over the leadership of the conversation (and thus also the part of the speech) to an extent that I had never experienced before in a "scientific one-on-one conversation". Even with Jay. W. Forrester (s.p.16), who was a completely autocratic person, I had a more balanced conversation.

However, in the end, I found the pitiful statement that "*the cost accounting*" was no longer an issue for "*science*" and that "*the flexible plan cost accounting*" was no longer relevant as a targeted provocation. The message had been received.

As soon as I sat in my chair and had not yet started recapitulating the conversation, one thing was evident to me: In the end, he wanted to make it completely clear to me that I should not give in to the illusion of communicating with him at eye level. The reference to my out-of-date field of research should eliminate the last doubt that he wants to demonstrate me "*where the hammer hangs here*".

However, something like this does not upset me; it really gets me into action. And I immediately thought to myself, "*Well, let's see if it's really appropriate to act with such arrogance*". What could be more obvious in such a case than to analyze his work "*Internal Corporate Accounting*" published with Ewert, i.e., his "opus magnum", once really in-depth from the point of view of the Integrated Target Commitment Planning. Until then, I had always avoided working through this book thoroughly. Now I was motivated. And this work, which was ahead of me, could perhaps contribute to improve the Integrated Target Commitment Planning.

30. Ewert and Wagenhofer's "Internal Corporate Accounting" in the light of the Integrated Target Commitment Planning

Ewert and Wagenhofer's monograph "Internal Corporate Accounting" differs significantly from the other works on cost-performance accounting. This view is also shared by the authors themselves when they point out that their work is characterized by an *"emphasis on information economic approaches"* (p.12).⁷³⁵ *"In doing so, the basic principles of the agency theory... are applied to corporate accounting problems"* (p.12). This focus corresponds to Wagenhofer's research activities.

Ewert and Wagenhofer's work is regarded by Richard Mattessich as an important contribution to cost-performance accounting, combining information economics with classical cost accounting. Mattessich's remarks on the field of information economics will be quoted in more detail below. But finally by quoting Mattessich's high estimation of their work we will come back to Ewert und Wagenhofer.

In his considerations of the *"history of analytical accounting"*, Richard Mattessich remarks (p.124) *"the crowning intellectual achievement" (of analytical accounting)... "was the slow but impressive development of the 'information perspectives' of accounting (including information economics the refined clean surplus theory and mathematical agency theory)"*.⁷³⁶

As Mattessich continues, Gerald A. Feltham and Joel S. Demski have made the basic contributions to this new field of research and received *"the highest research award of the American Accounting Association"* (p.132). Agency theory as a sub-area of the *"information perspective of accounting"*, therefore, plays a dominant role in the field of *"management accounting"* and this *"information perspective of accounting"*... *"has become the dominant area of analytical accounting research"* (p.133).

However, Mattessich also expresses doubts as to whether the results of this research can be regarded as a breakthrough. That's how he points it out:

"Whether these works mark a breakthrough in this field - i.e., extending the interest in this area from a relatively small elite of specialists to a broader or even global interest in analytical accounting - still is to be seen. But the mathematical rigor present in these publications (particular in the work of the two volumes by Christensen and Feltham with some 250 propositions and their mathematical proof) indicate that academic accounting may be on a critical threshold". And further: "The major items of critique against this approach are first that it is actually not dealing with 'accounting' but rather with the 'economics of accounting'... and second, that it is too esoteric..." (p.134).

This is a labeling of *"information economics"*, which in my opinion is fully acceptable. It was not without reason that I described Wagenhofer as an aloof theorist who broke off all relations (except for an obscure *"feedback downwards"*) to reality with his research direction.

⁷³⁵ The following page references refer to Ewert, R., Wagenhofer, A., *Interne Unternehmensrechnung*, 8. Ed., Heidelberg, 2014.

⁷³⁶ Mattessich, R., *A concise history of analytical accounting: Examining the use of mathematical notions in our discipline*. In: Spanish Journal of Accounting History, 2(2005) p. 123-153.

However, Richard Mattessich's above quoted text goes even further, and now Ewert and Wagenhofer come into play; "...too esoteric. Indeed most of its literature, as well as the books by Christensen and Demski (2003) and Christensen and Feltham (2003, 2005), operate with a conceptual apparatus very alien to the average accountant and, what may be worse, a neglect of the traditional tools used by accountants. But this hurdle may be overcome to some extent as proved by two German books on this subject (so far not translated in English). The first is by Ewert and Wagenhofer (1993/2003), dealing mainly with managerial accounting, while the second one, by Wagenhofer and Ewert (2003), concerns financial accounting. Both publications succeeded fairly well in combining major aspects of the information perspective with conventional accounting and, what is most important, without throwing the accustomed vocabulary and concepts over-board."

As you can see, Ewert and Wagenhofer's work on "*Internal Corporate Accounting*" is presented by Mattessich as the work that combines the traditional tools with the new direction of "*information economics*". As Mattessich turns out, they succeed in "*integrating major aspects of the information perspective with traditional accounting*." This is a remarkable judgment, and it comes from one of the most respected representatives of the history of accounting. Mattessich's assessment is still valid today, for there is no comparable work to date.

Ewert and Wagenhofer's approach of "*integrating major aspects of the information perspective with traditional accounting*" has also had an impact on the dissemination of their work. It has achieved a high degree of recognition in the field of "*management accounting*" or "*internal company accounting*" its degree of popularity goes far beyond the comparable English-language version of Demski's work "*Managerial use of accounting information*."⁷³⁷

Ewert and Wagenhofer's "Internal corporate accounting and the Integrated Target Commitment Planning.

It suggests itself to compare Ewert and Wagenhofer's work, which in Mattessich's view has taken the theory of "managerial accounting" to a new level of development, with the approach that has set itself a similar goal, and that is the Integrated Target Commitment Planning. Years ago I asked myself whether I should compare the Integrated Target Commitment Planning with Küppers or Ewert and Wagenhofer's work. One of these works with a high theoretical standard should actually be enough. And I chose Küpper because, as already mentioned, Ewert-Wagenhofer's work seemed too high-flying for me. It contained much more mathematics than Küpper's work, but something like that doesn't impress me at all. I have no reservations about mathematics. But too much mathematics in a text book (not an article) of business administration is a priori suspicious at first. Too easily it can be a text that is exhausted solely in mathematical self-satisfaction.

However, one thing was immediately clear to me. The "*theories*" offered there, including the agency theory, were not relevant to the Integrated Target Commitment Planning.

⁷³⁷ Demski, J.S. *Managerial use of accounting information*, New York, 1994. This is shown by a call from Google Scholar. Demski's work was quoted 278 times in scientific publications (on July 20, 2015). A total of 1,045 references were made to the works of Ewert and Wagenhofer.

Why should I be torturing myself with some outlandish theories? My starting point is and remains Kilger's work. There is a lot of sense in and from there I have tried to develop a comprehensive applicable theory of an operational company planning. In my opinion, Ewert and Wagenhofer's work could not contribute to this project.

But after the meeting with Alfred Wagenhofer in Graz and his arrogant appearance and above all his disparagement of cost accounting (s.p.426) I thought to myself: *"Now I will analyze this universally praised work in the light of the Integrated Target Commitment Planning after all"*.

The type of analysis intended and carried out in this way could be described as "textual analysis of differences". Its approach consisted of going through Ewert and Wagenhofer's work, chapter by chapter, and examining what the authors had to say on the subject of an operational planning and control with cost-performance models. The relevant explanations are then compared with the corresponding explanations on the Integrated Target Commitment Planning and then critically analyzed from the point of view of this normative theory.

As a result, all considerations not related to operational planning and control with cost-performance models were ignored. This applies, for example, to the entire 9th chapter "Investment Controlling". With this approach, an attempt should be made to reconstruct Ewert and Wagenhofer's text whenever it is possible, based on models, and then assess it on this basis. The reconstruction of the Balanced Scorecard as an Integrated Target Commitment Planning procedure described elsewhere is an example of this.⁷³⁸

Such an approach does not lead to a "book review", which takes place in a technical journal on the basis of a few pages. Rather, extremely detailed and extensive investigations were required. They cannot, therefore, be reproduced fully in this text either. It would also give them too much weight. Because the result is (as will be explained later) from my point of view devastating.

The discussion of the book by Ewert and Wagenhofer in view of the Integrated Target Commitment Planning can be called up separately according to the chapters dealt with. So far, only three of the chapters discussed are available, as well as a somewhat satirically colored view of Katharina and Elisabeth, who appear in Ewert and Wagenhofer's work as actors in the exercises to be worked on by the readers at the end of the individual chapters.

Kati and Elsi - and what they have to do with Ewert and Wagenhofer's "Internal Corporate Accounting", Berlin 2015 (15 pages), www.Inzpla.de/IN45-Kati-u-Elsi.pdf. (Text in German, title translated).

Decision Calculation with Uncertainty in the light of the Integrated Target Commitment Planning - Critical analysis of Chapter 5 "*Decision calculation in case of uncertainty*" from the work "Internal Corporate Accounting" by Ewert and Wagenhofer ,

⁷³⁸ See: Zwicker, E., *Integrated Target Commitment Planning and Balanced Scorecard*, Berlin 2003, p.30, www.Inzpla.de/IN29-2003g.pdf. (Text in German, title translated).

Berlin 2016, (42 pages) www.Inzpla.de/IN45-EW-Kap-5.pdf. (Text in German, title translated).

Control calculations in the light of the Integrated Target Commitment Planning - Critical analysis of Chapter 7 "*Control calculations*" from the work "Internal Corporate Accounting" by Ewert and Wagenhofer, Berlin 2016, (121 pages) www.Inzpla.de/IN45-EW-Kap-7.pdf. (Text in German, title translated).

Ratios as Performance Measures in the Light of the Integrated Target Commitment Planning - Critical analysis of chapter 10 "*Ratios as Performance Measures*" from the work "Internal Corporate Accounting" by Ewert and Wagenhofer, Berlin 2015 (44 pages) www.Inzpla.de/IN45-EW-Kap-10.pdf. (Text in German, title translated).

In the field of business administration, I have not yet come across such a comprehensive analysis and criticism of a work. And probably there will not be such an extensive text in the near future, which deals only with the work of another author.

In my opinion, the assessment of a book can be compared with the tasting of a tart. You only have to taste a piece of it, to judge how the whole tart tastes. I recommend Chapter 10 as a first piece but you can also start with the reviews of chapters 5 and 7.⁷³⁹

However, the entire verdict has already been anticipated: The work is a hodgepodge of infertile methodological approaches, absurd examples, elaborate mathematical analysis without any practical purpose but also theoretically worthless (see also p. 419 on the agency theory). And it contains serious conceptual errors. It moves between trivial clues and sophisticated (but almost exclusively) superfluous mathematical analyses.

From the perspective of the Integrated Target Commitment Planning, it is shown that almost everything to be read there is wrong, misleading or superfluous and could be "deleted". This applies in particular to "stochastic model analyses" in the area of cost-performance accounting, which I consider completely superfluous. And here, in particular, the agency-theoretical considerations, deprived of any reality, to which Wagenhofer as a "user of the agency theory" obviously feels particularly committed.

The result is that little remains of many chapters and what remains prove to be useless (with regard to the Integrated Target Commitment Planning) or describes connections that have been dealt with in the books on cost and performance accounting since time immemorial but there are better represented.

It also points out what should have been discussed in the light of the Integrated Target Commitment Planning, but was not dealt with by Ewert and Wagenhofer.

A first criticism of individual points

Ewert and Wagenhofer's "*Internal Corporate Accounting*" is like Kant's "Critique of Pure Reason". Everyone praises it, but no one has read it.

I felt the same way in a sense. Wagenhofer has the reputation of a first-class scientist, and

⁷³⁹ The criticism of Chapters 2, 3, 8 and 12 is closed and awaits its final formulation. However, what you can read there will not falsify the "tart theory".

everyone speaks of him with respect (s.p.415). Werner Dinkelbach, who was the main reviewer of the German Research Foundation in business administration for several years, asked me in Saarbrücken (on the occasion of the presentation of the Integrated Target Commitment Planning in his doctoral seminar): "Do you actually know the work of Ewert and Wagenhofer Internal Corporate Accounting, that is the work in the area? I said, "yes, yes", because "knowing" is a relative term.

In fact, it was like this: I had already had this 700-page work in my hands several times. Some passages I had partially read and certain sections also completely. It seemed to me very scientific and highly engraved, but I could not speak of "thoroughly read through".

And when I asked Werner Dinkelbach whether he would consider the strong propagation of the agency theory and information economics in the field of accounting to be good, he gave me such an evasive answer that I realized that he read this work (as I did) only sporadically. My inconspicuous "test questions" with other colleagues did not turn out differently.⁷⁴⁰

In the following, the topics of *planning*, *control*, *ratios*, and others will only be dealt with relatively briefly in order to at least somewhat substantiate this not very benevolent assessment, and perhaps encourage to read the chapter reviews.

Planning

Ewert and Wagenhofer's goal with their work is to place "*the instruments of internal corporate accounting*" "*in the foreground*". It is obvious that this also includes the instruments for planning with a cost-performance model. However, the text does not deal with a systematic treatment of planning with a cost-performance model.

This is evident from the fact that they do not define the term "planning" or differentiate "planning" according to certain planning procedures.

The Integrated Target Commitment Planning distinguishes between two types of planning. On the one hand, the Integrated Target Commitment Planning with the determination of the commitment targets (basic targets) and, on the other hand, a planning that consists in the determination of the values of the model parameters that can be directly influenced. This planning, in turn, is divided into an optimizing planning with decision variables and a planning, which consists of determining the decision parameters that can no longer be changed during the planning triad in the context of the bottom-up planning.

As has been shown, both planning approaches can be reconciled without contradictions. It is just a contribution of the Integrated Target Commitment Planning to have shown this (s.p.380).

Ewert and Wagenhofer do not clearly define even such central terms in the field of planning. Thus, they speak of the "*processes of planning, decision and enforcement*" (p.300) and use formulations such as "*planning as well as decision*" (p.301). Thus, there should be a difference between the two terms. On the other hand, they speak of "*operational*

⁷⁴⁰ About the reading of "colleague literature" in business administration, see page 514.

decisions, such as the planning of the production and sales program" (p.309) or of "production program planning as a short-term decision" (p.73). Here, planning is a form of a decision.

The fact that an optimization with decision variables is part of the activity "planning" is explained in Ewert and Wagenhofer's text by referring in their text to "*planning the optimal production program*" (p.73). And this optimizing planning with decision variables is for them the central topic of a target-oriented influencing of the profit of a cost-performance model. They dedicate a whole sub-chapter to this topic with the heading "*Cost and performance accounting as decision accounting*" 71 pages in length. And the main chapter including this sub-chapter called "*Decision calculations*" contains 270 pages. Here "**cost and performance accounting (CPA)** in its function as decision accounting" (p.30) is dealt with. Optimizing planning is also discussed in the system of the Integrated Target Commitment Planning, but it is not considered to be of great practical relevance. Only a few pages are used to describe it.

All approaches in practice work in a more or less concrete form with a target commitment planning to control the responsibility areas (s.p.497). And the target commitment planning implemented in the INZPLA-System provides a detailed and conclusive approach.

It is no exaggeration to say that Ewert and Wagenhofer "let off steam" in the area of optimizing planning. Their description of the deterministic linear production program planning, which is critically analyzed in detail elsewhere, extends over 51 pages and can be regarded as inadequate and largely superfluous from the point of view of the Integrated Target Commitment Planning.⁷⁴¹

However, what about the description of a planning procedure that could be described as target commitment planning? There's almost nothing to know about that. Statements that go in this direction are, for example, budgets "*can occur in the different variants. For production areas, for example, there can be **cost budgets** that specify a cost sum that should not be exceeded if possible*" (p.400). The requirement to "not exceed" a cost sum is a step in the right direction. Ewert and Wagenhofer also speak of "*setpoints for behavior control*" (p.311). However, if nothing more is said, such formulations are useless.

In the section "*Ratios as performance measures*" ... "*the focus is on the behavioral control function of ratios*" (p.513). Here it would be obvious that the authors will become concrete and develop a model-based system of "*behavioral control*" of ratios as target or even top targets using a cost-performance model. But what further remarks do Ewert and Wagenhofer make about such a "*behavioral control*"? The answer is nothing.⁷⁴²

The idea that planning can be carried out through behavioral control in the form of a target commitments, which ultimately lead to a setpoint-actual variance (or actual-setpoint

⁷⁴¹ To the subject of stochastic program planning see: Zwicker, E. *Decision Calculation with Uncertainty* in the light of the Integrated Target Commitment Planning - Critical analysis of chapter 5 "Decision calculation with uncertainty" from the book "Interne Unternehmensrechnung" by Ewert and Wagenhofer, Berlin 2016, p. 27f. www.Inzpla.de/IN45-EW-Kap-5.pdf. (Text in German, title translated).

⁷⁴² The following notes (p. 427) on Ewert and Wagenhofer's observations on the use of ratios show this in detail.

variance) for which one can hold someone responsible, is exhausted at Ewert and Wagenhofer in some general notes.

Cost accounting is almost exclusively seen as a supplier for the "*foundation of decisions with the help of costs and performances*" (p.64). More precisely, it is the marginal planning cost calculation, because the decisions that Ewert and Wagenhofer deal with in their text are only "*founded*" ..."*with the GPKR*" (p.640).⁷⁴³ This applies above all to the "foundation" of the linear production program planning, that is, an application area which is almost irrelevant from the point of view of the Integrated Target Commitment Planning. While the entire cost accounting is discussed by Ewert and Wagenhofer on 110 pages, their "decision accounting" based on the cost-performance accounting comprises 270 pages.⁷⁴⁴ Such a disproportion is unacceptable from the point of view of the Integrated Target Commitment Planning and a mockery of the practical needs of cost accounting.⁷⁴⁵

The decision calculation is so important for Ewert and Wagenhofer that they allow themselves to be carried away by assertions such as, "*The fundamental problem of cost and performance accounting is that of the optimum degree of complexity of decision models*" (p.695). This is a completely inaccurate claim of relevance because decision models play virtually no role in the system of cost-performance accounting. Moreover, the term "*optimum degree of complexity*" of a cost-performance model is an empty term that cannot be operationalized. One can only wonder how carelessly Ewert and Wagenhofer, as "quantitative analysts", deal with the notion of optimization.⁷⁴⁶

Cost Accounting

The planning of a "*profit for the period*" (operating result) in the area of "internal corporate accounting" is based on the plan cost accounting and the more comprehensive plan cost and performance accounting. If one revises what Ewert and Wagenhofer say in Chapter 12 "*Systems of Cost Accounting*" on 73 pages about the structure of cost accounting and the associated planning, then this can be described as more than inadequate. Each of the relevant textbooks on cost-performance accounting is more informative.

The following authors are just a few examples: Wolfgang Becker, Coenenberg-Fischer-Günther, Carl-Christian Freidank, Friedl-Hofmann-Pedell, Joachim Fischer, Uwe Götze, Hummel-Männel, Schildbach-Homburg, Schweitzer-Küpper and Gerhard Seicht.

The corresponding titles can be found at Amazon. I prefer a certain order, but here an alphabetical sorting was chosen.

****A wide range of books on cost accounting and cost-performance accounting is available to interested readers. Incidentally, the number of German-language monographs on

⁷⁴³ The word "*marginal planning cost calculation*" in the quoted text is represented in Ewert and Wagenhofer's original text by an abbreviation (GPKR).

⁷⁴⁴ The deterministic linear production program planning is dealt with on pages 71 to 119 and the stochastic one on pages 205 to 228.

⁷⁴⁵ For an assessment of the relevance of cost accounting in practice, see page 425.

⁷⁴⁶ This would be a fine example of Peter Merten's collection of abstruse uses of the term "optimization" in the texts of business management university teachers. See: Zwicker, E., *The RoI Target System and other Target Systems in the Light of the Integrated Target Commitment Planning*, Berlin 2014, p.16f, www.Inzpla.de/IN44-2014.pdf. (Text in German, title translated).

cost and performance accounting is truly astonishing. On 28.12.2016, Amazon displayed 1,296 titles on the keyword "Kosten- und Leistungsrechnung" (*cost and performance accounting*). Since I thought that number was quite unbelievable, I checked each of the titles. Disappearing few refer to older editions of the same work and all the others are in fact independent monographs on the subject of "*cost accounting*" or "*cost-performance accounting*". The search with Google Scholar, which only evaluates scientific publications (books and articles), resulted in 8,360 for the keywords "Kosten- und Leistungsrechnung" (*cost and performance accounting*) and 30,700 entries for the keyword "Kostenrechnung" (*cost accounting*).*****

Fundamental problems

For Ewert and Wagenhofer, "*the optimum degree of complexity of decision models*" is as mentioned "*the fundamental problem of cost and performance accounting*". The Integrated Target Commitment Planning has also a "*fundamental problem*" with regard to "*cost and performance accounting*". It requires (s.p.363) to disaggregate the structural equations of a cost-performance model to such an extent that its model parameters can be interpreted as basic parameters of an Integrated Target Commitment Planning. However, this fundamental problem has been solved because it could be shown that the cost-performance models (and thus also the models of the Kilger type) described by the hyperstructure model of the SAP-CO system and thus basically configurable allow such an interpretation of their model parameters.⁷⁴⁷

Cost Accounting and decision making

In an article entitled "*Purpose of cost accounting...*", Pfaff and Weber pointed out that in some textbooks on cost accounting, decision accounting is treated completely inappropriately.⁷⁴⁸ In their opinion, "*cost accounting is not so important because it would be particularly suitable in delivering a basis to make decisions, but because it represents a language with the help of which goals can be communicated, and decision-making behavior can be influenced*".

I also believe that this influence on decision-making behavior is precisely the main task of the Integrated Target Commitment Planning, because "cost accounting" is used here in the form of a plan cost-performance model to influence the decision-making behavior of area managers with regard to the achievement of a setpoint target value of the operating result.

Pfaff and Weber express the suspicion that "*the decision orientation of cost accounting is only an invention of university lectures*". This suspicion, if it should prove true, could even be a compliment if it meant that a university lecturer had discovered how, under certain circumstances, the cost accounting not previously used in practice for decision-making could be used for this purpose.

In the system of the Integrated Target Commitment Planning, it was shown in this sense

⁷⁴⁷ They were referred to as standard cost-performance models, see page 24.

⁷⁴⁸ Pfaff, D., Weber, J., *Zweck der Kostenrechnung? Eine neue Sicht auf ein altes Problem (Purpose of cost accounting? A new view of an old problem)*. In: DBW, 1998, p. 151- 165.

that an optimizing planning with decision variables (i.e., a *decision calculation*) could be seamlessly reconciled with a target commitment planning. However, this optimizing planning using a plan cost-performance model was not found to be very relevant in practice, and its discussion was considerably shorter than the target commitment planning.

Pfaff and Weber believe, however, that certain university lectures with their extensive, yes, escalating treatment of *decision accounting* and the associated claims of relevance induce the impression that decision accounting (optimizing planning) is the nonplus ultra in the area of cost accounting, this otherwise rather irrelevant discipline. The optimization orgies that are being exploited in Ewert and Wagenhofer's work can be seen, for example, in the fact that the term *optimization* is used 694 times.⁷⁴⁹

This is a disastrous development because such cost accounting, which is geared towards optimization, is increasingly distancing itself from practical concerns. Pfaff and Weber concluded their reflections with the warning: *"Anyone who, therefore, continues to write textbooks in a decision-oriented manner in the future is shoveling at the grave of cost accounting"*. This judgment is to be approved without reservation, but it is still to be personalized. If someone has shoveled and shovels *"at the grave of cost accounting"*, then these were and are Ewert and Wagenhofer with their escalating optimization orgies, stochastic glass bead games, and agency absurdities, which have nothing more to do with the operational reality of cost accounting but also in no way contribute to expanding the theoretical background of this discipline. And despite their excessive reflections on the topic of optimization, the authors do not provide a single realistic example of an optimizing planning that could be used in practice on the base of these cost-performance. A report on the application of such optimization models used in practice is completely far removed from their world of thought. Would they have tried to do so, they would have realized that, in practice, internal accounting planning takes place almost exclusively in the form of target commitments.

Control

Ewert and Wagenhofer's goal is not only to convey to their readers *"a conceptual understanding of the interrelationships of cost accounting in an organisation"* but also to provide them with insights into *"the conceptual design and operating conditions of information systems in the company"*.⁷⁵⁰ In their opinion, this is the topic that internal corporate accounting should be concerned with. You can only agree with that. However, Chapter 7 *"Control calculations"* does not fulfill either of these two objectives.

Their definition of the setpoint-actual variances of a control variable, ignoring the principle of controllability, is already a knock-out criterion for rejecting the entire text.

⁷⁴⁹ In the form: *optimale, optimal, optimalen, Optimalität, optimiert, optimierende, Optimalitätsbedingungen, Optimierungsproblem*. (The survey included the keyword index).

⁷⁵⁰ This text is largely consistent with the "summary" of the following text: Zwicker, E., *Control Calculations in the Light of the Integrated Target Commitment Planning - Critical analysis of chapter 7 "Kontrollrechnungen"* from the work *"Interne Unternehmensrechnung"* by Ewert and Wagenhofer, op. cit., p. 121, www.Inzpla.de/IN45-EW-Kap-7.pdf. (Text in German, title translated).

Ewert and Wagenhofer have not taken note of the control procedure described by Kilger in his standard work, which follows the implementation of a flexible plan cost accounting and correctly applies this principle of controllability (without explicitly pointing it out) for two cases.

Their assertion that no actual-plan variances occur in the planning of fixed costs is downright absurd so that the claim "fixed costs actual = fixed plan costs" must always be used in a control calculation which follows the planning process.

A model-based reconstruction of their "*cost-control calculation*" shows that it consists of two contradictory "*cost control calculations*", which were, therefore, referred to as cost-control-calculation-1 and cost-control-calculation-2. The cost-control calculation-1, in turn, is divided into two "sub-control calculations" that contradict each other. Ewert and Wagenhofer's criteria for selecting one of these two cost control calculations-1 are unclear and what is understandable at all is ludicrous.

In addition to a cost control calculation, Ewert and Wagenhofer also describe a sales and contribution margin control calculation. Here, too, it is completely inappropriate from the view of "control" in an Integrated Target Commitment Planning to speak of a "*control calculation*".

For all of these variants of a "*control calculation*" described by Ewert and Wagenhofer, it was shown using their examples how a "control" would have to proceed if the control procedure of the Integrated Target Commitment Planning were applied.

Ewert and Wagenhofer equate the term "variance analysis" with the term "control" and, therefore, actually describe procedures of an explorative variance analysis. However, if an explorative variance analysis is already used in a misleading way as a control procedure, then at least a variance analysis of the operating result should be carried out because this interests the corporate management. However, they do not deal with such an analysis. The description of cost accounting is, as has been explained, so incomplete in their work that with such knowledge Ewert and Wagenhofer would hardly be in a position to carry out such a variance analysis of the operating result, which requires a comprehensive model structure analysis and special decomposition algorithms.

They do not cover drill-down variance analyses, which are widely used in practice (s.p.105). Instead, an extensive and completely superfluous discussion of the agency theory in its relation to control takes place. Just as superfluous is the downright ridiculous attempt to combine the behavioral and decision-making function as central elements of their "*theory*" of "*internal accounting*" with their "*control calculation*".

This text is not recommended for anyone who intends to deal with the control systems of a model-based operational planning. It is confusing, misleading and harmful, since the idea of control as a setpoint-actual variance, for which someone is responsible, is completely messed up.

Use of ratios

The idea that a model is necessary to adequately describe the relationships between the ratios of a "ratio system" cannot even be guessed in Ewert and Wagenhofer's text "*Ratios as performance measures*" (Chap. 10).⁷⁵¹

Their reflections on the relationship between performance ratios and company targets (predominantly profit ratios) cannot be surpassed in ambiguity. The entire chapter only contributes to spreading confusion and disorientation.

It is acknowledged that Ewert and Wagenhofer work with models. However, these models deal predominantly with these unfortunate information economic models, in which mathematical debaucheries are presented without any practical relevance.⁷⁵²

Plan cost-performance models, which show the relationships between the operating result and the influencing variables of the cost centers (model parameters) on an equation level with an underpinning by figures, cannot be found in the entire text. How beautiful is Kilger's comprehensive example, which runs through his entire book, accompanying all the explanations of the planning with a cost-performance model?⁷⁵³

If Ewert and Wagenhofer had also used such an example, then they would not have had the idea of writing such confusing stuff about performance ratios and their connection with the company targets. Because when writing, they would have (hopefully) always kept this model in mind and would have been considering the issue: Where are the "*performance measures*" in this model? And: where are the "*company targets*" in this model? And finally, how must the model be designed in order to connect them to each other?

Models play an important role at Ewert and Wagenhofer. But which one? The author's comment, "*this book focuses on the information economic approach*" (p.14) and "**recent theoretical developments**, in particular information economic approaches, are taken into account" (p.21). And these "approaches" are "*information economic models*" (p.12). Such "*models sharpen the view on basically possible mechanisms of action*" (p.12). I strongly doubt that.

The fundamental findings on possible mechanisms of action that emerge from the mathematically complex analyses of their information economic models are trivial. However, since Ewert and Wagenhofer feel obliged to information economics, their not-model-related statements are also enriched with such "information-economically relevant find-

⁷⁵¹ This text corresponds to the "summary" of the following text "*Ratios as Performance Measures in the Light of the Integrated Target Commitment Planning - Critical analysis of chapter 10 of Ewert and Wagenhofer's book 'Interne Unternehmensrechnung'*", Berlin 2015, p.43 www.Inzpla.de/IN45-EW-Kap-10.pdf. (Text in German, title translated).

⁷⁵² For more information, see also: Zwicker, E., *Wagenhofer's Contribution to normative Agency Theory in the Field of Cost-Performance Accounting*, Berlin 2015, www.Inzpla.de/IN47-2015.pdf. (Text in German, title translated).

⁷⁵³ See also: Zwicker, E., *The Kilger Model - A brief Overview of important structural Features*, Berlin 2002, www.Inzpla.de/IN20-2002f.pdf. (7 pages) (Text in German, title translated). Furthermore also: Zwicker, E., *The Kilger Model - Structure and Configuration and its Connection with a CRFI Model in the Context of a two-step comprehensive Company Planning*, Berlin 2003, (137 pages), www.Inzpla.de/IN30-2003h.pdf. (Text in German, title translated).

ings" as, *"From an information economic point of view, however, the aggregation of detailed information is regularly associated with the destruction of information"* (p.513).⁷⁵⁴ Plan cost-performance models describe the possible *"mechanisms of action"* between the top targets (company targets) and the basic targets (*performance measures*). They should be dealt with and, by exceeding the area of the *"internal corporate accounting"*, also with a comprehensive company planning models. Ewert and Wagenhofer's work provides nothing in this chapter.

The goal of the online-accessible text on *"Ratios as performance measures"* was to use a model-based reconstruction of Ewert and Wagenhofer's remarks to show which glaring deficits were revealed here.⁷⁵⁵ In my opinion, this analysis shows that Ewert and Wagenhofer's approach in developing a system of ratios that connects *"corporate targets"* with the *"performance measures of decentralized decision makers"* has failed completely.

It may be that some readers regard it as insolence, especially Wagenhofer as such a renowned expert in contemporary business administration, to attack in this way. However, I don't really care.

This criticism doesn't inspire my ego either. This is really about business administration. If it wants to survive as a "scientific discipline" (whatever that is exactly), then such confusing stuff (as in this chapter on key ratios) must not be written by one of its most renowned representatives in the standard work on *"internal corporate accounting"*, and nobody says anything against it.

Bibliography and Exercises

The bibliography covers 22 pages. The 533 publications listed there are likely to comprise more than ten thousand pages. They are recommended to the reader *"for further employment"* in the area of *"internal corporate accounting"*. However, it would not be bad to include Erich Gutenberg and Konrad Mellerowicz in the list. After all, you can really learn something from them, including from the area of *"internal corporate accounting"*. Such an extensive list of literature by an author is an imposition. Who should do anything with it?

Ewert and Wagenhofer have written their work for *"scientists"* and *"specialists in practice"* but also for *"students of business administration"* (preface). It is, therefore, very laudable that at the end of each of the twelve chapters, certain *"questions"* are formulated and certain *"problems"* are cited. However, these *"problems"* are exercises for which there is a solution. What is astonishing is that Ewert and Wagenhofer do not answer these questions in their text and also do not propose solutions for the *"problems"* or exercises they cited. This is didactically disadvantageous and does not correspond to the procedure

⁷⁵⁴ In this respect, it can be said that *"from an information economic point of view"*, such findings are not associated with an increase in information and are, therefore, superfluous for everyone who is not completely innocent.

⁷⁵⁵ www.Inzpla.de/IN45-EW-Kap-10.pdf

of other textbooks for cost and performance accounting.

The work of Schildbach and Homburg, for example, contains certain "*control questions*" on "*cost and performance accounting*" that refer to the entire text and they then answer these control questions in a volume of 19 pages.⁷⁵⁶ In relation to their much more extensive work, Ewert and Wagenhofer would have to spend 45 pages answering their questions and problems.

References and plagiarism

Instead of citing 533 citations documenting the authors' apparently extensive knowledge, it might make more sense to point out which author has deepened these topics in a particular direction for some of the topics covered. This would give a reader who is really interested in the topic the opportunity to deal with the corresponding work.

The topic "*planning control*" (chapter 5, p.344f.) dealt with by Ewert and Wagenhofer in their text was discussed in great detail by Kilger, for example. Kilger's text goes far beyond what Ewert and Wagenhofer have said. However, there is no such reference to Kilger.⁷⁵⁷

However, it becomes more problematic if certain authors are not cited, although something that they have developed is discussed. Thus, Ewert and Wagenhofer describe the scheme developed by Agthe and Mellerowicz of a multi-stage contribution margin accounting, without quoting Agthe and Mellerowicz (p.672). That's not the subtle way in such a highly scientific work, because Agthe and Mellerowicz's system is the prototype of all hierarchical contribution margin accounting systems developed in the following (s.p.115) and has clearly been described by them for the first time. However, Ewert and Wagenhofer haven't noticed yet that the Agthe-Mellerowicz scheme has a definitional error. This error, recognizable from the scheme (actually by a sharp look), is taken over by them.⁷⁵⁸ It leads to the unfavorable fact that, on the basis of this scheme, one is not in a position to do what Agthe and Mellerowicz actually intended, namely the numerical breakdown of the profit of a company in the form of a profit hierarchy.

Also a second fixed star in the sky of business administration, namely Erich Gutenberg, is not quoted. Thus, Ewert and Wagenhofer use and comment on the illustration developed by Gutenberg, which shows how the fixed costs of production areas are divided into idle capacity costs and usable costs depending on employment (p.332f.). That it comes from Gutenberg, however, who also coined the term "*usable costs*", is not to be learned.⁷⁵⁹

⁷⁵⁶ Schildbach, T, Homburg, C. *Kosten- und Leistungsrechnung*, 10th Ed., Stuttgart 2009, p. 297f.

⁷⁵⁷ Kilger, W., *Flexible Plankostenrechnung und Deckungsbeitragsrechnung*, 9th ed., Wiesbaden, 1998, p. 559- 578. See Chapters "*Cost variances for the use of unscheduled procedures*" and "*Cost variances for unscheduled production execution within planned production sites*." (the titles of the chapters are translated).

⁷⁵⁸ For a description of this error, see: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., p.60, www.Inzpla.de/IN11-2001a.pdf.

⁷⁵⁹ See: Gutenberg, E., *Grundlagen der Betriebswirtschaftslehre*, Vol. 1: Die Produktion, 24. Ed., Berlin 1983, p. 348-354.

Karl Kraus demanded that all those who adopt someone else's text unquoted should be forced to rewrite it a hundred times. That's not a bad idea. However, to write off a wrong schema a hundred times, can one expect them to do that?

Gutenberg's diagram is correct. However, to draw a diagram a hundred times and please do so properly is perhaps still to be expected of Ralf Ewert, but not Alfred Wagenhofer as a full member of the Academy of Sciences.

Maybe they didn't do it on purpose. Perhaps the following sentence applies to them: *Originality is the art of remembering what you have read and forgetting that you have read it.*

Gallettianas

Not very informative is Ewert and Wagenhofer's remark, which directly follows the formulation that *"costs proportional to employment are regarded as the only costs relevant to decision making"*. It reads (p.642)

If *"variable or employment-proportional costs"* are not ***"regarded as the only costs relevant to decision making"***, then ***"otherwise" "it would have to be considered that fixed costs could also be relevant to decision making"***.

That is a strange sentence. In its logical structure, it corresponds to the following statement:

If *"men are not **regarded as the only** intelligent beings"*, then ***"otherwise" "it would have to be considered that women could also be intelligent"***.⁷⁶⁰

Professor Johann Galletti remains unforgotten even today after 200 years because of his "Gallettianas".⁷⁶¹ One reads: *The tiger, the leopard, and the panther can be distinguished only by the fur, which is multicolored with all three.*" The Ewert-Wagenhofer statement should not be inferior to Galletti.

Self-representation in a remarkable way.

In textbooks, it is common that their author introduces himself. You want to know whom you're dealing with. This also applies to the area of cost-performance accounting. Usually the imprint is on the back of the inner title page, and there you often find a short information about the background of the author like *"is professor for YY at the University ZZ"*. This is the case, for example, with the works of Thomas Schildbach and Carsten Homburg as well as Uwe Götze and Wolfgang Becker. Others such as Gunther Friedl, Christian Hofman, Burkhard Pedell or Joachim Fischer add their title and sometimes also the name of their home university to their *"cost accounting books"* on the first inner page.

⁷⁶⁰ The sentence reads precisely, *"according to which (E.Z. the assumed "assumption 5") the variable or employment-proportional costs are regarded as the only decision-relevant costs. Otherwise, it would have to be considered that fixed costs could also be decision-relevant"*. I inserted the boldface afterward.

⁷⁶¹ Johann Georg August Galletti was a German professor. *"His fame is not based on his merits as an academic, but on his reputation as the creator of a few hundreds of stylistic howlers, becoming a legend as 'Kathederblüten' (teacher's howlers) originated during his time as a professor in Gotha"*. See in English, https://en.wikipedia.org/wiki/Johann_Georg_August_Galletti.

At Ewert and Wagenhofer, however, this self-representation takes on other dimensions. As already reported (s.p.415) Ewert and Wagenhofer describe their activities, offices, and merits immediately after the table of contents. Wagenhofer's remarks are extremely impressive: President of the *European Accounting Association*, Member of the Board of the *Schmalenbach Society*, Vice President-Finance of the *International Association for Accounting Education and Research*, Vice President-International of the *American Accounting Association*, Chairman of the *Association of University Teachers of Business Administration* and more.

However, he is and was not only the leading man in the central committees. His scientific achievements were also honored in many ways. Visiting professor at a number of highly renowned foreign universities, honorary doctorate, winner of the Kausch Prize, one of the most renowned and highly remunerated prizes in the field of corporate accounting. Editor of two high-ranking business journals, member of various editorial boards of international journals and author of a large number of journal articles in renowned national and international journals and various monographs. And then also a "*real member of the Austrian Academy of Sciences*".

This exhibition of one's own importance reminds me of the opening ceremony of Vladimir Klitschko's boxing matches. When the champion enters the arena, he is preceded by powerful wardrobes with grim faces, holding up Klitschko's four world champion belts with muscular arms. And why is that? To impress the audience and the opponent. And Wagenhofer self-portrayal before the actual text is nothing else. Only the listed honors, activities, etc. serve as world champion belts. And why is he doing all this? To impress the audience, and these are the students. What student, when reading this, doesn't have to freeze to his core with respect? And what's the message? Such a man can only write an excellent book. And if something bothers you at this book, it's not his but your fault, you klutz. However, a book is only as good as it is. And if Klitschko goes down in the fight, his world champion belts won't help him either.

Summary

The work promises a lot and does not fulfill any of them.

The information-economic approach is completely infertile. The examples of the agency theory are ridiculous. The work wants to stand out from the usual treatment of "cost-performance accounting" and therefore, as the authors emphasize, the title "*internal corporate accounting*" is used instead of "*cost-performance accounting*". However, the result is that cost-performance accounting is treated completely inadequately as the core of "*internal corporate accounting*" because of the other clutter.

Here, however, the Integrated Target Commitment Planning is not to be promoted as the counter-program that makes everything better. There is no need to deal with this system. The effort is not insignificant. I developed it; I know it, and I think it's good. Meanwhile, I don't care if others are interested in it.⁷⁶²

⁷⁶² For a poetic justification, see page 515.

I am a "Kilger fan" and especially appreciate the 9th edition, which he still worked on alone. However some developments were not yet known at that time. Reading Kilger's text alone is therefore not advisable. And it's also not everyone's cup of tea to work through a book of 900 pages. Those who really want to dedicate themselves to cost-performance accounting, however, have to deal with the monographs already mentioned above (s.p.440) and others, since only in this way is, it possible to learn about what represents the "state of the art" of this discipline today. And if you also have a look at the introductory text of the Integrated Target Commitment Planning (s.p.142) I have no objection to. My model-based view is only one way of looking at things (s.p.586). Whether, however, Ewert and Wagenhofer's book is one of the works that one should definitely look at is in their language a "*question of information economics*". Perhaps it is suitable as a dissuasive example.

Katharina and Elisabeth

In addition to the above-mentioned criticism of Ewert-Wagenhofer's work, a chapter is reported here which is characterized by a certain entertainment value.⁷⁶³ It's not for nothing that Juvenal said almost 2,000 years ago, "*It's hard not to write a satire*". This statement also applies to me, having worked so intensively on this top work of German-language business administration. And I could not resist the temptation. The result is a description and satirical commentary of two "*illustrations*". Ewert and Wagenhofer refer to "*illustration*" as a text that "*introduces the problems in the context of a practical situation, which are dealt with in detail in the respective chapter*" (p.17). Each chapter of their work is, therefore, preceded by such an "*illustration*". In the following, I report on two "*illustrations*" in which Katharina and Elisabeth appear. They are students of the University of Graz and study there under Alfred Wagenhofer the subject "Controlling". The beginning of this chapter on "Katharina and Elisabeth" and the text concluding this chapter are reproduced below.

Katharina's appearance begins (p.511f.) like this: "*Katharina must smile. Actually, it's crazy what she's doing right now. She has borrowed the book by Kaplan and Norton entitled 'Balanced Scorecard' from the Business Administration Library.*" For although there is a German translation, "*she bravely grabbed the English version were Kaplan and Norton describe a case of a pilot flying an airplane equipped with a speedometer as the only measuring device.*" Katharina has read this and is so impressed by this account that she reports it to her friends, Philipp and Elisabeth. Katharina is of the opinion that the pilot should also be interested in an altimeter and other measuring instruments if his aircraft does not have them.

And Philipp turns to Katharina and Elisabeth with the question, why the pilot does not simply "*install the missing instruments himself*" in such a case. Since Philipp thinks his question is very funny, "*he begins to laugh heartily*". However, Katharina doesn't find

⁷⁶³ See in detail: Zwicker, E., *Kati and Elsi - and what they have to do with Ewert and Wagenhofer's Book "Interne Unternehmensrechnung*, Berlin 2015 (15 pages), www.Inzpla.de/IN45-Kati-u-Elsi.pdf. (In German, title translated).

this laughter funny at all, “*she rather looks disapprovingly at Elisabeth*“, and then she thinks “*he always has to brag about how clever he is*”. Elisabeth reminds that a “*life-weary pilot committed suicide in this way*”, namely by ignoring the altimeter. And Katharina rightly finds this “*horrible*”.

But Katharina, inspired by Kaplan and Norton's work, also arrives at insights that come from other areas of life, namely winning at soccer matches. Here she came to the conclusion, “*The final score doesn't help the coach and the players as much as the score in the middle. That sounds plausible to me.*”

At the end of this conversation, Katharina Elisabeth asks, “*When are you actually going to take the controlling exam?*”

After this confusing conversation, one can only advise Elisabeth but also Katharina, “*Barely. You'll never make it. If Professor Wagenhofer asks you about one of the many mathematical derivations from his book and not whether more than one measuring device is required in an airplane, then you are totally overwhelmed. Not to mention Philip, the old busybody.*”

However, the story of Katharina and the instruments missing in the plane gave me an idea. One should suggest to Ewert and Wagenhofer to subject the text of their work to an “admission test” before publication, which I would like to call “*Katharina test*”, bearing in mind the mentioned story.

However, it was Joel Demski who first gave me this idea. He has developed an appropriate “admission test”, which he calls the “*Ralph test*”. Joel Demski is, as already mentioned, the intellectual father of the information economics chosen by Wagenhofer as the central field of his research. And therefore, he is also the intellectual father of Wagenhofer.⁷⁶⁴

But now for the *Ralph test*. After trying in vain to find in Ewert and Wagenhofer's text any criteria for the acceptance or non-acceptance of the models they propagated, I turned to Joel Demski, the forward thinker of Wagenhofer, seeking help. My goal was to determine whether at least Demski has developed certain acceptance criteria for his information economic models.

Demski has written an article in the state-of-the-art work “*Handbook of Management Accounting*” in which he discusses three “*keys to good modeling*”.⁷⁶⁵

Of these three “*keys to good modeling*”, which the founder of a “*new domain for accounting theory*” cites in this fundamental methodological contribution, only the third “*key*” is to be treated and this is Demski's assertion that a model is only a “*good model*” if it has successfully passed the *Ralph test*.⁷⁶⁶

⁷⁶⁴ Joel Demski has contributed a “*path breaking work on applications of information economics and agency to accounting*” and: “*His work ... has created a new domain for accounting theory.*” See: https://en.wikipedia.org/wiki/Joel_S._Demski.

⁷⁶⁵ Demski, J.S., *Analytic Modeling in Management Accounting Research*. In: Handbook of Management Accounting Research, (Ed.) Chapman, C. S., Hopwood, A. G., Shields, M. D. Amsterdam, 2007, p. 365-371.

⁷⁶⁶ His further “*keys*” are “*primacy of the research question*” and “*proper preparation of the model*”. However, Demski does not disclose what is “*proper*” and what means “*primacy*”. His text is a very in-

And this test runs something like this: One should develop a model that can be discussed in terms of its comprehensibility not only in a doctoral seminar, it must also be understood by Ralph. Ralph is a fictitious student who (like Katharina with Ewert and Wagenhofer) appears in Demski's textbooks and is named by Demski after his "*undergraduate roommate*" at the University of Michigan, whose intellectual abilities he obviously had a good grasp of them during their time together.⁷⁶⁷

This test is highly questionable as a selection criterion for models. "*Keep it so simple and stupid that even Ralph will get it*" is a desirable but not a necessary selection criterion for a model to be developed.⁷⁶⁸ The *Ralph test* is, therefore, hardly a binding "*key to good modeling*", but it could be a recommendable as a "*key to good textbooks*". And this applies also to Ewert and Wagenhofer's book. A textbook should be oriented to its clientele. Therefore, it makes sense to recommend Ewert and Wagenhofer to introduce the "*Katharina test*" instead of the *Ralph test*. Its demand would be, "*Keep it so simple and stupid that even Katharina will get it*". In my estimation, Katharina will hardly understand any of the mathematical derivations in Ewert and Wagenhofer's work, and that is not so bad at all, because almost all the mathematical analyses found there are carried out with stochastic models and are superfluous from the point of view of the Integrated Target Commitment Planning anyway.

The story of Katharina and Elisabeth seems to be over, but this is not the case. Because in the "*practical situation*" at the beginning of the last chapter "*Systems of cost accounting*" we now meet Elisabeth as an employee of "*Buscher Elektronik GmbH*". Therefore, she graduated after all.

But also Katharina, Elisabeth's girlfriend, apparently passed her controlling examination successfully despite my poor forecast. As Ewert-Wagenhofer report, Katharina is now employed by ASD GmbH, where she prepared a stochastic break-even analysis for the Management Board. And I thought she was not in a position to do that. This is how you can be wrong.⁷⁶⁹

*** Demski's "*roommate*" Ralph is not only the namesake of the *Ralph test*. Rather, it plays a central role in the already mentioned (s.p.427) book Demski's (*Managerial Use of Accounting Information*). However, unlike Katharina and Elisabeth, he has already climbed a little further up the career ladder, because he is the head and owner of "Ralph LTD" (p.70). Demski mentions him by name more than ninety times because he has to

formative contribution to the methodological assessment of the information economy in the field of accounting, which can only be recommended to anyone interested in methodology.

⁷⁶⁷ See Antle, R., Jinghong Liang, P., Gjesdal, F., *Essays in Accounting Theory in Honour of Joel S. Demski*, Preface, p. XVIII, New York, 2007.

⁷⁶⁸ This formulation does not originate from Demski.

⁷⁶⁹ See about Katharina's activities at ASD GmbH in: Zwicker, E. *Decision Calculation with Uncertainty* in the light of the Integrated Target Commitment Planning - Critical analysis of chapter 5 "Decision calculation with uncertainty" from the book "Interne Unternehmensrechnung" by Ewert and Wagenhofer, Berlin 2016, p. 44, www.lnzpla.de/IN45-EW-Kap-5.pdf. (Text in German, title translated)

solve (like Katharina and Elisabeth) certain problems of *"managerial accounting"*.⁷⁷⁰ Ralph is so present in the book that Demski should have shown a picture of him at the end of the book so that all readers could say, "So this is Ralph".⁷⁷¹ ***

However, let us turn back to Elisabeth. She sits in the "Cafeteria" of the "Buscher Elektronik" and drinks *"her usual little brown"*. *"Suddenly she hears a voice, 'May I sit with you?' She is startled and looks Günther Wieser in the eye"* And she answers "Yes, yes, of course". And now she tells Günther that she *"read a new book on corporate accounting all last week"*, namely *"one of these so-called 'textbooks' over 600 pages long. And 'she proudly adds, 'I still came almost to the end.'"*

Congratulations to Elisabeth. I read it too, so I know what you have performed. However, one question remains unanswered. If she has only just read the book now, then she probably did not take her exams with Prof. Wagenhofer in Controlling. But no matter what. She has read the book and now wants to talk to Günther about it.

She tells Günther that she had tried *"once to tackle a problem in the way propagated in the book"*. And Günther, taking note of this *"stares interestedly"* into her *"dark blue eyes"*. He obviously has a thing for Elisabeth, because *"he always likes listening to her"*.

Elisabeth is very troubled for the solution of a decision problem. It is the problem to determine the lower price limit of a product described in Ewert and Wagenhofer's work, which requires the knowledge of the plan value of the variable unit costs of this product. Elisabeth would like to do what Ewert and Wagenhofer recommend for a product she is considering, but she questions whether the *"cost accounting guard"* at "Buscher Elektronik" is even capable of correctly determining the variable unit costs of this product. Elisabeth has the impression that there is a lot of nonsense going on there.

She reports to Günther that these guys *"allocate any overhead costs to their products and are still proud of their funny allocation keys. But what is even worse is that they simply say that all costs are linear; one already learns in kindergarten that this is not the case. Now she is really annoyed"* (p.636). They are still talking about a few points that I will come back to. Then Elisabeth *"finish"* her coffee", i.e., *"the little brown"*, and she remembers: *"The book still has a chapter on cost accounting systems. Perhaps she will find something to answer this question"*.⁷⁷² This chapter seems to be the only one she hasn't read yet.

Elisabeth, look me in the eye, but don't be startled as by Günther. I have something very unpleasant to tell you. You will hardly find anything in this chapter that can answer your question. But I would like to tell you why this is so and give you some answers to your questions in the light of a certain planning procedure for the cost-performance calculation, which can perhaps be of use to you.....

⁷⁷⁰ Demski, J.S. *Managerial use of accounting information*, New York, 1994.

⁷⁷¹ In Demski's book, Ralph carries out a planning using exotic cost functions that can only be admired. For an example of this cost planning, see www.Inzpla.de/Ralph.pdf.

⁷⁷² This is the last chapter 12 *"Cost Accounting Systems"* in Ewert and Wagenhofer's book p. 635-705.

In a separate text (www.Inzpla.de/IN45-Kati-u-Elsi.pdf) I tried to show Elisabeth that Ewert-Wagenhofer's text does not help her to solve her problem, namely the determination of the plan marginal costs, but perhaps this enables another procedure called "Integrated Target Commitment Planning". Proving the first was not so difficult. However, it was much more difficult for me to make it clear to Elisabeth, who has never heard of the Integrated Target Commitment Planning, on a few pages how to determine the plan marginal costs of an article using this procedure in a justified and comprehensible manner. I hope I can convince her. My "didactic efforts" end with the following remarks to Elisabeth:

You see, I'm not so enthusiastic about this work you've been working on "all last week". Don't be confused by my comments, but please read the last remaining chapter and consider which suggestions for improvement you can suggest to your "cost accounting guard" on the basis of these comments. And these should be proposals whose implementation should lead to the fact that you no longer call the determination of the variably planned unit costs at "Buscher Elektronik" a bit thick as before, but see it as a reasonable procedure.

Let's see if you think everything or most of what I have written here is superfluous because it is not necessary at all to determine the plan marginal costs of a product or has already been described by Ewert and Wagenhofer.

If you come to this conclusion, but also have any further questions about my points, then write me. While I was working at the TU Berlin, I exchanged letters with my students to clarify upcoming issues; seventy pages of this correspondence can be accessed online.⁷⁷³ This is how you can see that I mean it. I will make your text and also my answer to it also here on-line accessible.

Early birds can sleep until noon.

Over the years, I have sent Alfred Wagenhofer and other "renowned colleagues" texts on the Integrated Target Commitment Planning (s.p.514). No one has reacted, which cannot be expected in the case of unsolicited mail, which is, therefore, okay. At least he was willing to look at the text I sent him in August 2014 on the agency theory, and he also agreed to discuss it with me in Graz in the same year.

The occupation triggered by Wagenhofer with the "classical agency theory" (s.p.398) has given me a lot of trouble. I simply wanted to bring this theory in a relation to the "normative theory" of the Integrated Target Commitment Planning. The fact that it was reconstructed in retrospect as a variant of the normative agency theory surprised me myself.

My basic need, which cannot be suppressed, is to discuss professionally with others.⁷⁷⁴

⁷⁷³ See on this exchange of letters with my students Zwicker, E., *Information on the teaching activities of the Department of Corporate Accounting and Controlling*, TU Berlin 2008, p. 3-75. (Text in German, title translated). www.Inzpla.de/Lehraktivitaeten.pdf. Email: eckart.zwicker@tu-berlin.de.

⁷⁷⁴ See my discussions and conversations with Jay W. Forrester, (p.16), Dennis Meadows, (p.20), Herman Haken (p.20), Karl Deutsch (p.537), Carl Hempel, (p.533), Walter Goldberg (p.551) Josef

One receives a wealth of valuable suggestions and gets one's mind going. Therefore, I initially thought it highly desirable to have a professional discussion with Alfred Wagenhofer, as the world-renowned expert in the field of management accounting and especially the application of the agency theory in this field. In regard to his professional competence (apart from his other behavior), this assessment has changed quite a bit. However, the effort required to recognize this was not insignificant.

With his agency theoretical considerations on accounting and other information economic models for planning and control, he can no longer influence me. In terms of an operational planning and control with cost-performance models, this idle talk is of no use at all.

And after the intensive study of his and Ewert's *"Internal corporate accounting"*, to put it mildly, my opinion is even worse. Wagenhofer's (and, of course, Ewert's) level of knowledge in the area of cost-performance accounting is to be assessed with a highly unpleasant predicate. After Graz, I am quite sure; I will not drive there a third time.⁷⁷⁵

Theory yes, but in contrast to pure mathematics it must ultimately also lead to some enrichment of the *"specialists in practice"*. And whether *"scientists"* (introduction) are informed about the latest status of internal corporate accounting by this work must be decided by each *"scientist"* himself. However, in my opinion, *"business economists"* with their activities should in some way at least also serve the *"specialists in practice"*. The more I read in Ewert and Wagenhofer's work, the more I realized that one has to oppose such a presentation of internal corporate accounting. With such a work, business administration discredits itself as a discipline that is ultimately intended to serve application in some way. Hence the great effort to justify this argument. A first superficial reading easily gives the impression that this is a highly scientific and relevant work on internal corporate accounting.

However, I still have one more suggestion. What would it be like if Alfred Wagenhofer were to focus a little on the topic of "cost accounting" in his next research semester? And this even in view of the fact that *"science is not interested in cost accounting"* (s.p.424).

I have the following idea: With 6,500 predominantly German-speaking members, the International Controller Association is one of the largest German-speaking professional associations. It organizes the largest annual conference on controlling in the German-speaking world in Munich. Alfred Wagenhofer has a chair for controlling, but he is not a member of the Controller Association and (according to my information) has never participated in one of these conferences, let alone held a lecture there or exchanged ideas with Albrecht Deyhle, the long-standing chairman and head of the Controlling Academy. However, that should change, because the practice is very interested in *"feedback downwards"*.

It would, therefore, be extremely commendable if he were to give a lecture at one of the next meetings in Munich. Suggested topic: *Agency theory - how can it improve our current planning and control procedures?*

Kloock (p.515), John D.C. Little (285) and Michael Scott Morton (p.528), Hanns Martin Schoenfeld (p.524).

⁷⁷⁵ However, hopefully, more often to Vienna. See page 215, *"Why I travel to Vienna"*.

Ewert and Wagenhofer's goal with their work is to provide the *"theoretical foundation of a practice-oriented discipline"*. However, Wagenhofer's research efforts go beyond this goal. For, as has already been repeated several times, and this is the point by which he has to be measured, his research *"is predominantly shaped by the application of analytical models of the agency theory"*.⁷⁷⁶ And that, as he himself says, is not bad for a *"practice-oriented discipline"* such as "Controlling" (management accounting). So what could be more obvious to make the following proposal?

Albrecht Deyhle founded the Controller Association in 1975 and is now its honorary chairman. I would address Albrecht Deyhle, and I am sure he would find it a great honor if Alfred Wagenhofer were willing to present such a topic at the congress. And Albrecht Deyhle would certainly not miss the opportunity to announce this lecture himself. I like this idea so much that I have already made such an announcement, in rhymes. *"Goethe's Faust"* is also announced in the "Prelude" by the theatre director in rhymes. So why not *"Wagenhofer's agency theory"*? Since I got to know Albrecht Deyhle as a humorous and open-minded person, he might even take over this announcement.⁷⁷⁷ Let's see how the *"specialists in practice"* envisaged by Wagenhofer as contact persons for his theories react to his lecture.⁷⁷⁸

The same pre-reader who has already commented on my criticism of Küpper (s.p.320) said that the criticism of Ewert-Wagenhofer's work would now eclipse everything that has gone before. In view of the description of my meeting with Alfred Wagenhofer in Graz and the subsequent decision to "inspect" Ewert-Wagenhofer's work, it would have been immediately clear to him that this would probably only end with a scathing review. It would have been a miracle if things had turned out differently. My answer was that this is not true. I was quite angry and described my feelings frankly after the conversation. However, fortunately, this disappears quite fast with me.⁷⁷⁹

The visit had only the after-effect that I decided, which would never otherwise have been the case, to thoroughly read through Ewert-Wagenhofer's work and to assess it in the light of the Integrated Target Commitment Planning. What emerged is that this work is, in my opinion, unacceptable, not only in the light of the Integrated Target Commitment Planning but also in terms of cost and performance accounting as an application-oriented discipline.

In this text, Ewert-Wagenhofer's work is criticized in about twenty pages. However, it is only a summary of the more detailed chapter reviews that can be called up online. The summary in this text contains, it is true, a rather drastic judgments, the acceptance of which is only possible if one reads the detailed criticisms to the individual chapters to which reference is made here.

⁷⁷⁶ The word "application" was underlined by me. For the quote, see page 398.

⁷⁷⁷ For my meeting with Albrecht Deyhle, see page 447.

⁷⁷⁸ To the poem, see: www.Inzpla.de/Wagenhofer-Ankuendigung.pdf.

⁷⁷⁹ J.W. Forrester (see page 16) also let me clearly feel in the described conversation that I moved below his level and could be happy to be allowed to speak to him at all. I wasn't angry with him. I was just wondering why such a world famous and much older man needs to behave like this.

Does anyone really think that I am spending 121 pages alone critically reconstructing chapter 7 of Wagenhofer's text "*Control calculations*" just because I got angry with him? You can get rid of your anger with less effort. I did it because I think what Ewert and Wagenhofer present there is completely wrong. And if I take myself seriously as a representative of my special field of controlling, I am obliged to take action against it. Whether I am right is a completely different question.

The sometimes polemical statements were made while reading the work and were not an after-effect of the Graz meeting. Reichmann's statement that he has emphasized "*the essential, decision-relevant ratios in their mutual contexts with the help of the system theory*" (s.p.458) and nothing could be found about this in his text, was commented equally polemically. And I never met Reichmann personally.

The authors' self-portrayal at the beginning of their work is really ridiculous, and Katharina's conversations with her friends are more than childish. Who can restrain himself from not becoming satirical?

Theodor Fontane is right when he says, "*He who weighs anxiously says nothing. Only the sharp drawing, which already touches on the caricature, makes an effect*". And further, "*Others can come afterward with the explanations and mitigations*". That makes sense here too. Wagenhofer's comrades-in-arms can take action.⁷⁸⁰

There is a counterexample to the assertion that, after the conversation I have described, nothing else but a slating could have emerged. As mentioned, Teemu Malmi remarked in a rather condescending tone at the closing event of the conference that the Integrated Target Commitment Planning was not a normative theory.

This remark annoyed me on the spot and seconds later, I said, as in Wagenhofer's case (s.p.215), to myself: "*You should take a closer look what is the result of his efforts*". And what was the result?

The result is that I call Teemu Malmi a "*forerunner*" and even as a "*revolutionary*" of a new direction in management accounting (s.p.215) and suggest that, because I agree with his ideas, we should appear as a team at "conferences". What more can you ask for?

⁷⁸⁰ All responses themselves, if they are to be regarded as insults, I am ready to display as pdf files to be called up here.

31. The Dieter-Schneider-Syndrome and its consequences

Criticism is an integrated part of science. Scientific progress can only be achieved through criticism. Every scientist is virtually obliged to critically analyse these texts in his field that claim to contribute to the progress of his discipline. However, whether the criticism should be as harsh as it was practiced by me with Küpper, Ewert-Wagenhofer, Kaplan and Little is a matter of discretion. I had originally intended not to criticize the contributions of professional colleagues at all. And the reason for this was that I suffered from the Dieter-Schneider-Syndrome. In the following I will report on the development of this syndrome and its consequences.

The troublemaker

Early on I was aware that criticism destroys the mood and that something like this usually doesn't go down well at a meeting. This may be different in some disciplines. However, the meetings in business administration I attended left me with the impression that harmony is paramount.

Anyone who really criticizes the speaker of a lecture and does not just ask "a friendly question", which should make colleagues realize that the questioner also knows his way around the area, is considered to be a troublemaker because he endangers the harmonious mood. This insight is not a matter of chance but is based on several observations. And it became particularly clear to me through the following experience.

Carl Christian von Weizsäcker gave the opening speech at the 1994 conference of the Association of University Lecturers in Business Administration in Passau. There he developed what he called a theory of "*induced technical progress*".⁷⁸¹

To illustrate this theory, he used a differential equation to describe the development of corporate profits. On the basis of this model, an analysis led him to the following conclusion: "*The higher the share of fixed costs ϕ in total costs, the more technical progress is geared towards reducing fixed costs*".⁷⁸² In my view, this hypothesis is quite obvious. This does not require an explanatory model from which it is derived as a "new" hypothesis that would otherwise not have been possible. However, the question arises as to whether this hypothesis can also be empirically tested. In order to verify them, one has to determine the fixed cost share occurring in companies.

As someone who has studied the costs and their modeling in more detail, I was surprised at the ease with which von Weizsäcker formulated certain hypotheses without any indication of their empirical testability.

For example, he divided the rate of change in fixed costs (f) over time (t), i.e. df/dt , into a

⁷⁸¹ Weizsäcker, C. Christian, *Der Wettbewerb der Unternehmensgrößen – Eine evolutorische Perspektive (The Competition of Company Sizes - An Evolutionary Perspective)* In: Bühner, R., et al. (Ed.) *Die Dimensionierung des Unternehmens. Tagungsband zur Jahrestagung des Verbandes der Hochschullehrer für Betriebswirtschaft 1994 in Passau*, Stuttgart, 1995, p. 23-43. The symbols used in the following are no longer in my head but are taken from the article quoted above. This is where the theory of induced progress can be studied in detail.

⁷⁸² This quote was taken directly from the text on which the lecture was based, that is: Weizsäcker, C. Christian, *Der Wettbewerb der Unternehmensgrößen...*, op. cit., p. 32.

component that can and cannot be influenced by the company (ε and ε^*), i.e. $df/dt = \varepsilon + \varepsilon^*$. You can do that. The question is only how to determine the actual value of the influenceable component (ε) in a company. This is necessary because, in addition to the technical progress that can be influenced (λ), this component appears as an explanatory term in one of the hypothesis equations formulated by him. However, the theory developed by von Weizsäcker primarily requires that companies know the variable costs of their products and their fixed costs.⁷⁸³

After the lecture, one could ask questions. So I asked for the floor and said that I had a little bit dealt with the topic of determining the plan and actual costs in companies and got the impression that many companies were not even aware of the division of their total costs into fixed and variable costs and certainly not the division into influenceable and not influenceable fixed costs. Determining the variable costs in multi-product companies with multi-stage production is not as easy and requires a computer-based system in the form of a flexible plan cost accounting as the SAP-CO system. However, if a company does not use such a system, with which data it then wants to check whether its hypothesis derived from the model of the connection between technical progress and an increased reduction in fixed costs applies to this company.

I would, therefore, like to ask him a question about the verifiability of his theory, namely the question: Under which observable circumstances (according to the Popper criterion) would he consider his "fixed cost progress theory" postulated by him as valid for all companies as false (falsified).

Von Weizsäcker gave an answer to this question, from which I could not deduce whether he agreed at all that a hypothesis should be empirically verifiable according to certain criteria in order to be accepted as an empirical hypothesis. (At least that was my impression).

I then answered him with the question: *"If it turns out that only ten percent of all companies know the variable costs of their products, would your prediction theory of induced technical progress be rejected for lack of empirical verifiability, because it cannot be falsified? Or.."*. Here I was interrupted by the moderator of the event, Eduard Gaugler, who shouted: *"Just finish your speech"*. After he had silenced me in this way, he ended the event by thanking the speaker for his outstanding contribution.

The solemnity of the performance and the high intellectual level of the lecture were obviously disturbed by my disrespectful objections. It's not the right thing to do.

But perhaps it might be part of a scientific lecture that controversial discussions will follow, which need not be longer than a few minutes. It would certainly have been interest-

⁷⁸³ Von Weizsäcker's model was based on a single-product company, which is not very realistic. Should his theory also apply to multi-product companies, then the fixed costs (f) would probably have to be replaced by the individual fixed costs of the articles. However, it is even more difficult to determine these than the block of the total fixed costs in a company. For example, the SAP-CO system is not able to do this.

ing to know which verification criteria, in von Weizsäcker's opinion, should apply to his forecasting theory and whether he considers an empirical verifiability of his theory to be necessary at all. Maybe the audience would have even liked it. The demand for the empirical verifiability of a theory is (as the theory of *homo oeconomicus* shows) by no means a dogma. But you could talk about it.

After all, I fared better than Hans Jürgen Eysenck, one of the world's best-known psychologists, who was a firm opponent of the Freudian psychoanalysis.⁷⁸⁴ He reported that during a lecture in which he described the hypotheses of Freud's psychoanalysis as a pseudoscience because of their empirical non-verifiability, a lapsed elderly gentleman with a raised crutch and the call "traitor" came upon him to strike him (fortunately unsuccessfully) his crutch on the head.

Schneider in action

The second reason for my reluctance at meetings to criticize the contributions of others is, however, the most important one. It was the cautionary example Dieter Schneider presented at such conferences.

Everyone in the community of lectures in business administration knew him because his participation in scientific events consisted primarily of sharply criticizing others or, to put it more clearly, of picking their contributions apart and in most cases even de-qualifying them. His literary products also contain hefty reviews.

I remember a meeting of the Accounting Commission in Leipzig in 1998. The members of the Commission were sitting at a long table. The lecturer was sitting on one side of the table. Schneider had taken his seat directly across the corner on the left side of the lecturer. I sat to record everything better, on its right side, so that I sat directly opposite to Schneider. Behind us on both sides of the table were the other participants.

The lecturers changed, but the procedure was almost always the same. The longer a lecture lasted, the more restless Schneider became on his seat. One had the impression that he would have preferred to interrupt the lecturer during his presentation in order to "get started" right away. As soon as the lecture was over, Schneider raised his right arm to a kind of symbolic request to speak, but without receiving approval from the discussion leader at the back of the table by eye contact, and then he started.

You can label it that way: Everyone was served a review that eclipsed everything. Whether it was Paul Riebel or Klaus Dellmann. What he said was in part not unfounded, but as he said, it was simply unbearable. You could clearly notice that this was not about the issue, but an egomaniac presented himself. I've never seen such exaggerated vanity in anyone before. He spoke in a haughtily arrogant tone and left no doubt as to who was the cleverest in the room. The more he talked himself into his criticism, the more lively he became and the more complacent his voice sounded.

I was so repulsed by that that I always said to myself when I could have made a criticism

⁷⁸⁴ Wikipedia says about him: "*He has been described by experts as one of the most important or at times the most influential British or at times the most cited psychologist in the world*". For his critical assessment of psychoanalysis, see: Eysenck, H.J., *Sigmund Freud. Niedergang und Ende der Psychoanalyse (Decline and end of psychoanalysis)*, München, 1985

anywhere: Think of Schneider's condescending and self-indulgent appearances and keep your mouth shut before you get into his footsteps.

However, Schneider was not only a critic in love with himself. His addiction to appear as a relentless high priest who was competent in everything that had to do with business administration led to the fact that he himself did not control even things that he criticized. This applies in any case to the area that I overlook.

In a chapter of this "History..." (s.p.139) I referred to a text in which the cost accounting terms of the Integrated Target Commitment Planning are compared with the terminology used by other authors in their cost accounting systems. In this context, Schneider is also quoted there, who claims to have developed a completely new concept system of cost accounting. One reads that his contribution is intended *"to point the finger at the wounds of intellectual uncleanness in the basic concepts of financial, income and cost accounting"*. For what he found in this area was *"beginnerish confusion of concepts"* and *"dangerous drivell"*. However, with his work, this confusion of concepts will now *"disappear"*, etc. In view of such formulations, the question arises as to whether everything is in order with his psyche.

Perhaps, however, these quotes could also contribute to the description of his appearance in Leipzig not being too exaggerated. However, the culmination of Schneider's announcement to develop a new concept system for cost accounting is this concept system itself. I analyzed it (as well as Küpper's concept system) in the light of a model-based concept formation and came to the conclusion that it can hardly be surpassed in confusion and ambiguity.⁷⁸⁵ More expertise and less arrogance would not be bad.

But this is no exception. In his texts on cost accounting, Schneider also comments on cost centers with an interdependent settlement. He describes the *"allocation of internal services"* as an invalid procedure. Schneider explains this as follows, *"Difficulties arise when several cost centers provide each other with services. Cost theory requires the formulation of simultaneous equations for this purpose. Since this task is practically impossible to accomplish, arbitrary trying procedures (iteration procedures) are chosen when a target is set to achieve complete cost relief for the performing cost center"*.⁷⁸⁶ This remark contains a shaken measure of ignorance.

Schneider believes that the task of *"formulation up simultaneous equations"* is practically impossible. This is not true. With the help of configuration systems (such as the SAP system or the INZPLA-System), you can *"formulate"*, simultaneous equation systems of any size for cost centers using interdependent settlement. In practice, there are extensive interdependent price loop systems, such as a system of 100,058 equations (s.p.627) at ThyssenKrupp Steel, which are not a problem to *"formulate"*.

Apparently, however, Schneider does not mean the *"formulation of simultaneous equa-*

⁷⁸⁵ See: Zwicker, E., *Variable Costs vs. Fixed Costs, Individual costs vs. Overhead Costs in the relevant Cost Accounting Concepts and the Integrated Target Commitment Planning*, Berlin 2003, p. 38, www.Inzpla.de/IN24-2003b.pdf. (Text in German, title translated).

⁷⁸⁶ Schneider, D., *Betriebswirtschaftslehre*, Vol. 2, *Rechnungswesen*, München 1994, 1st Ed., p. 394.

tions" but the "solution of simultaneous equations", because in his opinion, only "*arbitrary trying procedures*" are possible for this "*task*" of a solution of simultaneous equation systems (not a "*formulation*"), which do not lead to "*complete cost relief*".

However, this claim is not true. Price loop systems, which are addressed by Schneider alone, can (as has been proven), always be solved with the help of the Gauss-Seidel method due to their structural peculiarities, and this with any given accuracy.⁷⁸⁷ This always allows' a "*complete cost reduction*".⁷⁸⁸

One simply should not write such nonsense if one has appointed himself as the "*advocatus diaboli*" of German business administration and considers one's own judgment infallible.

And I would like to tell another story of my experience with this so relentless fighter for the purity of business administration.

Several years ago Schneider gave a lecture at the TU Berlin in Theo Siegel's seminar.⁷⁸⁹ During this lecture, he claimed that the development of multi-stage stochastic optimization models is complete nonsense and there is no example for the practical application of such models. This assertion was presented by him with such certainty that any contradiction against it had to appear to the audience as a kind of insult to the majesty.

Now I have to insert that Schneider's assertion is wrong. Holt, Modigliani, Muth and, Simon have developed such a multi-stage stochastic optimization model of production control for a paint factory in Pittsburgh (known as the "HMMS model").⁷⁹⁰ They described this model in a monograph of 433 pages.⁷⁹¹ It is a classic of multi-stage stochastic optimization because for the first time optimal linear decision rules for solving multi-stage stochastic optimization models with quadratic objective functions are used.

So I asked to speak and said what he was saying is wrong, there exists a work by Holt, Modigliani, Muth and Simon, where exactly, etc. etc. etc. After a brief comment on the content of this work, I could not refrain from asking Dieter Schneider in front of the entire audience whether he would not know this publication. His answer, "*I've heard of it*". What I am writing here may seem unfair if one wishes to pay tribute to Schneider's entire work. After all, with four honorary doctorates, he is one of the top German speaking university professors in business administration awarded in this way.

But also here he falls out of the frame. A colleague (H. Z.) told me that he had sent Dieter

⁷⁸⁷ This means more precisely: It can be proved that the Gauss-Seidel method always converges in price loop systems, no matter what initial values are assumed. The number of iterations when using the Gauss-Seidel method is usually less than 20 with an accuracy of $(V_i - V_{i-1} / V_{i-1}) \leq 10^{-6}$. (V_i - value of an endogenous model variable V in the i -th iteration step).

⁷⁸⁸ Excel can also be used to solve smaller simultaneous systems of equations.

⁷⁸⁹ Theo Siegel worked from 1988 to 1994 as a professor at the TU Berlin in the field of business administration.

⁷⁹⁰ It is a top-class group of authors, for not only H. Simon but also F. Modigliani was later awarded the Nobel Prize in Economics.

⁷⁹¹ Holt, C. C., Modigliani, F., Muth, J.F., Simon, H.A., *Planning, Production, Inventories and Work Forces*, New York, 1960.

Schneider a programme draft in which he was announced as one of the speakers. His honorary doctorates were, as is customary, marked "Dr. h.c. mult.". Schneider then informed him that he insisted that all his doctorates had to be listed individually in the announcement of the lecture, i.e., in the form "*Prof. Dr., Dr. h.c., Dr. h.c., Dr. h.c., Dr. h.c., Dieter Schneider*".⁷⁹² It is good that Horst Albach does not insist on such a title when he is announced as the speaker. You'd need a little more printing space. He holds eight honorary doctorates. Typographically, however, it only becomes problematic when the Dalai Lama announces a lecture with over sixty honorary doctorates.

I am unable to judge Schneider's achievements in other areas of business administration in which I am not familiar. There have been a number of very positive reviews of Schneider's contributions by high-ranking colleagues.⁷⁹³ What I am writing here is my subjective view. But at least I tried to prove them with facts.

One might ask oneself, why should these remarks about Dieter Schneider be made? As mentioned there were two reasons why I did not criticize speeches made at conferences and other meetings for many years, even though there were a number of reasons for this.

One reason was the experience that criticism disturbs the harmony of a friendly get-together. And my "thwarting" by Eduard Gaugler in Passau is an example of this. However, the most important reason was Dieter Schneider's unbearable behavior.

His appearance in Leipzig and also the additional experiences described above led to the situation that whenever it made sense for me to express something critical, an inner voice said to me, "Let it stay; otherwise you will look like Schneider." I had pointed out that in view of Schneider's arrogant quotations on the development of a new conceptual apparatus of cost accounting; the obvious question was whether everything was in order with his psyche. In the same way, however, the question arises as to whether everything is all right with my psyche in view of my inner "think-to-Schneider voice", which has not given me peace for years.

Beyond Schneider

However, with this inner voice I got into a serious conflict at the end of 2014. Because my visit to Graz had aroused in me the desire, to criticize the work of Ewert and Wagenhofer from the point of view of the Integrated Target Commitment Planning.

On my return journey, my inner voice was already heard, and I asked myself whether, if I did not approve of this work, I could criticize it so as I felt it necessary, without falling into Schneider's complacency.

And unfortunately, there is no clear answer to this question. There is always a grey area because every criticism signals that the critic is always somehow presumptuous towards the criticized. Every criticism is always accompanied by a self-portrayal of the critic, which, if the criticism is accepted by the reader (which is not always the case), puts him

⁷⁹² See the Google search string for verification "Dr. Dr. h.c. Dr. h.c. Dr. h.c. Dr. h.c. Dieter Schneider".

⁷⁹³ See Ballwieser, W. *Fundamentale Fragen von Rechnungswesen und Unternehmensbewertung - vor und nach Dieter Schneider*. In: Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung 67.4 (2015), p. 490-521.

in a favorable light. Such a tendency towards a positive self-portrayal of the critic is unavoidable.

There is also the following: to arouse interest, one must formulate clearly and decisively. Also in scientific texts, one should take a clear stand, but it should serve the cause and as little as possible for self-portrayal. However, as I have already said, it is impossible to avoid the last completely. Therefore, at least one "small to large Schneider" always looks out of every criticism.

However, another point is also important. Schneider's reviews are enriched with mockery that goes all the way to malice. This too cannot be completely avoided; at least a shot of mockery and irony is quite appropriate in some cases. As Tertullian noted (197 AD), *"There are many things that deserve to be ridiculed and played with, just to avoid giving them undeserved weight through a serious attack."*

My criticism of Ewert and Wagenhofer (s.p.442) already contains a good portion of mockery. Because nothing else is the proposal to introduce the Katharina test as a selection criterion for the next edition of their book. And the fact that Ewert and Wagenhofer should copy their plagiarisms a hundred times as a punishment, as Karl Kraus suggests, is still an increase (s.p.439). However, the hint that such punitive work can perhaps still be expected of Ralf Ewert, but not of Alfred Wagenhofer as a member of the Academy of Sciences, is already a mocking in high potency. Dieter Schneider sends his regards.

Principle violations

Ewald Scherm's controlling terminology

You formulate principles, but you don't always keep them. This also applies to my intention not to be a critic at conferences. Because once at a conference I presented something that was more like an insult than a criticism. And Professor Ewald Scherm is to blame for this. At the annual conference of business management professors for controlling 2002 at WHU in Vallendar, Gotthard Pietsch gave a highly philosophical lecture on *"conceptually oriented controlling research"*. Also present was Ewald Scherm, the co-author of the text on which the lecture was based, but who only listened.⁷⁹⁴ In the ensuing discussion, Ewald Scherm responded with utter conviction to a discussion contribution *"Controlling has nothing to do with accounting"*⁷⁹⁵. He made this statement with great determination and indignation. That was the reason for me to "freak out", because and I was quite aroused by Ewald Scherm's statement in front of the entire forum as "the last nonsense". Such an assertion would correspond in physics to the assertion that physics has nothing to do with mathematics. How would physicists have reacted to such a contribution of a colleague at a scientific conference?

⁷⁹⁴ To be read in: Pietsch, G., Scherm, E., *Gemeinsamkeiten und Forschungsperspektiven in der konzeptionell orientierten Controllingforschung - acht Thesen*. In: Weber, J., Hirsch, B., Ed., *Controlling als akademische Disziplin. Eine Bestandsaufnahme*, Wiesbaden 2002, p. 191-206. Pietsch was at that time a research assistant at Scherm's department.

⁷⁹⁵ This formulation was confirmed on 8.4.2015 by Ulrich Krystek, who was sitting next to me at that time. If Scherm had not said *"nothing with"* but *"not only something with"*, then there would be no objection at all.

Ewald Scherm had impressed me so much with his statement that I did not sit down with Ulrich Krystek or another colleague at the following dinner in the basement vaults of the WHU, which I knew would be a cheerful and entertaining evening. Rather, with the buffet plate in my hand, I specifically sat down opposite Ewald Scherm in an empty seat. He already awarded the excellent buffet there. The purpose of this choice of location was to learn (naturally inconspicuously) something about his knowledge in business administration and also to gain an impression of his intellectual abilities. I have always had a preference for extreme types.⁷⁹⁶

I can still remember exactly that he did not know the name of Herbert A. Simon. For me, in the field of economics and social sciences, this is as if a German high school graduate has never heard of Thomas Mann. The conversation with him impressed me so much that I tried to find out about his activities in the field of controlling. This is how he described the focus of his research in this field on his website:

"The research efforts are aimed at analyzing controlling as an organizational practice. In this context, the theory of structure, socio-logical neo-institutionalism, the micro-political perspective and the approach of organizational anarchy have so far been applied to phenomena of controlling practice."

I must confess that I have never heard of this *"theory of structure"* or the field of *"socio-logical neo-institutionalism"* before. And the same applies to the *"micro-political perspective"* and the *"approach of organizational anarchy"*. After studying these approaches, however, I began to understand why controlling had nothing to do with accounting.

A man of the world would not have thought of getting so upset about Ewald Scherm's assertion. Nothing seems more sovereign and worldly than to take up an everything-goes position. And doesn't the Bible already say: *in my father's house there are many rooms*. But then I think of Karl Popper and ask myself, "Is it really possible to accept everything as science, even if it is absurd? Doesn't there have to be some sort of delimitation criterion?"

Thomas Reichmann's systems theory

Once more my trained equanimity was shaken, and this did not happen during a public event, but while reading a book. This was not even a text that in some way contradicted the Integrated Target Commitment Planning or (as with Scherm) called into question the foundation of an operational company planning and control.

It all began when I reviewed the literature on ratios for company planning and control. My goal was to get an overview of what is said in the literature about ratio systems. This is because an Integrated Target Commitment Planning model also contains a ratio system consisting of basic and top targets. And this "system" consists of the basic targets being linked to the top targets by a system of equations. And certain relationships can be shown between the top targets (s.p.171).

⁷⁹⁶ Someone who thinks that controlling in companies has nothing to do with accounting is, in my view, an extreme type.

In this context, it was inevitable that I would also deal with Thomas Reichmann's contributions on ratios. He has dealt intensively with ratios in his publications. In this context, I have also studied his main work on ratios "*Controlling with ratios and Management Tools*" (translated from the German title). In this book, Reichmann deals with the "RL ratio system" developed by him.⁷⁹⁷

If one reviews Reichmann's system of ratios, then one will notice that their definition equations listed there do not form a hierarchy or are in any way connected to each other by structural equations. This is not necessarily a shortcoming. And Reichmann also notes that in his system "*largely dispenses a formal connection of the ratios*" (p.32). However, the ratios of a "ratio system" should always be in a certain relationship or linked in a certain way, otherwise, they probably do not form "a system".

But well, that didn't bother me. However, here it comes. Reichmann points out: "*The limitation to relatively few ratios is possible by emphasizing the essential, decision-relevant ratios in their mutual contexts with the help of the system theory*" (p.32). That sounds good. However, he does not say one word about how this "*mutual context*" was carried out with the help of the system theory and according to which criteria of decision relevance this "*highlighting*" of the ratios was made. The name "*systems theory*" is used throughout the work only in this quote.

If you are reading this, you have to ask yourself if you've got the wrong book in your hands. The ratios of the RL system are listed according to groups and commented with some isolated claims of relevance. They are rudimentary and contradictory. Authors of such books are done the greatest favor by refraining from criticism. However, I didn't want to do Reichmann that favor. What stopped me was his assertion that "*is possible by emphasizing the essential, decision-relevant ratios in their mutual contexts with the help of the system theory*". Anyone who claims this without losing a single sentence about it must consider his readers to be more than limited.

And there I said to myself, "On behalf of all readers who don't want to be taken for fools I will criticize the entire RL system in my text on ratios and in a way I consider as appropriate, suppressing the Dieter-Schneider-Syndrome."⁷⁹⁸ Being kidded like that (there's a better word for it), you shouldn't put up with it.

However, I am not sure whether this "*management without a mandate*" applies to the agreement of the readers, as whose representative I presumed to appear. Perhaps at least some of them think that Reichmann, even without justifying his ratios "*with the help of the system theory*", has nevertheless achieved the goal of his work, which he strived for

⁷⁹⁷ Reichmann, T., *Controlling mit Kennzahlen und Management-Tools, Die systemgestützte Controlling-Konzeption*, 7. Ed., München, 2006. There exists an English version: "*Controlling: Concepts of Management Control, Controllership, and Ratios*", Springer 1997. The quotations are translations of the 7th German edition.

⁷⁹⁸ See: Zwicker, E., *Integrated Target Commitment Planning and Systems of Ratios*, Berlin 2002, p. 10f. www.Inzpla.de/IN22-2002h.pdf. (Text in German, title translated).

and described in the foreword, namely with his ratio system *"to arrive at a theoretically sound, practically applicable controlling system"*.⁷⁹⁹ I don't think so, though.

And how does it look now at the end of my activities with the Dieter-Schneider-Syndrome? Under no circumstances may one demand be neglected by this syndrome and this demand reads as follows:⁸⁰⁰

The smarter one gives in,

Are you out of your mind?

Then who will only win?

When arguments war each other
the better should prevail

If this requirement is abolished,
there is no more science.

Der Klügere gibt nach,

Seid Ihr von Sinnen ?

Wer wird dann immer nur gewinnen?

Wenn Argumente sich bekriegen,
dann sollte stets das bessere siegen

Wird diese Forderung abgeschafft,
dann gibt es keine Wissenschaft.

⁷⁹⁹ Reichmann, T., op. cit., preface p. XI.

⁸⁰⁰ Unfortunately, I couldn't find a poem form in English.

32. The “theory of promise decision making” in the light of the Integrated Target Commitment Planning

In the literature on management accounting, it is often pointed out that the employees in companies are given specific objectives which they are to meet. The term “*management by objectives*” is often used for characterizing this procedure. However, much more is not said about this procedure. A theory that shows that such a “*management by objectives*” can be interpreted as a special type of a decision was first formulated in 2016 by Mouritsen and Kreiner for the area of accounting.⁸⁰¹ The concept of “*management by objectives*” can be explained as a behavior that Mouritsen and Kreiner call “*promise decision making*”.

As already mentioned (s.p.27) the Integrated Target Commitment Planning can be regarded as the model-based precision of the normative concept of a “*management by objectives*” in the area of an accounting based operational planning and control. Therefore the behavioral theory of “*promise decision making*” described by Mouritsen and Kreiner will be investigated in the following, especially with regard to the Integrated Target Commitment Planning and Control. It will be shown that the Integrated Target Commitment Planning and Control is a normative theory in which such a “*promise decision making*” function as the essential element to achieve the objectives of the corporate management.

If one considers the various approaches describing the decision-making behavior in companies, they always assume that people who make such decisions do not act as maximizers according to the norms of the normative decision theory. The contributions of the “*behavioral theory of the firm*” by Cyert and March, which put the “myth of maximization” in the right light, have contributed to this in particular (s.p.471f.).

One of these contributions about decision-making behavior in companies comes from Mouritsen and Kreiner. Their description of a decision-making behavior is based on the “*idea of decisions becoming promises*”. These decisions are made in a very specific situation, namely that a person makes a decision and promises others that he will realize this decision.

Mouritsen and Kreiner name such decisions and their announcement “*decision as promises*”. Such “*promise decisions*” are not treated by the normative decision theory, but who wants to deny that in many areas of life such forms of decisions can be observed.

With regard to this type of a decision, Mouritsen and Kreiner note that “*after the decision (in the form of a promise decision), only the promise remains which commits decision makers to further action*”. This raises the question of what actions should be taken and in what form in order to fulfil these “*promises*”.

⁸⁰¹ Mouritsen, Jan, Kreiner, Kristian. “Accounting, decisions and promises.” Accounting, Organizations and Society 49 (2016), p. 21-31.

There are "*promise decisions*" where the announced "*putting the decision into action*" is obvious. For example, if someone holds a tennis ball in his hand and informs the present persons of his "*promise decision*" to let the ball fall and realizes this decision by letting the ball fall, then the promised action follows the "*promise decision*" immediately afterwards.⁸⁰²

But this case of a "*promise decision*" is a borderline case. In general, it remains open how and when a "*promise decision*" is realized. As Mouritsen and Kreiner emphasize, such "*promise decisions*" are decisions "*whose fate is unknown*". In detail, they describe this as follows: "*Understanding decisions as promises makes it possible to move attention from the things that happen before the decision to the things that happen to the decision*". And with regard to "*things that happen to the decision*", the question arises what are the characteristics of such a "*promise decision*".

Its characteristics differ threefold from the characteristics that is associated with a "decision" in the case of the normative decision theory.

First, the normative decision theory bases on the assumption that every decision is associated with a realization and that the decision made is so unambiguous that there is only one form of realization that is clearly identifiable. This assumption would apply in the case of a "*promise decision*" in the tennis ball example, but in the case of an upcoming operational planning of a company in which such "*promise decisions*" occur, this is almost never the case.

Second, in the case of a "*promise decision*", unlike the assumptions of the decision theory, unforeseen events may occur that require very different actions from those originally being planned by the "*promising agent*" in order to fulfil his "*promise decision*". Mouritsen and Kreiner point to the danger that the occurrence of such unforeseen events could create for the "*promising agent*" when they note: "*The promising decision maker risks being held accountable to unanticipated and unfortunate effects.*"

Third. The normative decision theory is based on the assumption that an objective set with a decision is always defined in such a way that it can always be clearly judged whether it has been fulfilled by a realized action or not. However, this is not necessarily the case with "*promise decisions*". Actions can be realized in which it cannot be clearly clarified whether the "*promise decision*" to realize a promised objective has been fulfilled or not. Mouritsen and Kreiner identify the reason for this as the "*fluid character*"... "*of objectives*".

The characteristics of a "*promise decision*" described by Mouritsen and Kreiner are then examined by them for the case that a "*promising decision maker*" makes his decision on

⁸⁰² The terms "*promise decision*", "*promise figure*", "*promise decision theory*", "*promise value planning*", "*promise decision behavior*" and "*promise decision making*", which are used below do not originate from Mouritsen and Kreiner, but are introduced analogous to their formulations as "*decision as promises*", "*promising decision maker*", "*actor making promises*", "*promised thing*", "*promises of the decision*", "*to promise action*", "*promising results*", "*promising agent*", "*decisions becoming promises*". They new introduced terms will still be printed in locked mode and quoted.

the basis of an accounting system in a company. The aim of their study is *"to revisit relations between accounting and decision making"*.

A "pure" accounting system in the form of a double book keeping system is only a system of definition equations.⁸⁰³ Such a system is not very helpful to make decisions on its basis alone. Mouritsen and Kreiner also share this view when they say: *"Accounting produces answers only when causal relationships are known and goals shared"*. This requirement is fulfilled by an equation model which describes the connections between the accounting parameters of a double book keeping system using hypothesis equations and also contains the target variable of an upcoming operational planning.

These are exactly the conditions that are fulfilled by a model of the Integrated Target Commitment Planning. This is because it links the basic parameters of a pure double book keeping system through hypothesis equations down to the quantity structure of a company. This modeling is made possible because the model configuration system of the Integrated Target Commitment Planning provides the entire quantity structure of a company described by hypotheses, from the purchasing quantities to the sales quantities, for modeling these relationships in the form of hyperstructural relationships.⁸⁰⁴

With their program *"to revisit relations between accounting and decision making"* Mouritsen and Kreiner move on a descriptive level exactly in that field in which the Integrated Target Commitment Planning moves on a normative level. It is normative, since their aim is to provide regulations for the execution of an operational planning and control of a company on the basis of the company's accounting system. And this planning takes place in the form of a "decision making".

With regard to my approach to describe the relationships in companies using equation models, it would have been appropriate to inquire whether it would be possible to develop a model that describes the relationships of Mouritsen and Kreiner's empirical theory of a *"promise decision making"* on the basis of a company's accounting system in the form of definition and hypothesis equations.

Such a model would correspond to the model of Charles Bonini, who developed an explanatory equation model on the basis of a company's accounting system in order to describe the behavior of decision-makers in this company according to the *"behavioral theory of the firm"*. In Bonini's model, the behavior of a satisficing decision maker is primarily modelled in accordance with Herbert Simon's empirical theory.⁸⁰⁵ Charles Bonini's model, which results from a dissertation supervised by Herbert Simon, has, as reported elsewhere, contributed significantly to the further development of the first approaches of

⁸⁰³ This can be seen particularly well from the matrix representation of an accounting system described by Mattessich, see p. 9.

⁸⁰⁴ See: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, Berlin 2000, www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated)

⁸⁰⁵ See Bonini remarks: *"The model we propose to use falls within a discipline, or sub discipline, labeled 'The Behavioral Theory of the Firm'"* on page 475.

sons, can under no circumstances be interpreted as quantitative formulations of a "*promise decision*". The situation is however complete different for the basic targets $BT_1, \dots, BT_n$. In my opinion, they represent exactly the case of a "*promise*" of an area manager to realize a (final plan) value of a basic target. And this value which is the result of the confrontation step (or bargaining process) is a "*promise*" of the area manager against the corporate management to realize this number.

In Mouritsen and Kreiner's terminology it would be a numerical "*promise decision*" of a "*promising agent*". Instead of calling them "basic target commitments of the area managers", they could in the sense of Mouritsen and Kreiner just as well be called as "*promise figures*" of the area managers and the Integrated Target Commitment Planning could be called as a procedure of "*promise decision making*". This also applies, as will be shown, to the observable characteristics of the (descriptive) "*promise decision theory*" presented by Mouritsen and Kreiner.

Mouritsen and Kreiner point out that it is not clear with which actions a "*promising agent*" achieves his promise. The achievement of his promise is dependent on unforeseeable circumstances and it is up to him to decide how he can meet his "*promise figures*" (the agreed values of his basic targets). Therefore in cases of such a "*promise decision*", it is appropriate to speak of a "*regime of hope*". However this characteristic also applies to the procedure of an Integrated Target Commitment Planning.

With regard to the epistemological status of a "*promise decision*", Mouritsen and Kreiner go on adding: "*The economy under this spell is not a predetermined economy but a promissory economy*". If "*economy*" is replaced by "*company planning*", this applies precisely to the Integrated Target Commitment Planning. As Mouritsen and Kreiner note further, the result of "*promise decision making*" leads to a "*promised and desirable future*". This "*desirable future*", which forms the result of all promise decisions made by the "*promising agents*", or the area managers is from the corporate management's point of view represented by the planned value of the operating result.

Mouritsen and Kreiner emphasize that in case of such a "*promise decision*" a "*promise*" is made "*whose fate is unknown*" and the actions of the "*decision maker*"... "*may be unfeasible or unfit for the purpose at hand*". This is also true for the area managers target commitment in case of an Integrated Target Commitment Planning. Mouritsen and Kreiner also point out that the "*promise*" of a "*promising agent*" is not always kept because circumstances have changed.

If such cases arise, then, as Mouritsen and Kreiner emphasize, "*accounting's role in a practice of forgetting and forgiving... is an... important topic*". Regarding the scope of such „*forgiving*“, they note "*but coercive systems refuse forgiveness and insists that the decision has to be restored*".

The question is how "*forgetting and forgiving (and their absence)*" is regulated within the system of the Integrated Target Commitment Planning and Control. The control as to whether the "*promise decisions*" or the target commitments of an area manager have

been met is carried out at the end of the planning period as a setpoint-actual control of the basic targets, which is often referred to more euphemistically as "reviewing".

It is not clear whether Mouritsen and Kreiner, by the application of the term "*promise decision making*" on the basis of accounting, assume that a "*promise decision*" will be always expressed in form of a numerical value. If this would be the case, then the characteristic described by them, that "*promise decisions*" are often characterized by a "*fluid character*" ... "*of objectives*" is not applicable. In the context of the setpoint-actual control procedure of an Integrated Target Commitment Planning however, the setpoint value of a basic target (*objective*) serving as a "*promise decision*" is always a well-defined and measurable variable.

In this context, it should be remembered that the basic targets ("*promise figures*") of an Integrated Target Commitment Planning are also characterized by the fact that they always have a direction of burden increase and decrease (s.p.171f.). They play an important role during the planning process when determining the values of the basic targets or "*promise figures*". In addition, a variance analysis can be used to determine which plan-actual variance of the operating result was caused fully or jointly by the setpoint-actual variance of the basic targets (or "*promise figures*") of an area manager (s.p.103).

Mouritsen and Kreiner point out that the "*promising agents*" ... "*require conditions of forgiveness*" if they do not achieved their "*promise*". Such "conditions", which would be necessary in the case of an unfavorable setpoint-actual variance regarding the basic targets of an area manager, are formulated in the context of the Integrated Target Commitment Planning. They exist and are formulated as norms of the setpoint-actual control in the reviewing process.

As already described (s.p.80), the commitment ("*promise decision*") to realize a certain sales quantity by a sales area manager is determined on the basis of certain business basis parameters which must be fulfilled if the initial setpoint value of this sales quantity should also be used as the setpoint value for the setpoint-actual control after the end of the planning period. Such a business basis parameter is always the price of the product to be sold and sometimes also the amount of the advertising and sales promotion costs.

If the values, assumed in the plan for these business basis parameters are not adhered to the initially committed (*promised*) target value of the sales quantity a new setpoint-value of the sales quantity has to be renegotiated between the controlling department and the sales area manager. In Mouritsen and Kreiner's terminology, such subsequent negotiations could be called "*ex post promise decisions*".

Other extraordinary circumstances that do not explicitly occur as business basis parameters in the planning model, such as changes in the originally assumed prices of competitors, are also dealt within the setpoint-actual control (reviewing) and can lead to a revision of an initial numerical "*promise decision*" of the basic targets.

If no justification for an unfavorable setpoint-actual variance of an area manager ("*promising agent*") is possible, then according to Mouritsen and Kreiner a form of "*forgetting and forgiving*" is necessary.

It is claimed that setpoint-actual controls (or review procedures) that can be observed in companies are not accompanied by great understanding and compassion for those who experience an unfavorable variance. I have participated in some of them as an observer. It is not for nothing that controllers are the most unpopular occupational groups in a company. Their status is often explicitly defined by the corporate management as that of a "devil's advocate". And as Eliasson aptly points out (s.p.477), controllers are the representatives of a consciously institutionalized "stress system".

As mentioned (s.p.524) I was a member of the working group "Integrated Corporate Planning" of the Schmalenbach Society to which the planning managers of some of the largest German companies belonged as members. This topic was often discussed there. I remember that there was also a discussion about the circumstances in which a profit center manager should be replaced. In this discussion the head of planning of one of the largest German companies took the view that if a profit center manager makes a loss once or twice, the cause of which could clearly not be attributed to him, then this could still be accepted. The third time, however, he had to be replaced, regardless of whether he was responsible for the loss or not. This would be necessary in order to send a signal to the other profit center managers. Ferdinand Piëch, the former CEO of VW, expressed it even more drastically: "*Either the figures are right or I want to see new faces.*"⁸⁰⁷. According to an anecdote, Napoleon remarked to a general who wanted to assert the adverse circumstances for his defeat: "*I need generals with fortune*". This probably also applies to the area managers in companies.

The reduced equation of the operating result, contains in addition to the uncontrollable basic parameters ($UP_1, \dots, UP_n$) and the basic targets ($BT_1, \dots, BT_n$) or "*promise figures*" also decision parameters ($DP_1, \dots, DP_s$). These decision parameters belong to the so-called fully influenceable model parameters of an Integrated Target Commitment Planning. The question arises as to their status in the light of Mouritsen and Kreiner's (descriptive) "*promise decision theory*".

Mouritsen and Kreiner point out that a "*promise decision*", which contains the "*promise*" to realize a certain target, does not necessarily have to be connected to the realization of a clearly defined action. However this is exactly the case with decision parameters. They are numerically precisely defined quantities for which someone is obliged to realize them precisely to the point. Examples are the sales price or the advertising expenses. For them there is always someone who has "*promised*" to realize them. The success of the realization of his "*promise*" is checked by a setpoint-actual control.

⁸⁰⁷ Brilliant- und beinhard, in: Der Tagesspiegel, 25.8.2019, page 15

The decision parameters are the parameters whose value is determined before the three-step planning procedure of an Integrated Target Commitment Planning begins, i.e. before the start of the bottom-up planning (s.p.72). However, there are also fully influenceable model parameters whose values must be selected anew for all the planning alternatives to be calculated in the planning triad of an Integrated Target Commitment Planning. These are as described the so-called decision variables (s.p.29).⁸⁰⁸ For each calculation of the model equations to realize a planning alternative, their values must be determined in such a way that the operating result is maximized. Their determination is therefore based on the standards of the decision theory.

This shows that the model-based normative reconstruction of the (descriptive) “*promise decision theory*” developed by Mouritsen and Kreiner leads to a normative theory in the field of management accounting that postulates the realization of “*promise decisions*” in the form of “*promise figures*” (or basic targets). As can be shown (s.p.45), the realization of a planning procedure of such a numerical “*promise value planning*” or an Integrated Target Commitment Planning can be reconciled without contradiction with a simultaneously operated optimizing planning with the decision variables in accordance with the norms of the decision theory. And the determined optimal values of the decision variables are also “*promise figures*”, because someone promises to realize them.

This connection of a target commitment planning with an optimizing planning is described by the so-called “*mixed optimization basic target commitment planning*” (s.p.45). However, as already mentioned (s.p.221), this case of planning is hardly to be applied in practice because cost-performance models used today for an operational planning have no decision variables and, in my opinion, nothing is likely to change in the future.

The “*promise decision theory*” described by Mouritsen and Kreiner, which is to apply to the area of accounting, would at least prove itself if a company would apply the procedure of the Integrated Target Commitment Planning for the operational planning and control of its operating result. Since there are actual companies that do this, they provide a clear observational evidences for the probation of Mouritsen and Kreiner’s empirical theory of an accounting based “*promise decision behavior*”.

⁸⁰⁸ They are not listed in Fig. 9 because this only refers to the so-called standard cost-performance models of the SAP-CO type or Kilger type (s.p.62). They do not contain decision variables.

33. Decision Theory and the Integrated Target Commitment Planning

Decision theory is a normative theory that prescribes how to reach (optimal) decisions. Its claim is universal, i.e., it claims to apply to all life situations. The Integrated Target Commitment Planning is also a normative theory, but its scope of application is much more limited. It is limited to the one-year operational planning of companies using a deterministic planning model. In this narrow area, however, the application claim of the decision theory also applies and here, it requires the selection of an optimal alternative, which is obtained by the extremization of a target variable.

It was claimed by me that such an extremization, i.e., a maximization of the operating result with plan cost-performance models, is almost never possible, since at the aggregation level of such a models no (completely controllable) decision variables can be found, whose alternative expressions form the alternative space of the optimization (s.p.26). In the case of a one-year operational planning using a cost-performance model, the Integrated Target Commitment Planning has a higher practical relevance than the decision theory because a pure optimizing planning according to the decision theory is usually not feasible using cost-performance models.

As already mentioned, none of the more than one hundred thousand companies that have created a cost-performance model with the configuration system of the SAP-CO module for their annual operational planning can run an optimization, because the completely controllable basic parameters required for this, i.e., the decision variables, do not occur in the potential structural equations of the SAP configuration system (s.p.26). Since the structural relationships of an SAP cost-performance model can be completely transferred to the model tableaux of an Integrated Target Commitment Planning, you can always use it for the Integrated Target Commitment Planning.

Even if decision variables occur in a cost-performance model, then, as has been explained, the Integrated Target Commitment Planning is still applicable in the form of a mixed optimization Integrated Target Commitment Planning (s.p.45). It is always “mixed” because basic targets for which an area can be made responsible can be found in every cost-performance model.

The Integrated Target Commitment Planning thus proves to be a normative theory for the annual operational planning and control of companies in the mainly existing form of a pure Integrated Target Commitment Planning, which is completely independent of the decision theory. The structural and procedural requirements of this system shall include:

- A hyperstructure model system with which the company-specific structural model of a pending operational planning can be generated by a configuration without entering equations (s.p. 479 and 498).
- A special interpretation of the variables and parameters of this structural model

in the sense of the Integrated Target Commitment Planning and Control.

- The planning procedures of the Integrated Target Commitment Planning and Control.
- The control procedures of the Integrated Target Commitment and Control.

The work steps required to implement these structural and procedural regulations should be carried out as far as possible by a computer. It is evident that such detailed regulations cannot be provided by the decision theory as a procedure to be applied to all decision situations.

However, it would be an advance towards the development of an area-specific decision theory if a hyperstructure model could be developed with which the annual planning of as large a number of companies as possible could be carried out in the form of an (pure) optimizing planning, i.e., planning that is exclusively determined by the optimization prescriptions of the decision theory.

The cost-performance models generated in this way would only have decision variables and uncontrollable basic parameters as model parameters. There cannot be any target commitment planning because these models do not contain any basic targets. This is the case of a "pure optimizing planning", which is marked in Fig. 39 on page 145 by the intersection point of line 3 with column 12.

So far I am not aware that such a hyperstructure model has been developed in the area of an operational company planning with annual models. In my opinion, which is justified elsewhere (s.p. 4, 363 and 409), such a project should not be successful either.

As described above, it may be necessary in the frame of an Integrated Target Commitment Planning to carry out not only a bottom-up planning of the first but also of the second step. The bottom-up planning of the second step is an optimization. However, this optimization is not an optimization in the sense of the decision theory with (completely controllable) decision variables (s.p.58). The alternative space of this optimization is rather formed by alternatively selectable combinations of basic sales quantity targets.

In view of the assertion that the Integrated Target Commitment Planning is the only operational planning and control procedure of an annual plan that is both theoretically justified and relevant in practice, two questions arise:

Aren't there any precursors to this normative planning theory? And, is there not another general normative behavioral theory besides the decision theory, from which the Integrated Target Commitment Planning can be derived as a special normative theory of an operational company planning?

There are, of course, predecessors such as the concept of target cost functions in the flexible plan cost accounting and the terms of the bottom-up, top-down and confrontation planning, which are not missing in any monograph on the subject of "company planning". However, these terms are by most authors considered as self-explanatory, i.e. not further described.⁸⁰⁹

⁸⁰⁹ See, for example, Küpper's comments on the top-down planning on page 315.

Above all, however, the Integrated Target Commitment Planning draws its prescriptions from the observation of how companies carry out their one-year operational planning. The observed applications consistently proved to be more or less explicit a planning through target commitment. The Integrated Target Commitment Planning, therefore, consists largely of in a normative reconstruction and precision of this process. As described above, the studies by Gunnar Eliasson on the operational planning of companies play an outstanding role here.

The second question as to whether the Integrated Target Commitment Planning can be derived from a general normative theory is to be answered in negative. There is no such normative theory. However, as has been shown, the Integrated Target Commitment Planning can be interpreted as a variant of a normative theory that is not general applicable but only to the cases of an annual operational planning. As has been explained in detail, this is the normative agency theory. This variant consists, however, in a rigorous change of the existing normative agency theory by deleting fundamental features (or basic assumptions) from it and adding other fundamental features (s.p.403).

However, there are also two descriptive theories that provide terms and principles of behavior that are "normatively turned" in the system of the Integrated Target Commitment Planning. These are the "Behavioral Theory of the Firm", which goes back mainly to Richard Cyert and James March, and the theory of bounded rationality developed by Herbert Simon, for which he was awarded the Nobel Prize in Economics in 1978. The influence of these two theories on the development of the Integrated Target Commitment Planning is described below. It will also be shown below how the contributions of Gunnar Eliasson and Charles Bonini have influenced the development of the Integrated Target Commitment Planning.

34. The "Behavioral Theory of the Firm" and Simon's theory of the "Satisficer" as starting point for the Integrated Target Commitment Planning

When I began to engage in the development of company models, the relevant theories to explain the behavior of economic actors were based on the assumption that they maximize their utility under complete information. If the hypotheses of these theories, which describe this maximizing behavior, can be formulated in the form of equation models, then they can also be interpreted as decision rules derived from an optimization calculation of the optimizing economic actor.

At the end of the 1950s, a field of research developed which claimed that the behavior of individuals in companies is not guided by optimization considerations, but (if at all) can only be described by "non-optimizing behavioral hypotheses". The representatives of this movement gave it the name "*Behavioral Theory of the Firm*". The ideas of this field of research were reflected in the anthology of Cyert and March entitled "*A Behavioral Theory of the Firm*".⁸¹⁰

I have studied the contributions of the "*Behavioral Theory of the Firm*" quite extensively. The reason for this was as follows: From the beginning of my dissertation, i.e., around 1966 onwards, I had the idea of modeling the planning of companies with equations. That is why I was constantly looking for ideas on how such equation models could be constructed. One thing was clear to me at an early stage: To describe the people working in a company as optimizers is a methodically fruitful approach to make problems transparent and to describe them with a calculation. However, if one wants to describe the behavior of the persons working in a company through empirically verifiable hypothesis equations, then the behavioral rules derived from a maximization requirement can almost never be used as hypotheses for predicting the behavior of these persons. However, the decisive question that arose was what behavioral hypotheses, which can also be described by equations, are suitable instead?

An initial approach was the article by Cyert, Feigenbaum, and March "*Models of a Behavioral Theory of the Firm*"⁸¹¹ and, above all, the already mentioned monograph "*A Behavioral Theory of the Firm*." Cyert and Feigenbaum's goal was to "*develop a theory with generality beyond the specific firms studied*" (p.2). This "*theory*" is described by the authors as a "*set of summary concepts and relations that could be used to understand the behavior of a variety of organizations in a variety of decision situations.*" (p.36)

For the first time, I came across the term "*organizational slack*", which was introduced by Cyert and March. The same applies to the term "*pressure*". This "*pressure*" is exerted by a person or group A in an organization on a person or group B and serves to influence the "*slack*" caused by a person or group B. However, I found the definition of an "*organizational slack*" provided by Cyert and March too abstract. It reads, "*There is ordinarily a*

⁸¹⁰ Cyert, R.M., March, J.G., *A Behavioral Theory of the Firm*, New York, 1963.

⁸¹¹ Cyert, R.M., Feigenbaum, E.A., March, J.G., *Models of a Behavioral Theory of the Firm*. In: *Behavioral Science*, 2(1959), p. 81-95.

disparity between the resources available to the organization and the payments required to maintain the coalition. This difference between total resources and total necessary payments is what we have called organizational slack" (p.36).

In view of this definition, how should one describe the "slack" caused by an area manager of a company as a quantitative variable by a definition equation? And how should the "pressure" that the corporate management exerts on this area manager be defined? However, not only that, a hypothesis (the "pressure-slack hypothesis") had to be formulated, which describes how a change in the "pressure" of the corporate management towards an area manager influences the "slack" for which he is responsible.

The "*Behavioral Theory of the Firm*" could only be applied in the model, which describes the planning of a company, if it would be successful to describe this "pressure-slack relationship" by the hypotheses of an equation model. However, I did not see the slightest possibility of finding a reasonable quantitative definition of the terms "pressure" and "slack" which occur by characterizing the relationship between the corporate management and the area managers in the case of a specific company. And the formulation of an empirically verifiable pressure-slack hypothesis working with these terms seemed almost utopian to me.

I had no doubt that there was something like "pressure" and "slack" in a company. However, how should these terms be defined operationally in the case of a company in question, i.e., how should their definition components be traced back to observable values? The demand to "bring down" this obvious pressure-slack relationship to a concrete equation level for singular cases could not be met. Work with equations, however, was my world and I didn't want to leave it. Overall, I found the contributions of the "*Behavioral Theory of the Firm*" very stimulating and innovative, but they did not help me in my plan to develop a process for the operational planning of companies that did not consist in an optimization.

A second direction, which was just as theoretical, but which also led away from optimization, was found in the work of March and Simon called "Organizations". Here the authors formulated a system of comparative statements on the "*adaptively motivated behavior*" of "*behavioral units*" in organizations. These were: ⁸¹²

1. The lower the *satisfaction* (S), the higher the *search rate* (L)
2. The higher the *search rate* (L), the higher the *expected value of reward* (R)
3. The higher the *expected value of reward* (R), the higher the *satisfaction* (S),
4. The higher the *expected value of reward* (R), the higher the *level of aspiration* (A)
5. The higher the *level of aspiration* (A), the lower the *satisfaction* (S)

March and Simon sharpened these "comparative hypotheses" (as "the higher...the lower")

⁸¹² March, J.G., Simon, H. A., *Organizations*, New York, 1958, p. 48. I was very impressed by this book when I was 25 years old. I looked at it again when I was 78, and I'm excited again. It's a real classic. That is also the opinion of others. With the incredible number of 26,987 quotations in scientific publications (Google Scholar on 31.05.2018).

etc.) by formulating the following system of two differential and two algebraic equations.

$$dA / dt = \alpha \cdot (R - A + a) \quad \text{with } \alpha > 0, a > 0 \quad (146)$$

$$S = R - A \quad (147)$$

$$L = \beta \cdot (S^* - S) \quad \text{with } S^* > 0, \beta > 0 \quad (148)$$

$$dR / dt = \gamma \cdot (L - b - c \cdot R) \quad \text{with } \gamma > 0, b \geq 0, c > 0 \quad (149)$$

S = satisfaction, R expected value of reward, L = search rate, S^* = desired level of satisfaction, A = level of aspiration.

I found this theory of adaptive behavior in organizations consisting of three hypotheses and one definition equation very interesting, because here the hypotheses of a behavioral theory, which describes a non-optimizing behavior, were so far specified that they could be described by the structural equations of a dynamic model. Although the terms used in this model were theoretical terms that required an operationalization, the hypotheses claimed to describe the behavior of "behavioral units" in organizations. They did not describe any optimizing behavior, and they seemed also plausible to me.

With this hypothesis system, Simon has for the first time integrated his concept of satisficing behavior into a quantitative theoretical context. The explanatory hypothesis of *search rate* (L) describes a satisficing behavior. This is because the *search rate* (L) becomes zero if the *desired level of satisfaction* (S^*) matches the actual satisfaction (S), and the *search rate* (L) is only "activated" (with $L > 0$) if the desired level of satisfaction (S^*) value is greater than his (actual) *satisfaction* (S).

The equation model, which had a higher empirical content than the three comparative hypotheses because of its more sharpened hypotheses, stimulated my imagination. Because I immediately noticed the analogy to a control loop. (March and Simon don't discuss that). I came to the conclusion that the *desired level of satisfaction* (S^*) can be interpreted as a kind of setpoint and thus the expression $S^* - S$ as a setpoint-actual variance. The higher this setpoint-actual variance, the higher the *search rate* (L). Thus the hypothesis for describing the *search rate* (L), i.e., the hypothesis for determining the *actions* of a satisficing planning, would correspond to a decision rule by means of which the manipulated variable of a control loop is determined. Because the increase of the *search rate* (L) leads to an increase in the *expected value of reward* (R), and such an increase can only occur if the behavioral unit, as Simon puts it, considers "actions" that increase the expected (or planned) reward (R).⁸¹³

If such an approach were to be applicable to the planning of a company, then a kind of control cycle planning would exist that would have to be regarded as a satisficing planning. This was finally a hypothesis system that was not based on an optimizing behavior.

***The model of March and Simon played an essential role in my attempts to develop equation models for a company planning. It was the first dynamic model I saw that described the behavior of behavioral units in an organization (or a company). Macroeco-

⁸¹³ As will be discussed in detail later, Simon identifies a person who performs an aspiration level planning as someone who "chooses actions that are expected to be satisfactory". See page 480.

nomic dynamic models, such as Samuelson's famous multiplier-accelerator model, were abundant. When I came across this model while studying the literature for my dissertation on modeling companies, I immediately set about analyzing it.⁸¹⁴ For this I determined (what March and Simon omitted) the reduced autoregressive equation of the model variables of the analog difference equation model. Only on the basis of these by Tinbergen so-called "final equations" is it possible to analyze the dynamic behavior of a model.

March and Simon claim in their text: "*The system possesses a stable equilibrium*" (p.50). This stable equilibrium should, therefore, be achieved for all combinations of the permitted values of the parameters α , β , γ , a , b , c and S^* . Using a stability diagram, I was able to show that the parameter space must be further restricted in order to obtain a (monotonously or fluctuating) "*stable equilibrium*" of the model variables. However, it would have been more interesting (but embarrassing for the authors) to show that not a single combination of the permissible values of the parameters leads to system stability. However, that was not the case. And I was glad to have found any non-absurd model implication at all. Samuelson's well-known and often quoted study on the influence of the multiplier and accelerator on "*qualitative behavior of national income*" served as an example for me to develop such a stability or behavior diagram.⁸¹⁵ ***

But now back to the hypothesis system of Cyert and March and its influence on the development of the Integrated Target Commitment Planning. I realized that such non-optimizing relationships in an organization and especially in a company could be described by an equation model. Based on the hypotheses of March and Simon, I came to the conclusion that such comparative hypotheses are very well suited for the first description of empirical relations. However, if you stand still, not much is gained. Their empirical content is too low. These comparative hypotheses must ultimately be sharpened into a system of structural equations.

However, there was still a long way to go to describe the behavior of those involved in the planning of a company by means of an equation model. At that time, I saw no way to develop such an equation model. However, I thought I knew the way now: If one wants to describe the decision-making behavior in a company by behavioral hypotheses that do not imply optimization, then these hypotheses must emerge from a concretization and further elaboration of this hypothesis system by March and Simon.

Charles Bonini's Model

That was the state before Charles Bonini's book came into my hands. Its title was "*Simulation of information and decision systems in the firm*".⁸¹⁶ It was published two years (1961) before the "state-of-the-art-book" on "Behavioral Theory of the Firm" (1963), but it was not quoted there. Therefore, it came into my possession rather late. This work enabled me to gain a great amount of knowledge. Charles Bonini's work is a dissertation he

⁸¹⁴ See: Zwicker, E., *Dynamisch deterministische Erklärungsmodelle und ihre Verwendung zur Kalkülierung betriebswirtschaftlicher Beziehungszusammenhänge*, Diss. TU Berlin 1969, p. 68-74.

⁸¹⁵ Samuelson, P. A., *Interactions between the Multiplier Analysis and the Principle of Acceleration*, 21(1939) Review of Economic Statistics, p. 75-78.

⁸¹⁶ Bonini, C. C., *Simulation of Information and Decision Systems in the Firm*, Englewood, 1963.

wrote with Herbert Simon. Bonini also quotes the above-mentioned behavioral hypotheses of March and Simon as well as Cyert and March's concept of "*organizational slacks*" and "*pressure*".

However, these contributions only form the basis for Bonini's description of the planning process of a fictitious company using a difference equation model. Bonini had set himself the goal of developing a "*comprehensive model of the firm which can take into account a large number of the interdependencies and interactions which occur within the firm*" (p.3). Bonini pointed out that his model takes into account the findings of the "*Behavioral Theory of the Firm*."⁸¹⁷ His goal was to describe the planning behavior of decision makers in a company in the case of periodically recurring operational planning.

It is a descriptive model and not a normative one. However, the complete description of the planning process in a company with the help of difference equations gave me an initial idea of how one could move from such a description to a normative theory of an operational planning. The Bonini model describes the planning process, or more precisely the repetitive operational planning, as an iterative process that runs in the same way in each planning period.

The planning process is divided into the following steps (p.21):

- (a) *Make preliminary estimates of sales and costs.*
- (b) *Use current prices as preliminary prices.*
- (c) *Determine profit goal (aspiration level) as a function of past profits.*
- (d) *Estimate expected profit using the preliminary estimates obtained from (a) above.*
- (e) *If expected profit is greater than aspired profit, finalize preliminary estimates.*
- (f) *If expected profit is below aspired profit, revise the estimates of cost, sales and price in turn and in that order until expected costs reaches aspired costs, at which point become finalized.*
- (g) *If expected profit, after revisions of costs and sales budgets and price, still does not measure up to aspired profits, then the goal or aspiration level is modified downward (aspired profits become a more modest figure).*
- (h) *The process is repeated in the above fashion until expected profit measures up to aspired profit, and the last estimates of sales and cost become finalized in the budgets; and, correspondingly, the last estimated price is accepted as a final price."*

Bonini's description is no longer very exciting today. For me it was so at that time. Firstly, there were no such descriptions of planning processes in companies. However, more importantly, Bonini's model has succeeded in operationalizing the relationship between the "*organizational slack*" and the "*pressure*", i.e., the "*pressure-slack hypothesis*", so that it can be used in an equation model that describes the process of the operational planning of this (fictitious) company in detail.

Bonini's model described for the first time the whole accounting system (including certain inventory valuation methods) and linked it with the "*pressure-slack relationship*" between the corporate management and the area manager. With his model Bonini suc-

⁸¹⁷ "The model we propose to use falls within a discipline, or sub discipline, labeled 'The Behavioral Theory of the Firm' (p.9).

ceeded in describing the entire process of an operational planning with its effect on the quantity and value structure of a company. Based on this, it was possible to determine and analyze the time development of such important company variables as net profit, costs, etc. by varying the parameters of his model.

At the beginning of the planning process, the corporate management has an idea of how large the net profit should be. This target value is compared with a forecast value of the net profit, which results from the previous planning assumptions. If the difference between the target net profit and the forecast net profit is positive, management tries to reduce this difference by revising its original planning. It assumes that *"organizational slack"* is still present in the company, the elimination of which may lead to a reduction in the difference between the target net profit and the currently forecast profit.

Bonini defines the *"organizational slack"* as *"performance relative to expectations"* (p.19). During the planning process, management tries to find and eliminate *"pockets of slack"* in the company. This is done by trying to detect *"inefficiencies"* which are representing the slack. These are described by the *"performance-expectation variances"* of certain cost and sales figures. The *"slack"* is, therefore, described by the difference between the *"performance"* of these cost or sales figures and the value of these figures used as a basis for the current planning. Certain persons in the company are responsible for these *"performance-expectation differences"*, and the corporate management exerts pressure on these persons to eliminate these variances through appropriate efforts and thus reduce the *"slack"*.

This happens in the form of the iteration process described. The change in cost and sales quantities agreed upon may reduce the *slack* (or the *inefficiencies*) and, as a consequence, the difference between the target and the originally forecast value of the net profit. Bonini's model is very complex (the process runs over several hierarchy levels, for example) and this short description is highly simplified.

It may sound a bit amazing from today's point of view, but when studying the structure of this model, I became aware of how to plan if an equation model is to be used. The planning procedure described is a satisficing planning in the sense of Herbert Simon. Bonini already points this out when he remarks, *"The firm, in this model is thus not maximizing, in the economist's sense, but 'satisficing' in the Simon's sense. It intends only to achieve a satisfactory profit..."* (p.21).

I liked Bonini's model very much. The insights that this model gave me did not immediately lead to the current concept of the Integrated Target Commitment Planning. However, I had a better idea of how the planning procedure could work and that the terms *"slack"* and *"pressure"* play a central role in the implementation of such a planning. In particular, it became clear to me that the *"slack"* must be described by the variance of certain parameters influencing profit for which someone is to be made responsible.

However, before the entire planning and control procedure was finally developed I was still working on everything possible. This included the intensive study of Kilger's "plan costing system", the analysis of existing costing systems in companies and above all the

development of an equation compiler (INZPLA-equation compiler), (s.p.627) which made the generation of equation models possible in the first place. (Spreadsheet programs like Excel or LOTUS 1-2-3 did not yet exist).

Gunnar Eliasson's Investigation

However, Gunnar Eliasson's investigation gave the final impetus to move in the direction of a satisficing planning.⁸¹⁸ This work also came into my possession much later after its publication. For me, there is only one relevant work on the subject of "*formal planning and control procedures in companies.*" And this is Gunnar Eliasson's contribution in which he examines how companies perform their comprehensive formal planning and budgeting. Eliasson's contribution, like many other empirical studies, does not limit itself to individual case descriptions but, on the basis of his findings, makes general assertions about the behavior of companies within the framework of their formal planning and provides theoretical explanations.

Eliasson points out which requirements must be met in order to be able to study the planning process in a company when he says, "*methods of planning can be observed if **formally** organized*" (p.97)⁸¹⁹. If this claim is accepted, only companies that apply formal planning procedures are suitable as objects to determine whether and how a satisficing planning in the sense of Herbert Simon is practiced.

Eliasson's finding is that a satisficing planning is being carried out in all the companies he examined. The determination of the aspiration level of top targets by the corporate management and the "*break down*" of the raised aspiration levels occurs in the step of planning described by Eliasson as "*targeting*". From the point of view of the Integrated Target Commitment Planning, this is the planning step of a top-down planning, in which certain subtargets for subordinate areas are deduced from the top target value. The procedure of "targeting" is discussed in detail and convincingly by Eliasson. He explains: "*Targeting should be conceived of as a systematic break down of aggregate goals formulated at the top executive level ... The breakdown may go in extreme detail, and the problem of formulating such detailed targets consistently was considered important*" (p.40).

The planning model developed by ThyssenKrupp Steel with 2.6 million equations and approx. 230,000 basic parameters, with which such "*targeting*" was carried out (s.p.336), is a confirmation of this statement.

Eliasson also succeeds very well in working out the "pressure-slack relationship" which is so important for the execution of an operational planning. He has very aptly coined the phrase "*planning as an administrative stress system*" (p.41) for the type of a comprehensive operational company planning observed in companies. For him, such a *stress system* is "*an administrative replacement for a competitive market mechanism that does not exist within the business organization*"(p.41).

⁸¹⁸ Eliasson, G., *Business Economic Planning - Theory, Practice and Comparison*, Stockholm, 1976.

⁸¹⁹ Gunnar Eliasson would certainly add the attribute "only" on request. Eliasson emphasized "formally" in the quotation.

Eliasson also discusses confrontation planning (*bargaining*) in detail. It serves, as he states, not only the negotiation of the basic targets but also the *"purpose of forcing information out of isolated organizational cells and channeling it upwards to the CHQ screened for irrelevant information and shaped in a format that can be taken in by those who have to make the major decisions"* (p.41). Such a planning system is, therefore, a system, *"by which CHQ communicates efficiently with the shop floor and not only in one direction"* (p.42). Anyone who wants to deal with operational company planning must have read this book with its descriptions of the operational planning procedures carried out in companies and the prudent and convincing theoretical reflections of these findings. A key statement of Gunnar Eliasson is:

"In a well managed planning system...much of the numerical part consists of negotiated figures. This again highlights one important feature of the number game called planning, namely a systematic method of making people responsible for numbers, responsibilities that are exactly defined and require compliance that is easily and exactly measured and checked. Such a reference-number system must be fairly stable so as not to create confusion. Compliance furthermore requires participation in the fixing of responsibilities by those who were later to be made accountable"(p.196).

How can the system of the Integrated Target Commitment Planning be better described than by these sentences?

I was so pleased with Gunnar Eliasson's book that I would like to make a brief comment on it. Gunnar Eliasson's work is hardly quoted in the "relevant" literature on operational planning. Google Scholar lists 102 quotations, but all of them do not come from contributions to operational planning or the area of operational company planning and control.

The only relevant author who quoted this work is Herbert Simon in his Nobel Prize speech, which is why I was only made aware of this work in 1979 with the publication of this speech in the American Economic Review. In contrast, other works on operational planning that do not come close to Eliasson were cited much more frequently. Kaplan's work *"Relevance Lost: The Rise and Fall of Management Accounting"*, whose contribution to operational planning I consider not only irrelevant but, more serious, to be misleading (s.p.189) was quoted more than 1,700 times after Google Scholar. It is an example of how an outstanding and groundbreaking work is simply not acknowledged, while completely irrelevant reflections on the same theme are quoted and praised in the skies of all places. However, back to Gunnar Eliasson's contribution.

In his text, Gunnar Eliasson does not develop a system of basic targets for implementing the commitment planning described by him, nor does he say anything about the relationships between the top targets and the basic targets. However, the fact that it is a matter of setting target commitments that are negotiated in a "number game" is clear and convincing expressed by him.

Gunnar Eliasson's work influenced me very much, and I would have liked to meet him personally. In 1987, Pierre Guillet de Monthoux, whom I met at the Science Center in Berlin through Walter Goldberg, invited me to a lecture on the Integrated Target Com-

mitment Planning at the Stockholm University School of Business. Pierre Guillet de Monthoux was professor of business administration there. During the preparations, he asked me if I had any wishes during my stay in Stockholm. I replied that he would do me a great favor if he could mediate a conversation with Gunnar Eliasson. He also tried, but Gunnar Eliasson was unfortunately not in Stockholm at that time.

After reading Gunnar Eliasson's book, the direction was clear to me. All I had to do was to develop a cost-performance model whose parameter contains such commitment targets for the forthcoming "*number game*".

The task was to develop a hyperstructure model system with which the cost-performance model of a company in question could be generated by a sequence of configuration steps (parameterization, order quantity linking instructions, etc.). This model had to lead to a classification of its parameters (basic parameters), which allows a comprehensive operational planning by means of target commitment but also an optimizing planning. It would be absurd to exclude optimizing planning from the start.

This finally led to the already described division of the basic parameters into the categories of basic targets, uncontrollable basic parameters, decision parameters, and decision variables. This hyperstructure model, whose structure and semantics had to be developed, also had to enable a target commitment planning procedure, which could be divided into the steps bottom-up, top-down and confrontation. This triad, as Eliasson confirmed, was a "must". In addition, the planning procedure should also be worked out so neatly that as many substeps as possible can be taken over by a computer program. It all sounds very simple, and in retrospect, it looks simple too. However, it took years.

Once the Integrated Target Commitment Planning has been fully developed, its normative status can be clearly identified: it is a planning and control procedure (or normative theory) that requires a satisficing planning.

Simon's theory of bounded rationality is a descriptive theory, for he maintains that a decision maker behaves as a satisficer in the search for decision alternatives. The Integrated Target Commitment Planning, on the other hand, requires a satisficing planning. It can also be described as a planning procedure that prescribes that those involved in planning should behave as a satisficer.

That is a difference. The Integrated Target Commitment Planning can, therefore, be interpreted as a "normatively turned" application of Simon's descriptive theory of a satisficing decision behavior. However, its scope of a satisficing behavior is limited to the cases of an operational company planning. Simon's descriptive theory, on the other hand, claims to apply to every decision maker in all conceivable situations.

In view of the normative turn of Simon's theory of satisficing and also in view of the restriction of this normative approach to the cases of an operational company planning, after developing this planning procedure, I tried once again to recapitulate how the ("descriptive") Simonian theory can be seen from this normative perspective.

Herbert Simon's Theory

Herbert Simon comments on his concept of bounded rationality: "*bounded rationality...chooses actions that are expected to be satisfactory*"⁸²⁰. The main features of his theory can be represented like this: A decision maker searches for alternatives to solve a decision problem by forecasting a value of the target variable (T) for each alternative selected. The target variable has possible values that can be realized. He uses so many forecasts until he recognizes that with the forecast in question the value of the setpoint target (T*) is not undershot. The "*objective of the decision maker*" is, therefore, that a certain value of the target value T* (his aspiration level) is maintained.⁸²¹ For such a decision maker, Simon coined the term "*satisficer*".⁸²²

Gigerenzer and Selten have tried to work out more clearly the criteria under which one can speak of a "*bounded rationality*" or a "*satisficing behavior*". The behavior of a decision maker acting in the sense of a "*bounded rationality*" or a "*satisficing behavior*" can according to them be divided into three steps. In their opinion, these steps are taken according to simple rules that a decision maker practices consciously or unconsciously. If they can be observed in the course of a decision process, then the decision behavior is a decision in the sense of a "*bounded rationality*". These "*simple rules*" are described by Gigerenzer and Selten as follows:⁸²³

1. "Simple search rules. The process of search is modeled on step-by-step procedures, where a piece of information is acquired, or an adjustment is made (such as to increase running speed to keep the angle of gaze constant), and then the process is repeated until it is stopped.
2. Simple stopping rules. Search is terminated by simple stopping rules, such as to choose the first object that satisfied an aspiration level. The stopping rule can change as a consequence of the length of search or other information, as in aspiration adaption theory (Selten 1998). Simple stopping rules do not involve optimization calculations, such as computations of utilities and probabilities to determine the optimal stopping point.
3. Simple decision rule. After search is stopped, and a limited amount of information has been acquired, a simple decision rule is applied, like choosing the object that is favored by the most important reason – rather than trying to compute the optimal weights for all reasons and integrating these reasons in a linear or nonlinear fashion, as is done in computing a Bayesian solution."

⁸²⁰ Simon, H. A., *Models of Bounded Rationality*, Vol. III, Cambridge, Mass. 1997, p. 17.

⁸²¹ This is the value S* in equation (148) in the equation model of adaptive behavior in organizations of March and Simon (see page 473).

⁸²² The term "satisficing", as a portmanteau of satisfy and suffice, was introduced by Herbert A. Simon in 1956.

⁸²³ Gigerenzer, G., Selten, R., Rethinking Rationality. In: Gigerenzer, G., Selten, R. (Ed.), *Bounded Rationality: The Adaptive Toolbox*, Cambridge (Mass.) 2002, p. 8. In the original text, the underlined text is printed in italics without underlining, and the rest of the text is not italic.

Simon's theory is not limited to the claim that a decision maker practices these rules of behavior (more or less) in order to find alternatives that satisfy his aspiration level requirement. His theory also includes the claim that the level of aspirations of a decision changes over time. This change can be triggered by the actual values of the aspiration level realized in the past. However, it is also possible that the level of aspirations may change during the search process. The Simonian theory of a bounded rational decision-making requires that this relationship between the changing level of aspiration and the other variables of the decision-making process should also be described by hypotheses.

In the discussion of Simon's theory, it is often not mentioned that the description of the change in a decision maker's aspiration level during the decision-making process is also part of his theory. That this is true can already be seen from the hypotheses equation (146) of the aspiration level in the hypothesis system of an adaptive behavior discussed by March and Simon. Here, the positive or negative change rates of the aspiration level A , i.e., dA/dt , depends on the difference between the *expected value of reward* $R(t)$ and the *level of aspiration* $A(t)$ (s.p.473).

No one has dealt with Herbert Simon's theory more intensively than Reinhard Selten.⁸²⁴ He himself has also contributed to the further development of this theory.⁸²⁵ The neglect of the relationship between the process variables and the level of aspiration is apparently so widespread in the literature that Selten attaches importance to emphasizing this especially when he notices: *"Often, satisficing is seen as the essence of Simon's approach. However, there is more to it than just satisficing. Aspiration levels are not permanently fixed, but are rather dynamically adjusted to the situation. They are raised, if it is easy to find satisfactory alternatives and lowered if satisfactory alternatives are hard to acquire. This adaption of aspiration levels is a central idea in Simon's early writings on bounded rationality."*⁸²⁶

Simon's satisficing decision maker is not a person whose activities are limited to operational company planning. Therefore, Simon's theory does not deal with the connection between groups of people who exert "pressure" on a (satisficing) decision maker. The pressure-slack hypotheses describing such relationships are provided by the *"Behavioral Theory of the Firm"*. Bonini has as mentioned first described these pressure-slack hypotheses between the corporate management and the area manager in his model in the form of structural equations.

The following section will examine whether a company that performs an Integrated Tar-

⁸²⁴ Selten reports in his biography on the occasion of the award of the Nobel Prize: *"The problem of bounded rationality has occupied my mind for a long time"*.

⁸²⁵ Thus Sauermann and Selten (1962), inspired by Simon's *"aspiration theory"*, developed an *"aspiration adaptation theory of the firm"*. This was then reconstructed and expanded in 1998 in a more formalized way. This theory shows that it is possible to perform a coherent modeling of non-optimal behavior. See: Rarely, R., *Aspiration Adaption Theory*. In: Journal Mathematical Psychology, 42(1998), p.191-214.

⁸²⁶ Selten, R., *What is bounded Rationality?*, In: Gigerenzer, G., Selten, R. (Ed.), Bounded Rationality: The Adaptive Toolbox, Cambridge (Mass.), 2002, p. 14.

get Commitment Planning meets the two characteristics mentioned, i.e., compliance with the "simple decision rules" described by Gigerenzer and Selten and the observation that an aspiration level adjustment occurs in the course of the planning process under certain circumstances.

If these two characteristics could be observed during the planning process of an Integrated Target Commitment Planning, then it could be described as a satisficing planning in the sense of Simon.

In his memoirs, Simon tells of a key experience that led him to his theory of "bounded rationality". *"My traumatic exposure in 1935 to the budgeting process in the Milwaukee recreation department had made of me an incorrigible satisficer."*⁸²⁷

The question, therefore, arises: can one observe a satisficing planning in a budgeting process carried out with a cost-performance model? However, as already mentioned, this question should immediately be limited to the case of a pure Integrated Target Commitment Planning, i.e., the case that the "budgeting process" in a company comes about through the commitment of the areas to adhere to the values of certain basic targets. This leads us to the question: Is the pure Integrated Target Commitment Planning a satisficing planning in the sense of Simon?

In order to pursue this question further, a distinction must be made between the behavior of the corporate management and the behavior of the areas. In both cases, the question arises as to whether the Integrated Target Commitment Planning prescribes a behavior to the areas and the corporate management whose realization can be interpreted as a satisficing planning (or decision) in the sense of Simon's theory.

A distinction should be made between the bottom-up planning of the area managers and the top-down planning of the corporate management (which is realized by the central planning). These two planning steps of the entire planning process are carried out as a sole planning of the two antagonists involved in the planning, that is, the corporate management and the areas.

Let's turn first to the bottom-up planning by the areas. At the beginning of the bottom-up planning step, the areas undertake to adhere to certain bottom-up values of the basic parameters. After the end of the planning triad, they then undertake to adhere to certain final plan values of their basic targets, which normally differ at least partially from their initial bottom-up values. If a satisficing planning in the sense of Simon exists, then there must be a target variable in the form of a basic target (BT) for which an aspiration level requirement has been formulated, i.e., a requirement of the form

$$BT \geq \{\text{numeric value}\} \quad (150)$$

or

$$BT \leq \{\text{numeric value}\} \quad (151)$$

In this case, the decision maker, here the area manager, searches according to Simon's formulation for "actions that are expected to be satisfactory", i.e., a bundle of actions A_1

⁸²⁷ Simon, H.A., *Models of my Life*, Cambridge, Mass., 1996, p. 386.

to A_n , the realization of which, in his estimation, leads to compliance with this aspiration level requirement.

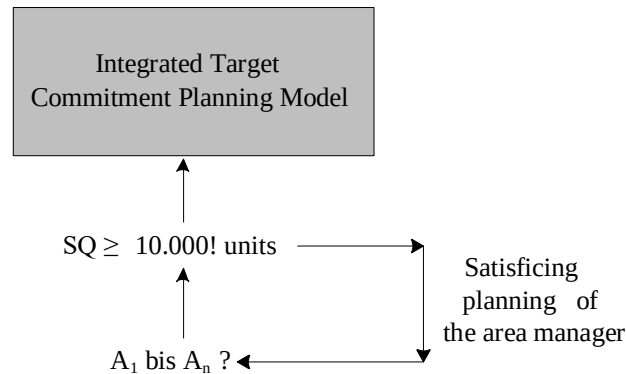


Fig. 70: Schematic representation of the satisficing planning of an area manager demonstrated using the example of a sales quantity

Fig. 70 describes the case where the sales quantity (SQ) is the basic target of an area. It is also assumed that, at the end of the confrontation planning, the area manager has committed himself to achieve a sales quantity of no less than 10,000 units. It is now supposed that the area manager if he accepts the demand " $SQ \geq 10,000$ units", has carried out a satisficing planning. In Fig. 70 the satisficing planning is highlighted by the downward leading arrow. The following can be stated for this case: If a satisficing planning of an area takes place, i.e., the search for actions that should be able to realize the target specification $SQ \geq 10,000$ units, then this search takes place outside the model.

In other words, the area manager does not use his area model (as a submodel of the plan cost-performance model) to look for alternatives that meet the " $SQ \geq 10,000$ " requirement. Only the committed value of the sales quantity, that is, the number of 10,000 units of an article for sale, functions as the value of the basic target (SQ) in the final plan version of the plan cost-performance model and thus also in his area model. In the case of such promises made by an area manager to the corporate management to meet a certain aspiration level requirement (such as $SQ \geq 10,000$), it is not even certain whether he already has certain actions in mind with which he believes he can fulfill the target commitments he has entered into.

Cases are reported in which an area manager tells his employees, "*I don't even know yet how I should comply at all with the requirements to which I have committed myself.*" The planning of the actions for the realization of the final plan values of the basic targets by the area manager will therefore probably be carried out after completion of the Integrated Target Commitment Planning. In extreme cases, no actions are planned at all as to how the agreed aspiration level target is to be achieved because the area manager's resigning. (It's enough for him).

In any case, a satisficing planning is carried out (if at all) by the area managers, "outside of the model", since the planned connections between the aspiration level target, i.e., the

basic target, and the actions required for its realization, are not described by the planning model. It, therefore, remains unclear whether the area managers will at all carry out a satisficing planning. Therefore it is not known if and which search, decision and stopping rules are used by an area manager. And from the point of view of the Integrated Target Commitment Planning, it is also of no importance. The only decisive factor is that the area managers must meet the aspiration level requirements, i.e., the basic target commitments.

Secondly, we turn to the top-down planning by the corporate management. The top-down planning is a planning procedure that is carried out by the corporate management (represented by the central planning) on its own, that is, not coordinated with the responsibility areas. In contrast to the bottom-up planning by the area managers, this planning is carried out "model-internally", since the INZPLA-models used for this procedure contain both the target level, i.e., the operating result, and the alternatives to be "searched for" and these are the different values of the basic targets of the responsibility areas. The model is also characterized by the fact that these basic target alternatives are clearly connected by equations with the operating result, i.e., the aspiration level target.

In detail, this can be characterized in the following way: At the beginning of the top-down planning, the corporate management formulates a top target for the operating result in the form: ⁸²⁸

$$OR \geq \{\text{numeric value}\} \quad (152)$$

The parameters with which this top target requirement (or aspiration level requirement) is to be achieved are the basic targets (or commitment targets) for the areas BT_1 to BT_n . You can, therefore, use the reduced equation

$$OR = F(BT_1, \dots, BT_n) \quad (153)$$

which describes the connection between the two target types (OR as top target and $BT_1, \dots, BT_n$ as basic targets) in the form of an equation. The satisficing planning of the central planning department (as a representative of the corporate management) now consists of finding a combination of the basic targets that meets the top target requirement (152).

If a "top-down planner" comes to the conclusion that none of the combinations of the basic targets that meet the top target requirement (153) can "with the best will in the world", be realized by the areas then he will inform the corporate management about it. In such a case, the corporate management may be willing to lower the setpoint value of the original claimed top target or in Simon's terminology the threshold of the aspiration level. A possible change in the aspiration level requirement, which Simon regards as a characteristic of satisficing planning, is, therefore, fulfilled.

Hypotheses about this behavior, i.e., the revision of the aspiration level depending on the findings of the "top-down planner", may be very difficult to formulate. However, their formulation is not necessary for the top-down planning described here. The top-down planning procedure, therefore, allows that the aspiration level of the original top target

⁸²⁸ As mentioned several times, another top target (e.g., RoI) can be selected instead of the operating result or even several top targets can be declared.

(its setpoint value) can be changed during the planning procedure in the sense of Simon's description of a satisficing decision maker. However, this behavior of changing the aspiration level is not (unlike Bonini's description model) described by a hypothesis contained in the model.

The top-down planning is complete when the "top-down planner" finds a basic target alternative that meets the aspiration level requirement (152). However, the question at hand is: Can regulations for a top-down planning be found that correspond to the "*simple decision rules*" cited by Gigerenzer and Selten?

The "*stopping-rule*" is undoubtedly followed. This is because the search is stopped as soon as in the present example a value of the operating result is found that meets the aspiration level requirement (152). But there is still a further restriction. Not every alternative of the basic targets that meets the aspiration level requirement (152) can be chosen. Their realization must also be "reasonable" for the areas. There must therefore be a "*simple decision rule*" which states which of the combinations of basic targets fulfilling the aspiration level requirement (152) can also be regarded as "reasonable" for the areas.

But according to which criteria (*simple decision rule*) are these basic target alternatives determined by the central planning (corporate management), which are calculated with the help of the model in order to check whether the desired operating result is achieved but the areas are also not unduly burdened by this?

The literature does not deal with this question according to the selection criteria of a top-down planning.

I asked a number of "top-down planners" in companies how they arrived at their top-down values. A top-down planning is practiced in the majority of companies, even if, as is almost always the case, they do not use the Integrated Target Commitment Planning. The answer, which was common to all, was that one had to look at the values of the bottom-up-planning to find these where there are "*air in the numbers*".

In the light of the "*Behavioral Theory of the Firm*", this "air search" proves to be the task of "*getting the slack out of the numbers*" or, as Bonini puts it, of tracking down and eliminating the "*inefficiencies*". These "*inefficiencies*" can be eliminated by replacing the inefficient (or "slacked" numbers) of the bottom-up basic targets with the setpoint setting of "efficient numbers" (or the numbers with a reduced slack) in the form of the top-down basic targets, which must be realized by the areas.

Obviously, however, no simple rules can be observed in practice which could then be formulated in a normative way. Each "top-down planner" takes an individual approach. Often one area after the other is "processed", and this procedure is repeated if the changed values did not lead to a satisfactory result. When I asked a top-down planner why he was putting more pressure on certain areas than on others in his top-down planning, he answered me: "*I know my customers.*"

However, the "top-down planners" surveyed agreed that the pressure or the burden on the areas is increased by the setpoint values of the basic targets determined by the top-down planning. There was also an agreement that the areas should be loaded as equally as possible "for reasons of justice". The tenor was, "All should make an appropriate contribution".

In view of these statements, I came up with the idea these considerations, which more or less are guiding "top-down planners", to sharpen into an optimization process. This optimization procedure, called GBM top-down planning, requires that the burden values (pressure values, stress values) of an area can be determined for the different value combinations of its basic targets. I developed and implemented such an evaluation procedure to determine the burden values of the areas.⁸²⁹

If such a determination of the burden values of the areas is possible, then the top-down planning can be described by an optimization whose goal is to maintain a threshold value of the operating result, such as

$$OR \geq 1,500,000 \text{ €} \quad (154)$$

The optimization requires the sum of the burden values of all area managers (SBA), i.e., the definition equation (8), whose area burdens (BUA) can move between 0 and 100 "burden points" (depending on the selected basic target values), to be minimized.⁸³⁰ For reasons of justice, it is still to be demanded that the resulting area burden points (BUA), defined by (7), should be the same in all areas.⁸³¹ The operating result (OR), the burden on the areas (BUA) and thus also the sum of the burden values of all area managers (SBA) as the target quantity for the minimization are functions of the basic targets of the areas.

Such a procedure would never be applied in practice because it requires from the central planning to carry out an almost impossible task, namely the evaluation of the burden on the areas with regard to different value combinations of their basic targets. However, the formulation of this optimization procedure shows in which direction the ad-hoc procedures operated by the "top-down planners" would have to be further developed in order to fully explicate the criteria of their approach.

However, a satisficing planning should not take the form of an optimizing planning, but rather, as Gigerenzer and Selten put it, a "*simple decision rule*" should be used. The described sharpening of the search for alternatives by introducing an optimization procedure probably leads to the fact that no more satisficing planning in the sense of Simon exists, since according to the Gigerenzer-Selten criteria hardly a "*simple decision rule*" is practiced in such a procedure.

With one exception, it was not possible for me to find out which comprehensible procedures different "top-down planners" use when they carry out their top-down planning. This already made the question of whether such procedures were "*simple*" or "*no simple decision rules*" superfluous.

⁸²⁹ See: Zwicker, E., *GBM Top-Down Planning, an algorithmic Procedure for Top-Down Planning in the System of the Integrated Target Commitment Planning*, op. cit., www.Inzpla.de/IN07-2000b.pdf. (Text in German, title translated).

⁸³⁰ See also for a description of this procedure: Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory*, Berlin 2015, p. 54, www.Inzpla.de/IN46-2015.pdf. (Text in German, title translated).

⁸³¹ Due to the conflict of targets between the reduction of the area burden and the increase of the operating result, the optimization always leads to the realization of the threshold value of the operating result, i.e., in the described case to a value of € 1,500,000.

The only procedures that probably fall into the category of a "*simple decision rule*" are the top-down planning procedures, which in practice are referred to as "*lawn mowing methods*". These methods consist of selecting certain groups of cost types and reducing them by a fixed percentage. If the changes of these costs thus made lead to the desired aspiration level of the operating result, the changed rates will be communicated to the areas as instructions and must be accepted by them. A confrontation planning no longer takes place in such cases.

One group of cost elements that is appropriate for this procedure are the overhead costs. Overhead costs include costs that (unlike direct product costs) cannot be causally allocated to a product. Reducing these overhead costs such as travel expenses, therefore, does not directly affect the production of the products. A top-down planning can, therefore, consist of reducing overhead costs by a percentage (often by ten percent) as a target value for the areas. This is probably a "*simple decision rule*". However, the idea of an "equal effort for all" is lost in such an approach.

When a top-down planning is carried out in companies, not only overhead costs but also individual cost elements or the costs of certain cost element groups are often reduced by a certain percentage in certain areas. For Thyssen-Krupp Steel we have developed such a top-down calculation method for carrying out their company planning with the INZPLA-system. In this procedure, you can specify those cost elements CO_1 to CO_n are to be reduced by ten percent from the bottom-up values in areas AR_1 to AR_m from the third month of the plan year, for example.

To achieve this, the system identifies all cost factors in the selected areas that are eligible for such a reduction. However, the selected cost variables are not always basic parameters that can be directly changed by ten percent but also endogenous variables. Only if a cost element (CO) represents a cost value commitment (such as travel expenses of € 20,000) can it be changed directly by ten percent as the basic target. However, if the costs of a cost element (CO) are determined by one of the three calculation rules

$$CO = \text{delivery\_price} \cdot \text{consumption\_quantity} \quad (155)$$

$$CO = \text{proportional\_cost\_rate} \cdot \text{employment} \quad (156)$$

and

$$CO = \text{consumption\_quantity\_rate} \cdot \text{employment} \cdot \text{delivery\_price} \quad (157)$$

then the corresponding consumption quantities, consumption quantity rates, and proportional cost rates must be changed by ten percent to achieve the desired ten percent change in the cost element (CO). After the program system has determined the values of the basic targets for realizing the ten percent reduction of the selected cost elements (CO), i.e. the consumption quantity for (155), the proportional cost rate for (156) and the consumption quantity rate for (157), the model is calculated using the newly determined top-down values of these basic targets.

If the change is not sufficient to achieve the target value of the operating result (threshold value of the aspiration level requirement), then, for example, a change rate of eleven percent is selected, or the values of other basic parameters are also changed.

As already mentioned, as a result of the top-down planning of Thyssen-Krupp Steel's 2008/2009 annual planning, 26,396 of the 231,994 model parameters were changed using 70 such overall cost reductions as described above. In addition, 1,215 model parameters, including sales quantities, were changed directly (s.p.338). Approximately twenty top-down calculations were carried out with different values of the basic parameters until a satisfactory top-down value of the operating result was finally arrived on the basis of the above figures. Not much remains of an individual consideration of the burden on the areas in this procedure, but it just so happened this way.

The question arises as to whether the procedure practiced by ThyssenKrupp Steel can be regarded as adhering to a "*simple decision rule*" in the sense of the Gigerenzer-Selten criteria. There is no clear answer to this question because the boundary line that decides whether an observed decision behavior is attributable to a "*bounded rationality*" or not cannot be clearly drawn.⁸³² Without our computer program (and also without our equation model) this kind of a top-down planning at Thyssen-Krupp Steel would not have been possible.⁸³³

However, there is no need to discuss the question of whether a "*simple decision rule*" exists. This is because a much more powerful argument can be put forward against the existence of a satisficing planning in the case of the top-down planning of the Integrated Target Commitment Planning.

One can object that the top-down planning of the Integrated Target Commitment Planning does not represent a satisficing planning in the sense of Simon, for one simple reason: The basic targets, whose top-down values are to be determined as a result of the top-down planning, are not "*actions*" as defined by Simon. Because then they would have to be quantities that are completely controllable by the central planning and can, therefore, be realized with certainty and without any burden. This is true in an Integrated Target Commitment Planning model for the decision variables, but these variables do not occur in a pure Integrated Target Commitment Planning, which is assumed here.

This objection is entirely true. The variables named by Simon "*actions*", which should be the result of the search, would actually have to be (completely controllable) decision variables in the light of the Integrated Target Commitment Planning.

Therefore, the question arises: Is a satisficing planning carried out with an Integrated Target Commitment Planning model only available if the decision variables (and not the basic targets) of this model are used as "*actions*" in the sense of Simon to carry out a satisficing planning? Simon's definition forces this conclusion. My assertion is now that such satisficing planning with decision variables as "*actions*" makes no sense in a planning model.

⁸³² Selten noticed in this sense: "*bounded rationality cannot be precisely defined*". Selten, R., What is bounded Rationality? op. cit, p. 15.

⁸³³ For information on the shortcomings in the SAP-CO system that prevent going the same way, see page 325.

If a cost-performance model contains only decision variables and no basic targets, then this decision variable forms an action space, i.e., all "*actions which could be chosen*", are described in the model as possible alternatives.⁸³⁴ Decision-makers no longer need to search for specific alternatives step by step and continue this (time-consuming) search until an alternative is found that does not fall below the specified threshold value of the aspiration level (here a threshold value of the operating result).

If all possible alternatives are already described by different values of the decision variables of the model (and if a suitable optimization procedure is also available), no rational human being will act as a satisfier in the sense of Simon.⁸³⁵ Rather, this human being will initiate the optimization process and implement the values of the decision variables found by the optimization algorithm, which maximize the operating result.

Therefore, if, as is propagated here, Simon's satisficing planning behavior is to be "normatively turned" and as a consequence of this requirement a normative satisficing planning procedure is to be developed whose "actions" are to be determined on the basis of a model, then Simon's definition of a satisficing planning is no longer applicable in this case.

However, a satisficing planning, which is connected with the practice of "*pressure*" (effort, burden) and the reduction of "*slack*" (and thus of inefficiencies), corresponds exactly to the procedure, if the "actions" described by Simon are the basic targets of an Integrated Target Commitment Planning.

The previous comments on the assessment of the Integrated Target Commitment Planning related to two cases.

The first case was based on the assumption that the model only contains decision variables and no basic targets. This is the case of a "degenerated" Integrated Target Commitment Planning which leads to a pure optimization. It is described in Fig. 39 on page 144 by case 1.1.3. If there are only decision variables and no basic targets in the model, then the demand is that they should not be used to find a value of the top target that does not fall below a threshold value. The only goal could be to find the values of the decision variable to optimize the top target, i.e., in our case, to maximize the operating result.

In the second case of a pure Integrated Target Commitment Planning, there are no decision variables, only basic targets in the model. In the case of a top-down planning, a satisficing target planning is to be carried out, but unlike Simon, the "*variables which should*

⁸³⁴ It is not a quotation from Simon but is formulated in the sense of the above-mentioned formulation of Simon "*rationality ... chooses actions*". See page 480.

⁸³⁵ Odhnoff points out that "*the words 'optimizing' and 'satisficing'*" are used in the literature "*without reference to a particular model*." That's my claim, too. Odhnoff stresses that in case of a decision model it is also appropriate to distinguish between optimizing and satisficing with regard to the search procedure being applied to find a solution. However, Odhnoff's considerations and conceptual clarifications regarding the use of "*satisficing and optimizing search methods for a decision making*" on the base of decision models are moving on a different level than my assertion. My assertion is that in the case of a decision model, which should determine an action to be realized no satisficing (in Simon's sense) but always an optimizing action is appropriate. That is because I assume the existence of an optimization procedure that always leads to a global optimum. See: Odhnoff, J. *On the Techniques of Optimizing and Satisficing*, in: The Swedish Journal of Economics, 1965, p. 24-39

e chosen" are not "*actions*", but the basic targets of an Integrated Target Commitment Planning.

However, what about the case where a model has basic targets and decision variables? In this case, which almost never occurs in practice, a mixed optimization basic Target Commitment Planning must be carried out.⁸³⁶

How is Simon's demand for the "*actions*" which should be selected to be judged when this planning procedure is pending? The answer is that the "*action variables*", i.e., the decision variables, are used during a "model calculation" (planning alternative) in an individual planning step to carry out an optimization. However, this optimization, which also takes place in the context of the top-down planning, is "consistently connected" with the satisficing planning practiced at the same time.

To carry out a top-down planning, the values of the basic targets of the areas and the values of the (then existing) decision variables are selected in such a way that the threshold value of the aspiration level of the operating result is met.

Which decision rules should actually be used in such a top-down planning by a "top-down planner" is an open question. However, it is doubtful that the described procedure (in view of the impossibility of implementing this procedure with the current SAP-CO system) has ever been used.

But let's do a thought experiment by assuming that a top-down planner would be able to perform the already mentioned burden evaluation for all areas (s.p.486). Depending on the achievable values of the basic targets, the burden values for all areas lie between 0 and 100.

Even in the case of such a mixed optimization Integrated Target Commitment Planning, it is assumed that the corporate management has specified a threshold value (*aspiration level*) of the operating result that is not to be undercut within the framework of the top-down planning.

In the example given, this would be an operating result of € 1,500,000. If such a case arises, one should proceed according to the GBM top-down planning procedure described before (s.p.486), i.e., a minimization of the total burden value of all areas should be carried out under the restriction that the burden of the single areas be the same, and the threshold condition (152) should apply to the operating result. This optimization leads to the fact that the threshold value of the operating result of 1.500.000 € is realized exactly but the burden of the areas to achieve this is minimized.⁸³⁷

The idea behind this is as follows: If the threshold value of the operating result of 1,500,000 € is realized precisely, the "profit setpoint" of the corporate management is met. If now in the context of this top-down planning a set of alternative values of the basic targets and the decision variables can be found, which fulfill this requirement, then these alternatives should be used exclusively to find the alternative, which minimizes the total burden of all areas, whereby the burden of the single areas should be equal.

⁸³⁶ Either a mixed optimization basic Target Commitment Planning or a mixed optimization area Target Commitment Planning. See page 45.

⁸³⁷ The optimization leads to the fact that the restriction (148) is kept point-exactly thus the operating result of 1,500,000 € is realized.

Thus, the corporate management practices a satisficing planning of the operational result, i.e., of their utility size. However, also an optimization is practiced, since the alternatives satisficing the threshold value requirement, are used for an optimizing planning in the interest of the areas. What would Herbert Simon think of this proposal?

Sune Carlson gave a speech at the award of the Nobel Prize to Herbert Simon in which he honored his achievements. In this speech he pointed out, "*Simon's theories and observations on decision making in organizations apply well to the systems and techniques of planning, budgeting and control that are used in business and public administration*".⁸³⁸

In 1954, Simon and other authors conducted an empirical study on the behavior of controllers with regard to centralization or decentralization of planning.⁸³⁹ Otherwise, I do not know of any other study by him that investigates how his theory is applied in "*systems and techniques of planning, budgeting and control that are used in business*".

One question that arises in view of Simon's theory of satisficing planning is, how can one arrive at the conclusion, based on the observation of the process "*of planning, budgeting and control*" in a "*business firm*", that those involved choose actions that, like Simon, "*are expected to be satisfactory?*"

As mentioned above, Eliasson is of the opinion that planning procedures in a company can only be observed "*if the methods of planning are formally organized*" (s.p.477). Simon points out that there are hardly any empirical studies in the "*area of organizational decision-making*", i.e., also in the field of an operational planning of companies. His formulation "*this domain is still grossly undercultivated*" (p.354) is unmistakable. This situation has not changed to this day.

Simon also points to certain empirical findings, which lead to the conclusion that the classical theory of a completely rational behavior in companies does not apply. Thus, he raises the question of how people behave in decision-making situations in which they are unable "*to apply the marginal calculus*" (p.352), i.e., cannot perform an optimization procedure (using differential calculus).⁸⁴⁰ The use of a "*marginal calculus*" meets the requirements of the "*classical models of rational choice*" (p.353), if the decision alternatives can be described by a goal function. Simon's answer to this question is, "*When the goals of an organization cannot be connected operationally with actions..., then decisions will be judged against subordinate goals that can be so connected. There is no unique determination of these subordinate goals.*" (p.353)⁸⁴¹

This is an empirical assertion about the planning behavior of organizations, which is to be considered in the light of the Integrated Target Commitment Planning. It should be called Simon's subgoal hypothesis. From the perspective of the Integrated Target Commitment

⁸³⁸ Carlson, S., *Laudatio on Herbert Simon*. In: *Lecture Economic Sciences 1969-1980*, A. Lindbeck, (Ed.), New York, 1992, p. 336. The official justification for the award is: "*For its groundbreaking research into the decision-making processes in business organisations*".

⁸³⁹ Simon, H. A., Kozmetsky, G., Guezkow, H. Tyndall, G., *Centralization vs. Decentralization in Organizing the Controller's Department*, New York, The Controllershship Foundation, 1954.

⁸⁴⁰ The following quotes are from: Simon, H. A. *Rational Decision-Making in Business Organizations*, in: *Nobel Lecture Economic Sciences 1969-1980*, A. Lindbeck, (Ed.), New York, 1992, p. 343-371.

⁸⁴¹ As Simon points out, this procedure is called "*subgoal identification*".

Planning “*the goals of an organization*” for a planning period of one year are described by the top targets of an operational planning.

The “*subordinate goals*” in Simon's sense are the basic targets for which the areas are responsible. In contrast to Simon's assertion, the “*subordinate goals*”, i.e., the basic targets, are connected with the top targets with the help of the structural equations of the model of an Integrated Target Commitment Planning. By determining the values of these “*subordinate goals*” or basic targets and the values of the other basic parameters, the values of the top targets (or “*goals of an organization*”) are thus clearly determined.

According to Simon, the “*subordinate goals*” are “*goals that can be operationally connected with actions.*” But in the model of an Integrated Target Commitment Planning, the basic targets, i.e., the “*subordinate goals*”, are model parameters and the model does not describe their connection with certain actions through which they could be influenced. They are, therefore, not “*operationally connected with actions*” through relationships in the model. However, as discussed, it is assumed as a result of the planning procedure that the areas will take actions to achieve the basic targets (“*subordinate goals*”) with which they have committed themselves.

This modeling gap, which opens up because “*subordinate goals are not operationally connected with actions by model relations*” can hardly be closed.⁸⁴² Apparently, it is almost impossible to find decision variables (representing Simon's “*actions*”) to influence the basic targets (“*subordinate goals*”) and to connect them in the frame of the model through definition and hypothesis equations with the basic targets (“*subordinate goals*”). If this were possible, the previous “*subordinate goals*” would be endogenous variables that would be determined by certain decision variables and probably also from some uncontrollable basic parameters.

However, these decision variables are nothing more than quantitatively described actions.⁸⁴³ If it were possible to disaggregate all basic targets in the planning model by introducing hypothesis and definition equations in such a way that they only depend on decision variables and uncontrollable basic parameters, then one would get a pure optimization model whose goal would be to maximize the operating result in the form of a pure optimizing planning.⁸⁴⁴

From this point of view, an Integrated Target Commitment Planning model can be regarded as an “*optimization model cut off below*”.⁸⁴⁵ It is “*cut off*” because further disaggregation to the actions in the form of (discrete or quantitative) decision variables using definition and hypothesis equations is not possible. However, the “*intersection line*” is set in such a way that the model parameters of the downwardly truncated model are basic targets (“*subordinate goals*”) for their achievement certain areas can be made responsible.

⁸⁴² The formulation in italics is from me.

⁸⁴³ In the system of an Integrated Target Commitment Planning, it would also be possible to trace back to discrete measures such as a make-or-buy decision, since even such decision alternatives for an optimization can be formulated with the configuration system. See: Zwicker, E., *Integrated Target Commitment Planning and Optimizing Planning*, op. cit., p. 15f, www.lnzpla.de/IN08-2000c.pdf. (Text in German, title translated).

⁸⁴⁴ See to a pure optimizing planning on page 221.

⁸⁴⁵ See also about this cut-off view on page 221.

If this were not possible, the Integrated Target Commitment Planning would not be feasible.

If it should nevertheless be possible, to find appropriate hypothesis and definition equations which lead to model parameters that can be fully influenced then an optimization can be performed with these decision variables. If in cases of such a disaggregation process some basic targets will remain then it is possible to carry out a mixed optimization Integrated Target Commitment Planning with the remaining basic targets and the newly acquired decision variables.

As part of the bottom-up planning and the individual planning steps of confrontation planning, the decision variables serve to maximize the operating result, which can be combined without a contradiction with the Integrated Target Commitment Planning carried out as well. In the case of a top-down planning, however, the decision variables should be used to minimize the burden on the areas if a burden evaluation of the areas is possible, as described above. The use of decision variables can, therefore, be reconciled without breaks in the three planning steps with the simultaneously performed target commitment planning.⁸⁴⁶

In practice, however, there are no decision variables in cost-performance models and the central planning generally tries to "somehow" realize the top-down values of the operating result prescribed by the top management by means of a trial and error procedure.

The concept of pressure developed by Cyert and March was realized in Bonini's model by a system of hypotheses. The pressure in the sense of Bonini plays a very important role in the system of the Integrated Target Commitment Planning. As mentioned above, each basic target has a burden (pressure or stress) direction (s.p.37). The direction of the burden of a basic target is a fundamental concept of the entire planning procedure. If there were no such a direction for each basic target, the procedure of the Integrated Target Commitment Planning would not be applicable. This is because the direction of burden is an important information for changing the basic targets during the confrontation planning. It was only possible to develop a special target theory of the Integrated Target Commitment Planning on the basis that each basic target has a burden direction (s.p.171). I described the connection to Simon, Bonini and Eliasson in such detail in this "History..." because it was only after studying **Herbert Simon's theory**, **Charles Bonini's model** and **Gunnar Eliasson's investigation** that I realized which theories and reflections form the base for the Integrated Target Commitment Planning and Control.

Much later, initiated by the meeting with Alfred Wagenhofer, I also turned to the normative agency theory (s.p.397). The first thing I recognized was that the "*effort of the agent*" plays a central role in this normative theory to describe the relationships between an agent and a principal. Elsewhere, I described how I came up with the idea of interpreting the Integrated Target Commitment Planning as a variant of the normative agency theory and giving it the name "*hidden-effort agency planning*" (s.p.391). In the case of an opera-

⁸⁴⁶ For a description of how to use an optimization in the three steps of an Integrated Target Commitment Planning, that is, bottom-up, top-down and confrontation planning, together with the target commitment planning, see: Zwicker, E., *Integrated Target Commitment Planning and Optimizing Planning*, Berlin 2000, www.Inzpla.de/IN08-2000c.pdf. (Text in German, title translated).

tional company planning, however, the "*effort*" of the agency theory is nothing other than the "*burden*" of the Integrated Target Commitment Planning and the "*pressure*" of the "Behavioral Theory of the Firm". This closes the circle.

It can be assumed that Bonini has given much consideration to how the "pressure indicators" of persons used in his model should be defined. The definition equations of its pressure indicators can be described as quite "sophisticated". They contain up to six endogenous model variables as definition components and corresponding weighting factors of these endogenous variables, with the result that a pressure indicator is composed of the sum of individual "pressure components". Critics of the normative agency theory argue that the definition of an agent's "*effort*" is one of the serious problems of this theory.⁸⁴⁷ One can only agree with this. Defining "*the effort*" or "*the stress*" or "*the burden*" of an area manager which is used in an operational planning model as an observable term of the pressure-slack hypothesis is an almost impossible undertaking.

However, this is no problem for the hidden-effort agency planning procedure or the Integrated Target Commitment Planning. The "*effort*" of an agent in the agency theory or the "*pressure*" of the "*Behavioral Theory of the Firm*" on a participant of an organization which are identical to the "*burden on an area manager*" is a term that plays a major role in the system of the Integrated Target Commitment Planning (the hidden-effort agency planning). This is because this planning system is in its effect, to use Eliasson's formulation, an "*administrative stress system*" (s.p.477) that exerts this stress from the corporate management on the area managers. However, the extent of the stress (= *effort* = *burden* = *pressure*) of an area manager is "*hidden*" to the corporate management (*principal*) and only known to the area manager (*agent*) himself (probably only in the form of a vague idea).

An important finding in this respect is: this central variable of the Integrated Target Commitment Planning, i.e. the "burden" does not explicitly occur in the planning model of an Integrated Target Commitment Planning. However, this non-description of the burden (*pressure*, *stress* or *effort*) exerted on the area managers does not harm this planning procedure, but rather increases its practical relevance.

I have already reported how I was impressed by the "*Behavioral Theory of the Firm*" with its pressure-slack relationship and soon recognized this connection as the "process maker" of an optimization-free operational planning. However, one thing was also clear to me: it will probably never be possible to describe this connection in the specific case of an impending company planning by means of an empirically testable hypothesis equation. The cognition that such a hypothesis equation of the pressure is not necessary in an INZPLA-model when applying the Integrated Target Commitment Planning and yet the pressure-slack relationship is the context that dominates the entire planning process was

⁸⁴⁷ Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative Agency Theory*, Berlin 2015, p.50, www.Inzpla.de/IN46-2015.pdf. (Text in German, title translated).

very important for my understanding of the entire process and its embedding in Simon's theory and the "*Behavioral Theory of the Firm*".

With Simon's contribution, I realized that the paradigm of the optimizing completely informed decision maker is obsolete. Simon's theory of "bounded rationality" has contributed to opening up a whole new perspective to me.

However, some authors also criticize Simon's theory of "*bounded rationality*" by questioning the empirical testability of his hypotheses. In an appreciation of Herbert Simon's performance, Kenneth Arrow formulated this criticism as follows: "*The problem with accepting the hypothesis of bounded rationality is not its reality but its adequacy as a theory. I am a sufficiently an old-fashioned positivist (as was Herbert Simon) to hold that a theory that cannot be falsified is no theory*".⁸⁴⁸

If one accepts that the "*hypothesis of bounded rationality*" cannot be falsified, then the central concept of this hypothesis, i.e. "*a satisficing decision behavior*", would have to be rejected as a concept of an empirical theory. In the case of the propagated satisficing top-down planning of an Integrated Target Commitment Planning, in contrast to Arrow's assertion, a criterion for falsifiability can certainly be specified. There is therefore a falsifiability at least in this case.

However, falsifiability is not sufficient to justify the application of this satisfying top-down planning as a step of an operational planning in companies. But which criterion can be chosen to justify such an application of the top-down planning (or the satisficing planning characterizing it)?

This question arises for the application of the entire procedure of an Integrated Target Commitment Planning and Control and thus not only for the top-down planning discussed here as a normative turn of Simon's theory of satisficing decision.

The Integrated Target Commitment Planning and Control is a system of requirements which states how to proceed when carrying out an operational planning and control of companies. It therefore comprises a system of norms.

However, a system of norms, such as the Ten Commandments, is not justified in its demand for application by whether it is followed or not. The same applies to the road traffic regulations but also to the norm system of the Integrated Target Commitment Planning and Control. But how can the application of the norm system of the Integrated Target Commitment Planning and Control be justified?

The decision to apply a procedure, i.e. a system of norms, is the result of a comparison with competing procedures (systems of norms). The justification for the application of a system of norms therefore always takes place in relation to competing systems of norms (or procedural requirements). An example are the three competing medical treatment procedures stent vs. bypass vs. do nothing.

The competing procedures (norm systems) are to be classified in a first step with regard

⁸⁴⁸ Arrow, K.J. *Is bounded Rationality unboundedly rational? Some Ruminations*. In: Models of a Man. Essays in Memory of Herbert A. Simon. Augier M, March J., G. (Ed.), Cambridge, 2004, p. 54.

to the occurrence or non-occurrence of certain observable criteria and these criteria are to be weighted in a second step in order to arrive at an evaluation number of the competing procedures.

Both the selected criteria (including the so-called KO criteria) and the selected weights may be different for each person involved in the implementation of such a procedure. A compelling result of the preferability (justification) of a certain procedure is therefore not guaranteed.

However, when comparing the Integrated Target Commitment Planning with other methods, the number of competing procedures is low. References in textbooks that a bottom-up planning should be carried out "*from bottom to top*" and a top-down planning "*from top to bottom*" do not represent an alternative. Since most companies today use the SAP-CO system for their operational planning and control, this application system is, besides the decision not to plan at all, the only alternative that can be compared with its requirements for designing such a planning. The information basis for a comparison is therefore relatively good.

Herbert Simon's normatively turned theory of a satisficing decision maker has therefore become part of a normative theory (a system of norms) that claims at least as I see it to improve the operational planning and control of companies.

35. A look back at the Integrated Target Commitment Planning

The development of the Integrated Target Commitment Planning has so far been dealt with separately according to different areas, namely modelling, the planning and control procedures used with these models and other model analyses. It was shown that the Integrated Target Commitment Planning could be interpreted as a variant of the normative agency theory.⁸⁴⁹ It was further demonstrated that the second step of the planning triad, i.e., the top-down planning, can be regarded as a „*normatively turned*“ application of the Simonian theory of a satisficing decision maker (s.p.480).

In the case of a pure Integrated Target Commitment Planning, the standards of the decision theory are not used, but if a mixed optimization Integrated Target Commitment Planning is performed, then the planning consists of a mixture between maximizing the operating result in the sense of the decision theory and the negotiation of basic targets in the sense of the Integrated Target Commitment Planning (s.p. 4 and 468).

If a pure Integrated Target Commitment Planning is carried out, however, an optimization can also take place. This is the case if a bottom-up planning of the second step is required. However, the optimization to be carried out here is not an optimization in the sense of the deterministic decision theory. Instead, an optimization or more precise a maximization of the operating result is achieved whose alternative space is composed of certain target sales quantity commitments, i.e., an alternative space that is not covered by the definition of an alternative space used in the decision theory. Therefore, this is a special optimization procedure that can only be assigned to the Integrated Target Commitment Planning (s.p.58).

Making certain areas of a company responsible for achieving numbers within the framework of an operational planning is a generally accepted procedure and is also described in the relevant literature under the name "*responsibility accounting*". The idea that this is a negotiation situation between "the basis" and the corporate management (a number game) about compliance with numbers is also common knowledge today and is not missing from any book on operational planning and control or management accounting. The same applies to the procedure for dividing the procedure of an operational planning into the planning steps bottom-up, top-down and confrontation steps (or bargaining). As already mentioned, the description of these steps, such as a top-down planning, is carried out at a rather simple level even by such eminent experts as Küpper (s.p.315). The only exception to this is Eliasson who eclipse everyone with his investigation (s.p. 159 and 477).

One of my contributions to the system of an operational planning is to have developed a model system, which enables the determination of plan cost-performance models in

⁸⁴⁹ See page 381f. and in detail: Zwicker, E., *The Integrated Target Commitment Planning as a Procedure of the normative the Agency Theory*, op. cit., p. 55, www.lnzpla.de/IN46-2015.pdf. (Text in German, title translated).

which certain parameters can be used as parameters of a target commitment and these parameters can be interpreted as parameters of a target commitment function. This extends the flexible plan cost accounting, which also works with target cost functions and target consumption quantities for the purpose of cost-effectiveness control, to a closed system for planning the operating result of a company through target commitment that serves the corporate management.

Only on this model related basis, it was possible to describe the three planning steps in a precise way and to develop exact regulations for the design of their procedure.

The procedure of the Integrated Target Commitment Planning could not have been developed if it had not been possible to develop a hyperstructure model of a plan cost-performance accounting. This hyperstructure model comprises the information that makes it possible to generate a plan cost-performance model tailored in principle for each company by means of certain configuration steps (e.g., parameterization and linking instructions), on the basis of which the planning steps described (largely computer-aided) can be executed.

It is actually obvious to develop such a model configuration systems of a plan cost-performance. The SAP-CO system is an example but also the only one I know of. However, as mentioned above, this model configuration system is not acceptable for the planning described here for various reasons and one of these is that the parameters of an SAP cost-performance model are not explicitly available.⁸⁵⁰

The hyperstructure model of the Integrated Target Commitment Planning requires the generation of certain model tableaux between which certain types of order quantity-price relationships must be specified (s.p.147).

The Integrated Target Commitment Planning with a cost-performance model can also be extended to a comprehensive company planning, as described above. This is because planning with a cost-performance model does not represent a comprehensive company planning. This requires the creation of a plan balance sheet, a plan P&L statement and a financial plan. The necessary procedures for a comprehensive one- or two step company planning have already been described (s.p.60).

I prefer a two-step comprehensive company planning (s.p.63). This is characterized by the fact that in a first step a target commitment planning is to be carried out and in a second step a pure optimizing planning. Here, too, the procedure of a pure Integrated Target Commitment Planning is used in the first step as in the case of a standalone planning with a cost-performance model. A one-step comprehensive company planning (with a comprehensive company model) is always a mixed optimization basic Target Commitment Planning.

It is not possible even to mention the entire procedures of an Integrated Target Commitment Planning in this review. They are all based on the stringent syntax and semantics of the underlying models. Therefore, they can be carried out on a large scale with computer support.

⁸⁵⁰ For a description of how to generate such an INZPLA-model with the help of the INZPLA Connect System, starting from an application of the SAP-CO system, with which the described planning procedures can then be carried out, see page 333.

However, as already mentioned, the overview scheme in Fig. 39 on page 145 provides a good starting point if a reader is interested in entering the field of the Integrated Target Commitment Planning in a somewhat more detailed manner. This is because the different model types (corresponding to the columns) are compared with the planning procedures (corresponding to the rows) that are relevant for these models.

The Integrated Target Commitment Planning should always be followed by a control. The development of certain control procedures was, therefore, necessary that were not previously available. The control procedures I developed for the basic Target and area Target Commitment Planning are based on a generalization of the control procedures of the flexible plan cost accounting. When comparing actual and setpoint costs of certain cost elements, the system works with the same planned transfer prices in the definition of the setpoint and the actual cost element.

The demand generalized from this procedure is in line with the principle of controllability (s.p.81). This is based on the structurally identical definition equations of a setpoint and the actual quantity to be compared with it. Due to their structural identity, these explanatory equations of the setpoint and actual variables have the same definition components. The requirement of the control procedure consists in the fact that for the definition components in both equations, i.e., the setpoint equations and the actual value equations for which the area to be judged is not responsible, equal values are to be selected. This sounds obvious but requires a detailed treatment. The main features of such a control have been described in this text.⁸⁵¹

This concretization of the principle of controllability on the level of a model of the Integrated Target Commitment Planning and Control was described by me as the model-based principle of controllability. It seems so important to me that I regard it as one of the two essential features or "paradigms" of the Integrated Target Commitment Planning and Control (s.p.597).

Just as the control is defined, there is a difference between the control of an area in the system of the Integrated Target Commitment Planning and the explorative variance analysis, which, for example, can answer the question of which actual-plan variances of the model parameters are responsible for the actual-plan variance of the operating result.

In my opinion, this distinction between control as a normative procedure and variance analysis as an exploratory procedure is necessary in order to classify the interrelationships correctly. With regard to the explorative variance analysis, I developed a method of variance analysis called (responsibility-related) RR-Min variance analysis. It is again a consequence of the newly introduced "variance interpretation" of the model parameters. This makes it possible to show which area manager is responsible for certain components of the actual-plan variance of the operating result in a certain type of responsibility (s.p.97). The treatment of the variance analysis "forced" it to develop a theory of the structure and semantics of actual cost-performance models that correspond to a plan cost-performance model (s.p.112).

⁸⁵¹ See page 81. A more in-depth treatment can be found in: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 41f., www.lnzpla.de/IN34-2007.pdf. (Text in German, title translated).

The relationships between the control procedures of the Integrated Target Commitment Planning and the various methods of a variance analysis were systematized in Fig. 25 (s.p.109). It can be used as a starting point if a reader wants to systematically deal with the subject of control and variance analysis.

This brief review is not very profound. Some readers may notice that a whole series of the described constructs, procedures and analyses have been described in this text in a more or less clear form as "new" or "continuative". With so many "novelties", one might suspect that things are called novel here that have been known for a long time. The reason for this "novelties" is simply that a certain structure and semantics of an operational planning models not previously discussed in the literature have been developed. And if one starts from this (perhaps useful) approach, then one can derive a series of "novelties" from it, to which someone else cannot arrive. If you successfully attack the basis of this concept, all "novelties" will collapse.⁸⁵²

It is also obvious that when reading such more or less clearly articulated claims of novelty, thoughts come up to say: *"That all sounds quite nice, but how am I supposed to judge what is new or already an old hat here. I can only make a judgment about the novelty of a procedure if it is one of my construction sites in which I really know my way around. And this is not a construction site of mine."*

One way to dispel this suspicion, however, is to check the systematic high-level monographs on planning, control, internal accounting and controlling to see whether something of this kind has been described there.

However, there could also be forerunners to all this in the special literature, whose contributions are "generously" concealed in order to emphasize the own contribution. As far as cost-performance accounting is concerned.

I think there is mostly one whose approaches can be compared with what is offered here in terms of its novelty, and that is Wolfgang Kilger. Its significant influence on the Integrated Target Commitment Planning is described in detail in this text, but also the difference between its cost-performance accounting and the Integrated Target Commitment Planning (s.p. 516 and 621).

With regard to the other areas dealt with, such as the control procedures of the basic target or area Target Commitment Planning, the explorative variance analysis, the multidimensional hierarchical profit segment analysis, the activity-based costing and the model exploration procedures such as the target value analyses, primary cost analyses, model structure analyses, etc., I have explained in detail in the individual texts what the literature has said so far after the descriptions of these procedures.

This is at least a good basis for a potential opponent to show what has not been considered negligently or intentionally.

⁸⁵² For arguments that could cause the Integrated Target Commitment Planning system to collapse, see page 321.

36. *Mirror, mirror on the wall ...?*

• Blohm's assessment procedure and its "winners"

People, whose activities are comparable often ask themselves the question, who is the best of us? But also others, who are only spectators, seem to be preoccupied with such a question about the best ones. For hundred-meter runners, this question can be answered by a measurement. For figure skaters, the criteria for answering this question are already more problematic. And in other disciplines, such as business administration, one can argue excessively about which criteria should apply. In German-language business administration, however, there seems to be one criterion that is considered very important.

I became aware of this when my colleague Hans Blohm gave a farewell speech on his retirement in 1988. He said that if someone like him retired now, it would make sense to take stock. And here he is forced to ask himself what contribution he has made to the further development of business administration. This question could be answered after his considerations on the basis of the *"Handwörterbuch der Betriebswirtschaftslehre"* (Hand Dictionary of Business Administration). The amazed and at the same time, interested audience now learned the following:

Professors of business administration almost exclusively work on the edited keywords in this handbook, so that one could say that the concentrated state-of-the-art knowledge of German-language business administration, written by its authoritative representatives, manifests itself here. However, how should this handbook say something about the "scientific significance" of a German-speaking professor of business administration?

Whenever an author of a text in this work quotes another author, this is indicated by a page reference in an index of all quoted authors at the end of the work. As Hans Blohm explained, this index formed the basis for assessing the "scientific significance" of a professor of business administration. He would have determined the significance of each of the professors listed in this index by measuring the length of the page citations in centimeters with a ruler.

Here the audience already started to laugh, and this was true not only for Lutz Kruuschwitz, who is always available for a joke but also for colleagues, who, otherwise, hardly had a smile on their lips.

Then Hans Blohm announced that the differences in length between the colleagues were astounding and then shouted into the hall: *"Do you want to know who has the greatest length?"* And everyone was shouting, "Yeah...". *"He has the stately length of 182.5 cm..."* Shouts, *"Unbelievable, madness"*. *"Do you really want to know who it is?"*, "Yeah..." And Hans Blohm, enjoying the moment, shouted like at an Oscar award ceremony: *The winner iiiis.... Erwin Grochla.*⁸⁵³ Cheering applause and bravos.

Then he also announced that his own length was 38.0 cm and that this would be enough for him. You don't always have to be at the top. That would only lead to unnecessary stress.

⁸⁵³ Such an exorbitant length is really hard to believe. Therefore, the page with these links can be accessed at www.lnzpla.de/Grochla.pdf. The lengths were reconstructed by me afterward because I can't remember exactly what measures Hans Blohm named at that time.

He then suggested that at the conference of university professors of business administration, which takes place once a year, each professor should also indicate his centimeter measure behind his name on his nameplate. Based on this measure, one could then always correctly assess the meaning of one's counterpart.

I didn't like this remark because I already knew that my length with two quotes would probably be less than one centimeter. This weak result should have been an incentive for me.⁸⁵⁴ But instead of achieving an increase, I only went downhill. In the next edition in May 2007, nine years after the Blohm Prize was awarded, Hans-Ulrich Küpper, one of the three editors, led by a considerable margin with a length of 44.4 cm.⁸⁵⁵ Alfred Wagenhofer followed in the second position with 27.7 cm. The average of the quoted authors was about 1.4 cm.⁸⁵⁶ But to my horror, my measure of meaning had now shrunk to zero centimeters. With this length on my name tag, I would have been able to participate without remorse only in the "ladies program" (as it was called at the time) at the so important conference of university teachers of business administration.

One could argue (which I do not agree with) that the Integrated Target Commitment Planning is an exotic procedure, which should, therefore, probably be described more in special handbooks. If this is approved, the 1,147-page "*Handwörterbuch Unternehmensrechnung und Controlling*" (Hand Dictionary of Corporate Accounting and Controlling) published by Küpper and Wagenhofer in 2002 could be considered.⁸⁵⁷ However, here, too, the result is zero. In this work, Küpper and Wagenhofer are back on the winner's podium, Küpper with 116.7 cm followed by Wagenhofer with 68.7 cm.⁸⁵⁸

Given the immense number of pages in this work, my disastrous performance is a bit strange. How can anyone claim to have made a not insignificant contribution to controlling and management accounting and then not be quoted at all in this mammoth work produced by so many authors? Apparently, this is another case of typical overconfidence. It could be, but I think there's another reason.

Right at the beginning of my "scientific activities" in the field of business administration, I asked myself the question that probably everyone will ask themselves in a similar situation, and this question is, who really cares about what one "creates" by putting it to paper?

Practitioners are out of the question. They don't have time to deal with such differentiated topics. I know this from my working group "Integrated Company Planning", to which I belonged for several decades and asked many participants about their reading behavior.⁸⁵⁹

⁸⁵⁴ Blohm's award ceremony related to the edition of the 1976 handbook. Grochla, E. und Wittmann, W. (Ed.), *Handwörterbuch der Betriebswirtschaft*, 3 volumes, 4th Ed., Stuttgart 1976.

⁸⁵⁵ Küpper is quoted 67 times, while Grochla has 197 entries. The difference is probably also due to the fact that the 1967 edition, in which Grochla shoots the bird, comprises 5,010 columns, while the edition with Küpper at the top only covers 2,162 columns.

⁸⁵⁶ Küpper had 67 entries, Wagenhofer followed with 44. On average, there were 2.51 entries.

⁸⁵⁷ Küpper, H.U., Wagenhofer, A. (Ed.) *Handwörterbuch Unternehmensrechnung und Controlling*, 4th Ed. Stuttgart 2002.

⁸⁵⁸ Küpper has 174 entries, followed by Wagenhofer with 105. All in all, the authors quoted have an average of 2.84 entries.

⁸⁵⁹ See page 524 on this working group of the Schmalenbach Society.

Therefore, monographs and articles in professional journals can only serve to address colleagues. However, who are "the" expert colleagues? Journals such as ZfB or ZfbF cover the entire field of business administration. There are articles on marketing or management or on financing theory that I would never read, not because I find them bad (I cannot judge that), but because they do not interest me and are not relevant to my field of research. So with which reason can I expect a marketing professional to read a contribution from me?

Therefore, only colleagues who are involved in operational company planning, control and cost accounting can be considered as potential contacts. Included are also the specialist representatives who write textbooks on general business administration, which deal with the area of an operational planning and control. They may be interested in these topics in order to keep their textbooks up to date.

The colleagues who came into question for this were to a large extent personally known to me, because there are not so many in the German-speaking area. Initially, I regularly provided them with working papers, which concerned the field of an operational planning and especially the Integrated Target Commitment Planning. Of course, the personal dedications also indicated that, if interested, I would be pleased to have a conversation or discussion about questions arising from the study of the text sent. However, no one has ever reacted to it and also in the publications of these colleagues provided with my writings I was, with one exception, neither quoted, let alone treated thematically.⁸⁶⁰ Peter Mertens was the only one who reacted to my mailing campaign that had been going on for many years. He called me and asked about the difference between definition and hypothesis equations in planning models.⁸⁶¹

In the absence of a response, I increasingly restricted my mailings until only a few "particularly important" colleagues were left on it. This at least prompted them to take a look at the title and name of the author before they disposed of the paper.

The "direct mailing" campaign apparently did nothing to improve Blohm's measure of length. Finally, I concluded that it makes no sense to raise energies for something that leads to nothing.

However, one should also ask oneself what benefits an expert colleague has if he receives the article from another colleague. I look at almost every book and journal article on planning and control, cost and performance accounting written by colleagues, and study reports from practitioners. But why? For the simple and unique reason that I am interested in whether these publications "touch" the system of the Integrated Target Commitment Planning.⁸⁶²

⁸⁶⁰ All discussions with colleagues about operational planning did not result from this mailing campaign.

⁸⁶¹ In his work "*Planungs- und Kontroll-Systeme in der Industrie*" (Planning and control systems in industry), Wiesbaden 2008 (last Ed.), written with M. Meyer, he deals with the topic "budgeting models". In my opinion, he is the only one in German-language technical literature which explicitly points out that the operational planning of a company is to be carried out with equation models and also cites and discusses such equations.

⁸⁶² Examples of this are the reviews of Kaplan's two books. See pages 184 and 189.

"Touch" means several things. On the one hand, I am interested in whether these works contain concepts that can be profitably integrated into the system of the Integrated Target Commitment Planning. On the other hand, I am also studying this work from the point of view of whether it contains assertions that cannot be reconciled with the system of the Integrated Target Commitment Planning. Especially when such renowned authors as Küpper, Wagenhofer, Heinen, Riebel, and Kaplan make such claims contradicting the concept of the Integrated Target Commitment Planning, I spend a lot of time understanding and disproving them.

However, all activities serve the sole purpose of securing, expanding or revising the concept of the Integrated Target Commitment Planning if inconsistencies should arise.

Every specialist who receives a text is in the same situation. He is currently working on one or two "construction sites". When he reads something, he is interested in information, which can serve him to gain certain suggestions, insights, and information for the work on his "construction sites". However, texts that are capable of fulfilling this wish will probably be sent to him only extremely seldom.

The Integrated Target Commitment Planning is also an approach that is not very suitable for such an objective. It should be quite difficult to "cut off" a piece of this approach and integrate it into one's own system.

I do not know anyone in or outside Germany who practices such a consistent model-based presentation of an operational planning and control. Who should then install what of it in his system?

If one does not start from a model of the Integrated Target Commitment Planning with its specific semantics and structure, then one cannot use almost any of the procedures I have described.

I do not consider the Integrated Target Commitment Plan to be complicated. This is because the whole system is represented by certain models and procedures, whose intersubjective comprehensibility is guaranteed by the fact that they can and have been realized by computer programs which ultimately represent the whole concept.

What is decisive, however, is that a partial adoption and integration into one's own existing research building is likely to be associated with considerable difficulties.

Would it be conceivable that when sending a text to the Integrated Target Commitment Planning, someone would give up the further development of his own "thought construction site" and would intensively deal with the Integrated Target Commitment Planning in order to develop it further? If he does not want his Blohm's measure of length to shrink to zero centimeters, you cannot recommend it to him. On the one hand, it is not possible to take credit for such further development because "the others" do not know the Integrated Target Commitment Planning and these others influence Blohm's measure of length in future editions through their quotations.

It is also not so easy to enter the entire system in such a way that you are able to carry out a further innovative development. Since I have a thing for "systems", I have been dealing

with the ARIS concept of August Wilhelm Scheer for many years, simply out of interest in the matter. I think I know the system quite well. However, I would never fall for the belief that I would be able to make an "innovative contribution" to this system that would increase my "scientific fame". You have to be "in" in such a system, you have to dream about it, only then can you get something out of it. This is what distinguishes a system presentation from the "small talk presentations" that are occasionally encountered in journals and textbooks about business administration.⁸⁶³

Is it now preparing me sleepless nights to have done so badly in Blohm's length measurement and perhaps to be regarded as "loser", who looks up annoyingly to the "winners" like Küpper and Wagenhofer or Grochla?

Not in the least. I find such winner-loser categorization entirely inappropriate, and even a little infantile. Our former TU President Hans-Jürgen Ewers was a very astute man, but he tended to use drastic formulations. When he kept talking about "loser" and "winner" in one session, so *"he's a winner"* and *"he's a loser"* and *"that's another such a loser"*, *"we need winners"* etc., I couldn't stop talking in between: *"Well, just stop this silly winner-loser talk"*.⁸⁶⁴ Charlie Brown, the eternal "loser", who never lost his optimism and dignity, is my favorite.

Blohm's length measurement is, of course, a mockery. However, if the number of quotations replaces Blohm's measure of length, then this measurement is already in the range of the procedures that are used today to compare the performance of the representatives within a specialist field. These procedures are all highly ridiculous.

However, when, like Hans Blohm in his farewell speech, I look into the question of what "contribution" I have up to now made. What's the result?

First, I think that most students found it an inspiration to study with me, at least there was always a friendly and relaxed atmosphere, and in my opinion, they learned something. However, "teaching" does not count in the eyes of experts.⁸⁶⁵

However, what is the "contribution" to the further development of business administration? What was already claimed in the introduction by the Integrated Target Commitment Planning (s.p.4), and was also pointed out in individual chapters as a kind of interim balance (s.p. 212, 420, 468) is to be summarized again at the end on the basis of the information provided in this text:

The Integrated Target Commitment Planning proves to be a normative theory in the field of operational company planning, being on a par with the classical decision theory, which has dominated alone up to now. However the Integrated Target Commitment Planning clearly eclipses the classical decision theory with regard to its practical relevance. This is because virtually no optimization is practiced in the area of an operational company planning (s.p.409).

The procedure observable in practice almost always proves to be an unoptimized planning that works in a more or less rudimentary form with target commitments.

⁸⁶³ See the reflections on the *"Trivialities in a Tailcoat"* on page 507

⁸⁶⁴ He also constantly used the phrase: *"We have to get the cow off the ice"*. Of course, I didn't mind. Because that's not where it belongs.

⁸⁶⁵ See on my efforts in teaching on page 520.

However, if decision variables occur in the planning model in addition to the basic targets then it is also possible to carry out an optimizing planning in the sense of classical decision theory. Both procedures can be carried out simultaneously and without contradiction. The Integrated Target Commitment Planning can be interpreted as a normative turned version of Simon's descriptive theory of a satisficing decision maker (s.p.479). However, it also proves to be a normative version of a "planning by commitment to objectives" that has always been applied in practice (more or less clearly). It can also be reconstructed as a variant of the normative agency theory (s.p.381f.) and thus shows how the normative agency theory is consistent with such satisficing planning through target commitment.

Thus, the Integrated Target Commitment Planning represents a theoretically founded but also applicable normative theory that integrates all previous normative approaches in the field of an operational company planning into a comprehensive normative theory. And this comprehensive normative theory goes far beyond the previous normative approaches, both with regard to the planning procedures to be applied and with regard to the hyper-structure model system developed to configure the planning model of a particular company in question.

Therefore; the contribution consists in the development of a comprehensive practice-relevant operational planning and control theory for companies. In addition, an elaborate software system was developed to prove that this theory is also applicable. This proof was provided using (I am quite sure) the world's largest plan cost-performance model at ThyssenKrupp Steel. For several years, the annual operational planning of the entire company was operated using the INZPLA-System.⁸⁶⁶

Have all goals been achieved? Not quite.

Business administration is (which is sometimes overlooked) primarily an applied science. The theories it develops should, therefore, serve users. No matter how sophisticated a normative theory may be, if it is not applied, i.e., if it finds no users, it runs into nothing. An architect is measured above all by his buildings and not by his books about what should be built.

I would have liked the INZPLA-System to be widely used in practice. Then the goal would be achieved to develop a normative theory, which is not only on paper but also successfully applied on a large scale in practice. That's why I didn't shy away from this huge effort to develop the INZPLA-system, an effort that cost me a lot of nerves and time.⁸⁶⁷ Nothing has come of it.⁸⁶⁸ But who can achieve everything he has set himself? However, to return to the Blohm's award ceremony, with which it all began. Who actually knows the name of the then 182-cm winner Erwin Grochla? And if so, what is his contribution to the further development of business administration? ⁸⁶⁹

⁸⁶⁶ See pages 336-344 and 628.

⁸⁶⁷ For the size of the program system, see page 628. See footnote on page 630 for information on nerve wear and tear and health impairment.

⁸⁶⁸ See chapter "Dr. Sinzig visits ThyssenKrupp Steel", on page 339f.

⁸⁶⁹ What about the contributions of the two "winners" of the "*Handwörterbuch der Betriebswirtschaft*" and the "*Handwörterbuch Unternehmensrechnung und Controlling*", i.e., Ulrich Küpper and Alfred Wagenhofer, to the further development of business administration? I would not presume to judge

- **How one can nevertheless become known in expert circles**

Anyone who believes that I am completely unknown in professional circles is wrong. And this has the following reason. Lutz Kruschwitz (6.2 cm) represented the investment and financing field in the faculty of business administration at the FU Berlin. However, more important for the following is that we are friends. At a conference of the university professors in business administration, we listened together to a lecture given by a colleague. Then he asked me, "How did you like that?" And I replied, "I can only come up with one thought for such lectures: *"Trivialities in a tailcoat"*.⁸⁷⁰ He not only liked this phrase very much, but he was downright enthusiastic about it.

And that had its consequences. Whenever he now attended a colleague's lecture and found it pompous and at the same time meaningless, he told the speaker in the following "discussion" in his friendly and cheerful manner: "My friend Eckart Zwicker would describe such a lecture as *'trivialities in a tailcoat'*."

The large amount of feedback I received almost leads me to conclude that I have become better known through this statement than through the system of the Integrated Target Commitment Planning. Because Lutz Kruschwitz is a busy man, who took part in many events in the field of business administration and does not mince his words.

On his retirement, there was a farewell event attended by about three hundred people. Among them were some well-known colleagues from other university cities such as Wolfgang Ballwieser (10.9 cm), who were willing to take the effort of the journey to Berlin. Of course, Lutz Kruschwitz gave a "farewell speech". In this speech, he attacked now not only a colleague but equal an entire field of activity. It began when he said that at the end of his professional career he had to say what had long been a need of him, namely that marketing had nothing to do with science and, therefore, did not belong to business administration taught at universities. Nothing would describe this unscientific and embarrassing discipline better than the formulation by Eckart Zwicker, while he pointed at me, I sat right in front of him in the second row,... **"Trivialities in a tailcoat"**.⁸⁷¹

However, another colleague has also contributed to increasing my reputation in academic circles. This is Axel Hunscha (Professor of Law at our Faculty). He is one of the few who succeeds in spreading a good mood through witty and cheerful remarks. I always regretted it when a faculty meeting was held without him. It all started when I told him the following joke: A professor looks into his calendar and realizes that he was invited to a dinner yesterday, but to his dismay did not appear there. He immediately calls the hostess and says, "Madam, I apologize many times for not coming to your dinner. She replies, "But Professor, you needn't apologize, you were there."

that. For the contributions of this two accounting and controlling specialists from the perspective of the Integrated Target Commitment Planning, however, see pages 414-449 (for Wagenhofer) and (pages 427, 306-318, 372, 395, 399) for Küpper.

⁸⁷⁰ This formulation was not yet accessible in the context of Google on 12.10.2006.

⁸⁷¹ My remark *"Trivialities in a tailcoat"* did not refer at all to a lecture from the field of marketing. Since this area is so far away from my own, I always opt for lectures from more specific fields when it comes to the alternative offers for lectures at the association conferences.

So much for the joke. Sometime later I met Axel Hunscha, and he told me with great enthusiasm, "I told your joke everywhere with a huge success". "So." "But I have changed it and told that you had been the professor." "Aha". "I told it to a lady who knows you well, and she said, "The Zwicker always seemed a little confused, but I didn't think he is come to that point by now." "Hm, and who's the lady?" "I'm not telling you that."

However, news travels quickly. At one of the President's New Year's receptions in the atrium of the TU, a colleague from another faculty spoke to me, whom I only knew from seeing and greeting, and asked me, "Say, is the story actually true with your invitation". I knew immediately what he meant and said, "Unfortunately, yes. And it happens to me all the time. Recently I wanted to buy some shoes, and after trying on dozens of shoes that were all around me, I said to the saleswoman, "I'll take those, they are the only ones that fit me". Then she said, "But these are the ones you came with". "My God, Hm... You're still lecturing, right?" "Yes, but that's not a problem. My wife takes me to the lecture hall and picks me up at the end of the course". Therefore, I have earned a reputation at the TU Berlin that not everyone gets.

In fact, every semester I still hold courses in the subject "operational company planning and control", which cover a full course in "Special Business Administration" connected with an examination. A former employee carries out the exercises. A limitation of the number of participants was introduced for the event due to the strong demand.

However, that's nothing compared to my old friend Axel Hunscha (we've known each other for over 50 years), who has contributed so much to increase my reputation at the TU Berlin.

We met at a university party when I was still a scientific assistant so over 50 years ago. When I was holding a champagne glass in my hand, talking to an attractive young lady with long blonde hair, someone called her loudly and across the room "*Piggy, come over here*". And "*Piggy*" left me very friendly with an apology but on the spot to follow the call. I followed her with a reasonable delay to see what an impressive but probably also crazy guy it must be to whose request "*Piggy*" was willing to follow without contradiction. It was Axel Hunscha, and "*Piggy*" was his wife. This was the beginning of a long and entertaining friendship.

He is two years older than I am, so he is not the youngest anymore, and he gives a lecture just like me every semester. His lecture "Labor Law" is so popular that in a cross-university student evaluation in October 2015, he received the best evaluation and thus a price of 3,000 € from the Society of Friends of the TUB.

It has been several years since a former student who had written his diploma thesis with me and worked as an authorized signatory at a large bank visited me. I asked him which course he could remember best. He replied, "*The best lectures I attended during my studies were Prof. Hunscha's, a fireworks display of jokes, but the instruction was not neglected either*". I am convinced that this has not changed to this day.

Axel Hunscha's rhetorical powers, however, are not even species-specific limited. In summer 2012, we visited the exhibition "*Friederisiko*" on the 300th birthday of Frederick

the Great in the New Palace in Potsdam. Exhausted from walking, reading and looking, we took a seat on a park bench at the edge of the half roundabout in front of the palace, into which the main axis of the park flows. Suddenly a swarm of crows landed right in the short trunk tree that overshadowed our bench, and a terrible croaking started. Axel Hunscha took a nerved breath and shouted, forgetting his good manners and derailing in his choice of words, with a thunderous voice "*shut up*". As a result, a miracle happened, for the wild croaking stopped instantly.

In my course on rational reasoning (s.p.518) I referred to an important basic assumption of the Enlightenment and in particular of the critical rationalism, and this is: *there are no miracles*. Even if one does not recognize certain connections, everything can be explained and, therefore, there are no external interventions, namely "miracles", in the exclusively natural law determined connections. Here I had to experience that such a miracle happened to my friend Axel Hunscha of all people. And I can testify it.⁸⁷²

Some time ago, I met Olaf Berlien, currently CEO of Osram AG and honorary professor in our department, for a joint dinner at Lutter & Wegner.⁸⁷³ He also "outed" himself as a "fan" of Axel Hunscha. We agreed to meet again at the same place in the same way, but he had a request, Axel Hunscha should be part of it. That can be done. Maybe we will even experience a second miracle when he says "*Shut up*" to one of us.

Things are going downhill

Despite all efforts: one thing is clear; things are going downhill. I don't do programming anymore. Programming was one of the most strenuous and challenging mental activities for me.⁸⁷⁴ If you are able to keep the variable names, addresses and the manifold relationships of a complex context in mind simultaneously and thus "have the whole problem in mind" and then simply "program it down" and sometimes it is even correct, then this is an extremely satisfying activity. Some may consider it primitive, but in a system development where the endpoint is programming, you get a feeling of supreme satisfaction and during programming, where every point counts, you are completely absorbed. It's a kind of pleasurable autistic encapsulation.⁸⁷⁵ When programming you can create something with your head that can be almost completely influenced by your own will. And finally, if you arrive at a verifiable result, this can then clearly be regarded completely as your own achievement. That's all over now, though. At 79, one can be glad to be able to overlook somewhat less complex interrelationships.

The memory is also diminishing. When age-mates like Axel Hunscha complain about their bad memory and ask me how things are going with mine, I answer: "my memory is also getting worse and worse. *Above all, I can't remember three things. First, names. Secondly, numbers. And third, uh, what was it?*"

⁸⁷² It should not go unmentioned that after a certain time they started cawing again. Then we got up. But it was a miracle. Miracles are always limited in time. The exact description of the place where the "crow miracle" happened can be found at www.Inzpla.de/Wunder.pdf

⁸⁷³ About Olaf Berlien, who started his career as a successful controller and studied at the TU Berlin, see www.Inzpla.de/Berlien.pdf.

⁸⁷⁴ For the programming volume of certain modules of the INZPLA-System, see page 628.

⁸⁷⁵ See also page 533.

Recently I went to an otolaryngologist for a hearing test, and after that, he asked me, "*Do you have crickets in your garden?*" And when I replied "*no*" to him, he answered me, already quite close to retirement and a real Berliner, "*ha, ha, ha, you do have some, you just don't hear them*". Then he told me that hearing is going downhill from twenty-four. That's reassuring-- *welcome in the club*.

I also seem a little confused (see my reputation at the TU Berlin). That's what my wife thinks too. However, at least I'm not completely unfit. My years of daily ergometer work (currently 150 watts permanent 30 min.) led Prof. Reinhard Ketelhut (sports physician) to the conclusion on 15.10.2014 that I had the condition of a 45-year-old with an output of 2.21 watts per kg body weight. However, he noted that today's average condition of 45-year-olds is catastrophically bad.⁸⁷⁶ Also otherwise, I tried to keep myself fit. I never use an elevator. Even in Thyssen's high-rise building in Düsseldorf I always renounced the so-called bigwig elevator and walked up the 22 floors. With my colleague Hans Hirth, who was on the same fifth floor as me, I hold a not undramatic stair race (up to retirement at 68) after lunch together. We never met anyone in the stairwell who could have got upset about the "mad professors".

I try hard to keep fit. During a bicycle tour with my grandson Frederik (18) on the Inn cycle path in July 2016, we covered 105 km in one day (from Jettenbach to Obernberg). It didn't always go along the Inn as I thought, but up and down. At the end of the day, I nearly landed in the river mentioned because the concentration decreased. You should not overdo it. In spite of all the fitness achieved with a lot of effort, always is valid: tomorrow everything can look completely different. However, that's the way it is.

What is a serious scientist?

But back to my story, which began with me telling a joke to Axel Hunscha. A colleague benevolent to me who read this text in advance said that these stories went too far after all. I could really lose my scientific reputation with that. Thank you for the advice, but there are two counterarguments.

The first is I have no scientific reputation to lose because I do not possess one (s.p.502). The second is that this text should not only be a scientific work. The scientific contributions in this text have a white background. And everyone can learn more about my further scientific contributions and thus my contributions to the Integrated Target Commitment Planning by calling up the texts listed in the bibliography and the footnotes which are available as PDF files online. And the text with the grey background describes my thoughts and experiences that accompanied the development of the Integrated Target Commitment Planning.

This text here has a yellow background, and there I only tell anecdotes, experiences, conspicuities, and memorabilia from my academic area of life and also personal things.

My pre-reader was satisfied with this answer. However, he could also have replied that a "scientist" (whatever one understands by it) should not write such a thing at all. This would also call into question the seriousness of his scientific work.

⁸⁷⁶ See also page 215. "*Why I travel to Vienna*".

There are good examples against this argument. Richard Feynman is regarded as the most important theoretical physicist of the 20th century alongside Albert Einstein. He wrote a book entitled "*Surely you're joking Mr. Feynman!*"⁸⁷⁷

In this book, he reports on his scientific development but also tells anecdotes from his life and describes his hobbies. The book is extremely funny and entertaining. It was on all the American bestseller lists for months. Among physicists, it is considered a cult book and almost every physicist is familiar with it.⁸⁷⁸

One of Feynman's hobbies was cracking vault codes. He told in his book how he asked a colonel at the American nuclear research center Oak Ridge to open a vault containing important secret documents. The colonel thought he was a madman and said he should try it. And when he actually opened the vault (he also tells how he found the correct code), he describes how a world collapsed in the colonel with the words: "*The colonel's jaw dropped, and his eyes bugged out*" (p.146).

When he was a professor at Caltech, he observed ants running out of the drain of his bathtub and described how he "pursued" them with a colored pencil and how he managed to prevent ants from touching his food by building an "ants' ferry" in Princeton. Complete nonsense, however, his experiments with ants are systematic and logical. I cannot agree with those who are not amused and cheerful by these descriptions, but who think that a Nobel Prize winner should not write something like this. Cheerfulness to the limits of nonsense and beyond makes life worth living. Whoever loses his scientific reputation in the eyes of some colleagues, what role does it play?

Dealing with the dazzling border between meaning and nonsense is often an amusing and entertaining undertaking. However, it is not only the "exalted" nonsense poetry like Goethe's magic square (Hexeneinmalein) that is located on this borderline and exerts an intellectual charm. The question of an empirical criterion of meaning to separate meaningful and meaningless statements still dominates scientific theory today. Popper's well-known falsification criterion is nothing more than an attempt to give an answer on how to distinguish meaningful and absurd statements (meaning and nonsense) from each other.

Sense or nonsense - that is here the question

Writing something about nonsense is harder than doing it.

Why would a well-known zoologist publish a book about an animal that does not exist? This book entitled "*Form and life of the Rhinogradens*" has been translated into four languages. Several editions have been published in Germany. Of the German edition alone, 56, 0000 copies were sold. In Germany, it was published by the G. Fischer Verlag, which has published a large number of biology textbooks.

If you look at it, all standards of the treatment of a scientific topic (citation, bibliography, structure, terminology, etc.) are fulfilled. Using excellent color charts and illustrations, this amazing animal and its subspecies are described in detail. What attracts the readers to this work?

⁸⁷⁷ Feynman, Richard, *Surely you're joking Mr. Feynman!*, New York 1985.

⁸⁷⁸ Please refer only to the emphatic discussions at AMAZON (in German and English).

There is a problem slumbering in the topic of "nonsense" - what is upscale nonsense for some is pure, even primitive foolishness for others. And this judgment very often depends on the mood and temperament of the person who makes this judgment.

Goethe speaks of the *"bewitching charm of nonsense poetry"*. However, he has also pinpointed the problem of the unfolding of nonsense. *"In a nonsense poem the nonsense is concentrated, in a conversation, there must be a pre mood, and this must be perceived intuitively. Even a joke runs the risk of not getting there. With nonsense, however, this danger is many times greater."*

It is almost impossible to draw a line between meaning and nonsense as well as nonsense and foolishness because there are no "meaningful" standards. And it is not foreseeable whether absurd statements contribute to the amusement of those present and create a "mood of nonsense". I think Karl Valentin's nonsense contributions are amazingly good. Others find him impossible. He recognized this himself and let Liesl Karlstadt, his stage partner, say in a sketch with him after one of his "contributions": *"I'm not obliged to listen to your idiotic drivel!"* And she's right about that. Actually, you should not write anything about nonsense; you should do it.

Those who can do it, do it, those who cannot describe it.

It is in this spirit that I have proposed a contribution to the reform of marriage law. Is it nonsense or not? That is the question.⁸⁷⁹

I am a great fan of nonsense at the right time in the right mood with the right people. However, it has to be the right people. Whoever is serious and sedate is out of the question. Rhymed is this credo:⁸⁸⁰

Praise of nonsense

Enjoy it when the nonsense reigns.
If wallowing in nonsense, never stop it.

For nonsense that fully unfolds
there's no better therapy.

Nonsense makes us fresh and easy.
Doing nonsense is a must.

Is it a shocker for philistine
but a real treat for us.

Lob des Unsinnns

Genießt es, wenn der Unsinn waltet.
Schwelgt Ihr im Unsinn, bremst ihn nie

Für Unsinn, der sich voll entfaltet
gibt's keine bessere Therapie.

Unsinn macht uns frisch und locker
Unsinn treiben ist ein Muss.

Ist's für Spießer auch ein Schocker
für uns ist's ein Hochgenuss

Several years ago, I visited the Royal Air Force Museum in London. There, a film about the *"Red Baron - Legend of the skies"* was shown in the *"4 Dimensional Theatre"*. When I left the screening, a serious-looking gentleman stood at the exit. He looked like a retiree,

⁸⁷⁹ See www.Inzpla.de/Marriage-Reform.pdf (in English).

⁸⁸⁰ Unfortunately, I was not able to translate my credo for nonsense into English. This also applies to my rhymes on page 513 and on page 515 as well as the rhymes of Wilhelm Busch (p.513) and Oskar Blumenthal (p.515). Only my "leading poem", whose German version comes from Hans Dieter Gelfert, I have translated into English (p.647). It is of course by far not as good as the German original. But I felt the need to translate it.

who wanted to do still something meaningful. I asked him why they are showing a film about the red baron. There would be enough English fighter pilots. He answered me in an excellent Oxford English (which I like to hear) *"he was a remarkable fellow"*. Then I told him that my question was no coincidence and I would now tell him something confidential - *"I am the illegitimate son of the red baron"*. Then his face began to lighten up, he took my hand, looked at me enthusiastically and said, *"Sir, it is a great honor for me to welcome you to our museum"*.

I replied that I was very happy and proud that my father was held here in such high honor. Afterward, a seriously insane conversation developed about the not strongly developed father duties of the *"red baron"*. In the end, we said goodbye like two old friends, and it wouldn't have taken much for us to hug.

I recently read an interview with Bill Bryson, who wrote one of the most successful books on "The English", considered as a key work in England. In this interview, he says that one of the most prominent characteristics of the English is a special preference for *"silliness and absurdities"*.⁸⁸¹ My museum friend was a real Englishman. And as for myself, I should probably apply (in spite of the Brexit) for English citizenship.

But back to the "scientific reputation". From Wilhelm Busch comes the saying

Once reputation is away	Ist der Ruf erst ruiniert,
you enjoy a relaxed stay	lebt es sich ganz ungeniert

That maxim I could never follow because I have no reputation. At the beginning, I still tried to make the system of the Integrated Target Commitment Planning a little better known through my as mentioned shipping activities of texts to thereby gain "a reputation" among experts in a certain way. However, in retrospect, I can only give everyone the following advice

When a reputation is not sought,	Wenn ein Ruf nicht angestrebt,
You live in a particularly casual way.	sich besonders zwanglos lebt.
And you think relaxed and lively	Und man denkt entspannt und munter
What you do I don't care	rutscht mir doch den Buckel runter

If despite this maxim, you have gained a "reputation" (what is that actually?) because what you have done, somehow "arrives", then you can take it with you.

And, if one has not gained a "reputation"? What's the difference? As far as the Integrated Target Commitment Planning is concerned, I have no illusions that it will be widely used. However, that doesn't matter. Basically, the way is everything; the goal is nothing.

And as far as this whole text is concerned, the following applies:⁸⁸²

⁸⁸¹ Interview in Berliner "Tagesspiegel" on 11.6.2016. Bryson, B, *Reif für die Insel. England für Anfänger und Fortgeschrittene*, 18. Ed., München 1999. (*Ready for the Island. England for Beginners and Advanced*)

⁸⁸² See on a similar rhyme on which it is based: www.Inzpla.de/Reim.pdf.

If you think what's good and important,
and doubt whether it will please others,
you should still put it on paper
even if no readers can be found.

Alone when you describe it,
it's good for your self-perception
Whether someone reads it and finds it super,
is there any relevance to that?

Wer was für gut und wichtig hält,
und zweifelt, ob es auch gefällt,
der soll's auf jeden Fall verkünden,
auch wenn sich keine Leser finden.

Allein, wenn man's beschreiben tut
ist's für das Selbstverständnis gut.
Ob's einer liest und super fand,
ist das denn dann noch relevant?

Conversations, discussion, and thought development

Unfortunately, I was not able to discuss the system of the Integrated Target Commitment Planning and Control in detail with colleagues. I have given several lectures on the concept of the Integrated Target Commitment Planning at the meetings of the Scientific Commission for Accounting, the meeting of the university lecturer for Controlling in Vallerendar and also the meeting of the Association of University Teachers for Business Administration. Furthermore, as already reported, I have sent all colleagues the publications on the Integrated Target Commitment Planning, which I believed might be of interest to them.

However, their non-reaction is not really surprising. As colleagues told me, they have also developed new concepts and described them in texts that they sent specifically to colleagues who might have been interested in them. In almost all cases, however, this did not lead these colleagues to turn to them afterward to clarify open questions out of their own interest or to discuss them at all.

I have the impression that the reading of even related technical texts and the discussion about them today are somewhat neglected. That's a little drastic: Everybody writes, and nobody reads. The story that my colleague Hans Blohm used to tell is quite true.

Two professors meet. Professor A asks Professor B, "*Have you already read the latest work by colleague Miller?*" Professor B answers, "*Why read? I publish myself*". Professor A replies, "*Oh yes, I know that, and your work 'Splendor and Misery of the Bank Balance Sheet' impressed me so much that I bought it as soon as it appeared three years ago.*" And B answered, "*Oh yes, it's you*".

Apparently, such an only-writer lived by the motto: "*What you write remains what you read, that melts away.*" That motto is fundamentally wrong. You have to read about a topic ten times and more before you can write anything reasonably further about it. And if you don't keep up to date with what's going on in your field, you soon become an autistic person.

And to the assertion "that remains". You shouldn't be under any illusions. At best, it remains in the magazines of a library. If the pages of all books in the professional libraries, which have not caught an eye in the last ten years, would fade, then over ninety percent of all pages would be blank. All contributions can only attract the interest of other readers, if at all, within a short period.

Paul A. Samuelson's "*Foundations of Economic Analysis*" is a fantastically good work, and since it deals with a considerable extent with dynamic models, I have also "read" it. It

is a must for any theoretically oriented quantitative economist. An MIT colleague (D.D.) told me that Samuelson had stuck a 20 dollar bill in his book in the MIT open access library and asked the finder in an enclosed text to report in order to receive another 20 dollar bill. Always before Christmas, he checked to see if the dollar bill was still there.

However, one must also limit oneself when reading. It's worth reading only what enriches you. Drawing a line here is not easy.⁸⁸³

The rhymes that Oskar Blumenthal formulated some 120 years ago are still quoted everywhere today in Germany and apparently apply to every professional group. They are:

Gaining recognition from your peers,	Du willst bei Fachgenossen gelten
that's a lost love effort,	das ist verlorene Liebesmüh,
what you're failing,	was Dir mißlingt
they rarely will forgive you	verzeihn sie selten,
what you're succeeding,	was Dir gelingt,
they never will forgive you.	verzeihn sie nie.

For one professional group, however, this poem is only limited, and these are the professors of business administration. Many of them do not care in any way about the contributions of their colleagues, but consider it highly appropriate that others should, indeed would have to know their contributions in order to be at the cutting edge of "research". They could use another poem, and that's:

You want to impress with writings,	Du willst mit Schriften Eindruck machen,
one can only laugh about it,	da kann man doch nur drüber lachen,
because what you write is not read,	denn was Du schreibst, wird nicht gelesen
whether it was good or bad.	ob's gut oder ob's schlecht gewesen
You are severely indignant	Du bist aufs Heftigste empört
and you think it's outrageous.	und findest das ganz unerhört.
No reason to get upset artificially,	Kein Grund Dich künstlich aufzuregen,
what do you read from your colleagues?	was liest Du denn von den Kollegen?

However, I myself have never been a lonely writer in my bower. I am far too interested in contacts and conversations (and not only about the Integrated Target Commitment Planning). Only once did a more in-depth technical discussion with a German colleague took place.⁸⁸⁴ I was able to have a detailed, stimulating and very constructive conversation with Josef Kloock about my contribution to the analysis of variance, which he had previously read through. From his mathematical approach and his work with models, he was an ideal interlocutor.⁸⁸⁵

The procedure of the Integrated Target Commitment Planning was not completely ig-

⁸⁸³ See also the consideration on page 503.

⁸⁸⁴ For a discussion with colleagues at MIT, see page 528.

⁸⁸⁵ See: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, Berlin 2007, p. 94f., (301 pages), www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

nored either. Invitations to a lecture signal an interest of the inviting person. Various colleagues such as Uwe Götze, Dietger Hahn, Josef Kloock, Wolfgang Männel, Hans Robert Hansen, Wolfgang Ossadnik, Werner Dinkelbach, and Hanns Martin Schoenfeld invited me to a lecture on the Integrated Target Commitment Planning.

I deliberately did not aim for a conversation, and that was the conversation with Wolfgang Kilger. In such a conversation, I would have told him on the one hand how much I liked his book, indeed that this book was of great importance for my research work. Then, on the other hand, should I have told him,

- that the “coverage reference size allocation procedure” is an unacceptable allocation procedure,⁸⁸⁶
- that it is absolutely necessary to carry out a sales quantity-driven planning (even in the case of his model example), that is, a planning that Kilger does not carry out,⁸⁸⁷
- that the complete description of the quantity structure and the value flow of a single-stage and multi-stage production also requires modeling of the quantity and value flow of the produced products through the interim and final inventories, i.e., an area which is not treated by Kilger,⁸⁸⁸
- that the “*cost object profit calculation*” developed and described in detail by him proves to be a simple cumulative actual-plan variance analysis of the article contribution margins. However, this type of a variance analysis should always be replaced by a differentiated cumulative variance analysis in the form of a (responsibility-related) RR-Min variance analysis since it is an inferior procedure,⁸⁸⁹
- that an actual cost and performance accounting works with actual models that have semantic and syntactical differences to the plan cost-performance models, which would have to be worked out,⁸⁹⁰
- that it is not sufficient to review the efficiency of a company in question by means of a setpoint-actual comparison of the cost elements in the cost centers,⁸⁹¹

⁸⁸⁶ For a detailed explanation see: Zwicker, E., *Classic Cost and Performance Accounting in the Light of the Integrated Target Commitment Planning*, op. cit., p. 6-17., www.Inzpla.de/IN15-2002a.pdf. (Text in German, title translated).

⁸⁸⁷ See page 57.

⁸⁸⁸ A model tableau describing such a flow through an inventory is shown in Fig. 14 on page 69 under the name “*inventory updating tableau external raw material inventory*”. See the structure of the model tableaux, which can be used to model the quantity and value flow through an inventory (also depending on the type of inventory valuation) in: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 88f., www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated).

⁸⁸⁹ See page 106 and more on this procedure: in: Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 241-277., www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

⁸⁹⁰ See page 112 and Zwicker, E., *Actual Cost-Performance Models: Structure, Semantics and Application*, Berlin 2008, www.Inzpla.de/IN35-2008a.pdf. (Text in German, title translated).

⁸⁹¹ This setpoint-actual comparison is used as a control calculation in the case of a pure basic Target Commitment Planning if the cost elements are selected as the aggregation level of the setpoint-actual

- that it is not sufficient to carry out certain decision calculations (such as make or buy decisions or article elimination decisions) on the basis of the marginal planning costs determined.⁸⁹² Such decisions can and should, of course, also be made in the system of an Integrated Target Commitment Planning. These are 0-1 decisions of an optimizing planning, which are usually made during the bottom-up step. However, the procedure for deciding to eliminate an article on the basis of its (negative) contribution margin₁ is too short,⁸⁹³
- that the linear production program planning, which Kilger describes in detail, is not to be regarded as a decision calculation (at least not in the sense of the decision theory), but as a bottom-up planning of the second step and is, therefore, a procedure of the Integrated Target Commitment Planning. If a linear production program planning is used in an annual operational planning, then this should only be a partial step of the Integrated Target Commitment Planning,⁸⁹⁴
- that the decision calculation propagated by Kilger, which can be operated with a flexible plan cost accounting model, is not particularly relevant. Much more relevant (or at least also necessary) is the implementation of a planning and control procedure with which the corporate management achieves that its top targets are realized through a procedure of target commitment "at the grassroots".

How would Wolfgang Kilger have reacted to these objections? The situation seems a little paradoxical: His greatest admirer is probably also his greatest critic. However, doesn't that have to be the case? After all, new concepts can only be justified by criticism of the inadequacy of existing concepts.⁸⁹⁵

Of course, before I formulated these points of criticism, I looked through the literature to see which criticisms were made by other authors against Kilger's flexible plan cost and contribution margin accounting. I didn't want to be criticized for raising objections to

comparison. However, there are other setpoint-actual comparisons within the scope of the setpoint-actual comparison of the pure basic Target Commitment Planning that Kilger does not deal with. See Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, op. cit., p. 49f. www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

⁸⁹² For a description of make-or-buy decisions as yes-no decisions of an optimal planning see, Zwicker, E., *Integrated Target Commitment Planning and Optimizing Planning*, op. cit., p. 17, www.Inzpla.de/IN08-2000c.pdf. (Text in German, title translated) and, Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., p. 66f., www.Inzpla.de/IN11-2001a.pdf. (Text in German, title translated).

⁸⁹³ This is a process that Kaplan propagates for its "long-run models". Unlike Kilger, however, Kaplan assumes that fixed costs will turn into variable costs in the long run. See page 188 and in more detail in: Zwicker, E., *The Johnson and Kaplan Management Accounting System in the Light of the Integrated Target Commitment Planning*, op. cit., p. 11f., www.Inzpla.de/IN27-2003e.pdf. (Text in German, title translated).

⁸⁹⁴ See page 58 and for a detailed explanation: Zwicker, E., *Linear Production Program Planning and its Relationship to the Bottom-up Planning of the Integrated Target Commitment Planning*, Berlin 2006, www.Inzpla.de/IN32-2006a.pdf. (Text in German, title translated).

⁸⁹⁵ For a description of how the cost-performance models propagated by Kilger are step by step converted into models that can be used to carry out an Integrated Target Commitment Planning, see Zwicker, E., *Integrated Target Commitment Planning and Control - a Process of a comprehensive Company Planning and Control*, Berlin 2010, p.93f., www.Inzpla.de/IN37-2008c.pdf. (Text in German, title translated).

Kilger's approach, which had been discussed long before in the literature. Apart from one exception, I didn't find any text in the literature criticizing Kilger's system of the flexible plan cost accounting. The exception was Riebel's critical remarks in a protocol of the Accounting Commission. In my opinion, however, the arguments against the marginal costing in Kilger's flexible plan cost accounting put forward by Riebel on not more than one side are so irrelevant that they need not be quoted.⁸⁹⁶

Debating and Methodology

When I was at MIT and walked with a colleague across the campus, my companion pointed to a student who passed us and said with respect in the voice that this young fellow was the last winner in MIT's debating competition. So far I had never heard of the fact that there were institutions at universities in which "debating" is systematically practiced and debating competitions that take place according to fixed rules. The thought immediately came to me: "We also have to do something like this at the TUB". I, therefore, acquired the standard work by Austin Freely "Argumentation and Debate", which was recommended to me.

From this work, I learned for the first time that such debates take place according to precisely defined procedures (topic formulation, 1st affirmative, 1st negative, etc.) and I found all this fascinating.

Today debating in the university sector is nothing special anymore. Each university has a debating club; there are German championships, a European championship, and the World Championship. The "World Universities Debating Championship" was held in Berlin in 2012. However, about 1982, at least at the TU Berlin and the FU Berlin, there was nothing like this.

That is why I founded such a debating club with some interested students, whose debates were conducted according to the American debating rules, namely those described by Freely. However, I realized that it was not enough to comply with the rules of debate, but that it also makes sense to deal with the standards of "rational reasoning" that contribute to raising the level of such debates. In order to clarify these questions, I formulated my thoughts in a brochure that I discussed with the students. Its title was, "*Rational Reasoning in Economics and Social Sciences*". I think I learned the most myself.⁸⁹⁷ It dealt with the forms of declarative and normative reasoning and its justification, the differentiation of empirical assertions from pseudo statements and tautologies, etc.

The rules to be observed for defining terms were also discussed. It was only a small

⁸⁹⁶ The Accounting Commission is a working group of the Association of University Lecturers in Business Administration. The discussion contribution of Riebel's against Kilger's Concept can be found in: Chmielewicz, K. (Ed.), *Entwicklungslinien der Kosten- und Erlösrechnung*, Stuttgart 1983, p. 81.

⁸⁹⁷ When I look at this script after more than forty years, I'm not so taken with it anymore. A fundamental overhaul would be necessary. However, for "proof reasons" that it even exists, I am willing to send it to an interested party as a PDF file upon request. Zwicker, E., *Rational Reasoning in Economics and Social Sciences - an Introduction*, (Text in German: Rationale Begründung in den Wirtschafts- und Sozialwissenschaften - eine Einführung) without year. (109 pages). The introduction is available at: www.Inzpla.de/Ration-Argu.pdf. Text in German.

group, but the participating students were very committed, and everything only ran on a voluntary basis. Later, at my suggestion, some students coming from all Berlin universities, founded a debating club called "The Debate". My two sons Jörk and Hendrik, who studied chemistry and law in Berlin, were among the co-founders. I was told that this debating club was active for some time, but at some point, I lost sight of it.

All in all, in my discussions with students, I always had the impression that they benefit not only from dealing with business administration issues but also with the prerequisites, methods, and goals to handle these issues. I was, therefore, very pleased when my colleagues gave me the opportunity to carry out a compulsory course entitled "*Basic Questions of Business Economics*" in the main course of study in General Business Economics. In this course, I have tried to discuss basic questions of defining and argumentation using examples from business administration. My goal was to make the event as vivid as possible, despite its theoretical basis, so that the students could really benefit from it and not get lost in the abstract.

Therefore, I dealt with questions of the kind: How to define? What types of definitions are there? Which errors should be avoided when defining? How to build arguments? How can arguments be invalidated? How to justify normative in contrast to descriptive arguments? ...

The text that served as a basis for the students in this course on the topic "*Defining and Classifying in Business Administration*" can be called up as a PDF file. Thus, an interested reader can at least get an impression about the level at which all this took place.⁸⁹⁸ Since the event was held over decades, several thousand students, namely business economists, industrial engineers, and economists, (forcibly) took part in it.

I have carried out this event with great enthusiasm and joy, because it may sound ridiculous, but I had the impression that I was making a contribution that deviated from the usual in order to increase the intellectual competence of the students. And I still believe that to this day.

To avoid any misunderstandings: students at a university learn standards of argumentation and methodical procedure even without such an event, namely implicitly, in, that a university teacher introduces them to his subject with a lecture and the knowledge imparted and the approaches submitted there are deepened and comprehended by the students. Just as children learn (or do not learn) from their parents to speak grammatically correctly, so scientific forms of argumentation are passed on to the learners by "imitation" and also by appropriate methodological notes of the teachers in the context.

This is also the case for the training in the field of business administration. The only exception is statistics, which are purely method-oriented. With my event, I have tried to emphasize the methodical approach explicitly and to demonstrate this by means of exam-

⁸⁹⁸ Zwicker, E., *Defining and Classifying in Business Administration*. (Text in German, title translated), TU Berlin, no year, (62 pages), www.lnzpla.de/Definitionen.pdf. (Text in German).

ples. The great danger of such an event is that nothing more comes out than "methodical gossip". I hope I have avoided this.

Teaching

In the past, I have also tried to hold discussions with the students who took part in the events of my actual subject "Controlling". Unfortunately, this was only possible to a limited extent due to the large number of students who had opted for the compulsory elective courses "Controlling I to IV".⁸⁹⁹ In order to exchange some ideas with the students, I asked them to ask me questions about the discussion forum of our chair information system. I had committed myself to answer every question.

This offer was accepted. For example, with regard to the Controlling I and II events, I exchanged letters with a whole series of students in the discussion forum to answer their questions on almost seventy pages, which is accessible to all course participants via our chair information system.⁹⁰⁰ Furthermore, to motivate students, a prize financed by ThyssenKrupp was awarded for the best exams in their undergraduate and postgraduate studies.⁹⁰¹

I didn't enjoy "big events" that much. I liked seminars the most. And in some semesters I have conducted two parallel seminars (with the same topics) to keep the number of participants as small as possible.⁹⁰² The larger the number of students in an event, the less you come into contact with them and acts as a solo entertainer without feedback. Some colleagues seem to enjoy "rhetorically mastering" a large audience, so to speak, but I don't like it. The number of participants in the compulsory courses of general business administration in the undergraduate studies was particularly high. Not only did all business economists, industrial engineers and economists take part in these obligatory events but also a considerable number of students of the technical disciplines joined voluntarily, who probably thought that it would do no harm to learn a little something about business administration. In short, the events were sometimes so crowded that the students were sitting on the stairs.

I would like to tell a story from my undergraduate course. In the early morning, I gave a lecture in the H 104, the second-sized lecture hall of the TUB, which was obligatory for all students of the basic studies. Then I noticed that a student not only slept in the second row but also snored. When he suddenly stopped snoring and opened his eyes, I asked him, "Did you sleep well?" And he answered: "No, you spoke too loudly." (An excellent

⁸⁹⁹ In the winter semester 2006/2007, for example, of 406 students took a written exam in the subject "Operatives Controlling" as an elective in the main course of study. See: Zwicker, E., *Information on the teaching activities of the Department of Corporate Accounting and Controlling*, TU Berlin 2008, p. 82. (Text in German, title translated). www.Inzpla.de/Lehraktivitaeten.pdf.

⁹⁰⁰ For this exchange of letters, see: Zwicker, E., *Information on the teaching activities...*, op. cit., pages 3-75. For an overview of the courses offered by the subject area, see: www.Inzpla.de/Lehrveranst-FG-Controlling.pdf.

⁹⁰¹ See a photo of the award ceremony www.Inzpla.de/Preisverleihung.pdf.

⁹⁰² This text ends on the last page with a picture of the participants of the main seminar in SS 2008, in the same semester, a parallel seminar with the same number of participants was held. There exists, therefore, another photo.

answer). Apparently, he had doubts about his bold answer, and after the lecture, he approached me and probably wanted to express a kind of regret. And so he said to me, *"I'm sorry about earlier, but I just got out of the disco before"*. Then I decided right away to get an impression of how things are going in a disco, which apparently has such a large attraction for my clientele. Therefore, I asked him to give me the name and address of the discotheque. The disco was called "Far Out" and was located at Lehniner Platz. The next evening the bouncer let me pass without any problems, and I entered the "Far Out" full of expectation.

An indescribable noise hit me, which pushed all other impressions completely into the background. Fortunately, I found two old bus tickets in my pockets, which I rolled up and used as a replacement for earplugs. Within a very short time, I was surrounded by a group of grinning young people, and one of them screamed into my ear: "What are you doing here?" I felt like "Prof. Unrat", the Lübeck grammar school teacher, who was known to have been discovered in Heinrich Mann's novel by his students in the "Blue Angel" brothel and also surrounded.

On the dance floor, everyone danced for himself, and no one noticed the other, a kind of egomaniacal mass event. To my surprise, I discovered one of our student tutors among the dancers. It was M.E., who stood out well from the billowing wave of the dancers due to his size. Like everyone else, he seemed to have been put into a kind of trance by the rhythmic and irrepressibly loud disco music, always carrying out the same movements with a dull, introverted gaze. But suddenly he, of all people, ejected a kind of "primal scream" and stomped, while he clenched his hands at eye level in a fist, so hard with his feet on the dance floor that one had to fear that he would punch a hole in it. That was enough for me, and I left this extraordinary place.

Already the next day I received a call from my colleague Karl Scheidl, who had heard that I was seen yesterday in the Bhagwan discotheque on Lehniner Platz. That would have surprised him, and he wanted to ask if I... and so forth.

In the following lecture, the auditorium was filled to the last seat, a student asked me right at the beginning of the event *"Professor Zwicker, how did you like it in the disco?"* Suddenly the audience was all ears. I said, *"One thing will remain a mystery to me forever, how do you actually get to know each other? With this noise no one can talk to the other, and on the dance floor, everyone is only occupied with himself. It was very different in my day. Dancing was the opportunity to become acquainted with someone. For example, I met my wife (and I knew what would come next) at a **tea dance** in Niendorf at the Baltic Sea."* This was followed by mocking laughter that filled the entire lecture hall. And some repeated in joyful cheers *"tea dance, tea dance...ha, ha, ha"*.

To put one more thing on it, I said, *"And it was also more orderly than today, for I bowed before her and said, **May I ask**"*.

There was no stopping there. Such derisive laughter had probably not existed in lecture hall H 104 for a long time. From the outside, the doors opened, and students looked in to

see what was going on here, and even the caretaker appeared to see what happened there. Fun has to be. However, it is true.⁹⁰³

Who benefits from lectures?

However, I didn't just enjoy teaching courses; I also profited a lot from them for myself. There is hardly a more useful exercise to completely grasp a subject than to present it to others in your own words. The ancient Romans coined the sentence: "*Master the subject, then the words will follow*". But one could also say, "*Only with words you can really master a subject*". (Sometimes, however, also with equations.)

Goethe has already recognized this. He reports that in order to gain clarity about a subject he imagined that a well-meaning friend was sitting opposite him in an armchair. To this friend he then explained the subject, he was dealing with. And it was only in this way that this subject often became really clear to him.

At my teaching courses in the field of operational planning, the participants were for me the „well-meaning friends". In any case, I always assumed this and tried to explain the connections to "my friends" as clearly as possible. One gains a wealth of insights and permanently improves the precision of the own formulations.

Schopenhauer, who was a master of clarity, once said: "*improving the expression means improving the thought*". After some of my lectures and seminars in operational planning, I remained in the auditorium to bring a good idea or an improvement into its final form to paper. This led to the fact that sometimes after thirty minutes the following lecturer "forced" me to finish this attempt.

I find the following anecdote typical for learning by teaching. A professor of physics tells an old friend (but not a colleague who is for this out of the question). "*When I gave my first lecture on the general theory of relativity, none of the students understood anything. When I gave my second lecture about it, again none of the students understood anything. And when I gave it for the third time, I understood it*". It didn't go that far with me, but exaggerations clarify the intended direction.

A slogan is needed

In his famous textbook, "Economics", Paul A. Samuelson's prefaced a chapter with the sentence: "*Every parrot becomes a learned economist if he masters only two words: supply and demand.*"

I think this maxim is wonderful. In science, too, you can be cheerful and put things simply in a nutshell. Because every rational person knows, what it means. I have, therefore, considered for a long time whether I could also find such a sparkling formulation for the system of the Integrated Target Commitment Planning. I've come to a conclusion, too. Whether this result is "igniting" remains to be open, but I did not communicate it only once, but more often in my courses. It was a rehearsed procedure, I took attitude and announced:

⁹⁰³ I always told my sons (under the protest of my wife) that I had said to her, "*May I ask or shall we dance first*". However, that's not true, of course.

*"The whole message of the Integrated Target Commitment Planning can be described in two sentences, and if you consider them later, then my effort has already paid off. These sentences are: **"What you can't measure, you can't manage"** and **"Make people responsible for numbers"**.*

Both sentences are indeed the core statements of the Integrated Target Commitment Planning and Control, which are implemented in this system down to the last detail.

In September 2009, I had an appointment at the "green space office" in Steglitz-Zehlendorf in order to obtain a permission of the widening of my rather narrow car parking space at the expense of the green space (in Germany everything has to be approved). As I walked with my wife across a forecourt towards the entrance of the Zehlendorf green space office in Kirchstraße, a gentleman in his higher forties addressed me directly in front of a massive round stone fountain, "Are you Professor Zwicker?". "Yes, I am." "I studied controlling with you." "That must have been a long time ago." "Yes, that was about twenty-five years ago." "Do you remember anything else?" "Of course".

He then took an attitude, holding his right hand with his thumb up (not his middle finger) and declaimed laughing *"What you can't measure, you can't manage"*. Then he raised his left hand up again with his thumb and continued to declaim, *"Make people responsible for numbers"*. I said to him, "If you kept this, something really got stuck. Did it benefit you?" "But of course, I did not forget it, and it helped me, too." I was so impressed that I would have liked to have invited him for a beer. However, my wife, who had already walked to the foot of the stairs at the entrance of the "green space office" and was waiting for me there, looked at me with a "does-this-have-to-be" look. And if you have an appointment with an official who has to approve something, then you should not keep him waiting. Therefore, I wished him all the best, and he wished me the same.

Persons

Today I still see **Konrad Mellerowicz**, one of the "forefathers" of German business administration, standing next to the catheter in his course "Cost Accounting" and repeatedly announcing *"a business economist must calculate, calculate, calculate"*.⁹⁰⁴ With every exclamation of the word "calculate", he hurled his right forearm forward with a theatrical gesture. This request to calculate is now extensively practiced in the system of the Integrated Target Commitment Planning. "Calculating", which Mellerowicz so urgently called for, is now however taken over from the "business economist" by a computer. But the procedure on which the calculation is based is determined by the "business economist". The world changes.

But calculating alone is not enough. There are many problems that can only be computable to a limited extent, but which are of great importance for the success of a company. I used to say to the students, *"With a controlling system such as the system of the Integrated Target Commitment Planning and Control, as a corporate manager you have the normal process of doing business under control, in that you can hold someone responsible for these tasks and are immediately informed if something goes wrong and above all*

⁹⁰⁴ Occasionally he supplemented this maxim with the postscript: *"... even if it is sometimes wrong"*.

your profit target is not achieved. On this basis, you can then concentrate on the actually important tasks in your company, and these are topics such as personnel management, development of new markets, introduction of innovations, etc."

Conversations, discussions, and talks with colleagues have always played an important role for me. You cannot overestimate a good conversation.

Dietger Hahn (until his death a close friend of mine) and I were members of the Schmalenbach-Gesellschaft's "Integrated Corporate Planning" working group as the only representatives of the universities for more than twenty years. The planning directors of many large German companies (e.g., BMW, VW, Daimler Benz, Allianz, Esso, E.ON, RWE, Haniel, Siemens, Thyssen) participated in this working group (changing over the years). The working group met twice a year in a hotel or guesthouse for two half days. Of course, (almost) only planning was discussed in the sessions and in the evening meetings not only, but quite often. The discussions were very stimulating, and I cultivated friendly relationships with some members of the working group over the years.

Alfred Biel has been discussing almost all German-language monographs on controlling in the *Controller Magazine* for about thirty years. He not only discusses them, but he has also read them thoroughly and has an excellent overview. He is also an outstanding expert on the non-university controller scene. I have been talking to him for years, and we have talked for several hours.

I also had a longer conversation in Munich with **Albrecht Deyhle**, who was the chairman of the Controller Association and head of the Controller Academy for many years. He immediately understood what the Integrated Target Commitment Planning was about and (in my opinion) correctly assessed the practical relevance of this operational planning and control procedure. He is knowledgeable, humorous and a very pleasant interlocutor. Deyhle is dedicated to the world of controlling, and I really like such a commitment, especially in view of the great indifference that one encounters so often.

Hanns Martin Schoenfeld has been Professor of Accountancy at the University of Illinois Urbana Champaign since 1962. With this appointment, he left Germany and became an American citizen. Despite several appointments from German-speaking countries, he did not return. However, he has always maintained active contact with many German-speaking colleagues. One can say that he really was a mediator between two worlds and not only knew these two worlds very well but was also very active in them.

When I was still a research assistant at the TU Berlin, he gave a lecture invited by Bernhard Hartmann. I then spoke to him about a point he had discussed, and he immediately invited me to a "lunch", as he said. This resulted in a connection that lasted for several decades. Since his wife was from Berlin, he was in Berlin almost every year, and we came together in most cases. After my vocation on a professorship also improved my financial situation, I visited him more often in Vienna, where he had an apartment, and we met at the annual meetings of the European Accounting Association.

He invited me to Urbana Champaign for a lecture on the system of the Integrated Target

Commitment Planning. When he received the Dr. Kausch Prize in St. Gallen in 1997 for his achievements in the field of accounting, I was there and in 2008 at the award of an honorary doctorate from the University of Graz. He was a very interesting interlocutor who literally "knew the world". I had many stimulating conversations not only with him but also with his wife (a Germanist with a doctorate).

Hanns Martin Schoenfeld founded the International Section of the American Accounting Association and was President of the Academy of Accounting Historians for several years. He told me that he had given guest lectures in 25 countries (one does not forget such a number) or also worked there directly as a visiting professor. In addition, he was also on the road as a tourist. According to his own statement, he lived by the principle: "*My roots are in my boots*".

He knew almost all important American and English Management Accounting professors such as Robert Kaplan and Charles Horngren and knew to tell "stories" about them. He was well acquainted with Sune Carlson, who like him was active in the field of "international business". Sune Carlson was a member of the Nobel Prize Committee for Economics and, as reported, gave the laudation for Herbert Simon at the award ceremony (s.p.551). Hanns Martin Schoenfeld had written a three-volume work (only in German) on cost accounting. So there was already enough to talk about from a technical point of view. One of his activities as a "bridge builder" is the publication of the "Management Dictionary, German-English".

The impressive thing about him was that he knew the world of "*cost accounting*" and "*managerial accounting*" just as well as he knew the German-speaking world of cost and performance accounting and controlling.

As President of the Academy of Accounting Historians, he was very interested in the history of management accounting.⁹⁰⁵ For this reason, our conversations also referred to the system of the Integrated Target Commitment Planning, which is a system of *managerial accounting*. And he was interested in this system. This was also due to the fact that he had sound knowledge in the field of cost accounting and contribution margin accounting. And when we talked about professional matters what was, however, not the focus of our conversations it was about the characteristics of this system and its development.

He also read my critical remarks about Kaplan's book "*Relevance Lost: The Rise and Fall of Management Accounting*" and talked to me about it.⁹⁰⁶ While he agreed with my criticism of Kaplan's new system design for a management accounting system, he said that Kaplan's contribution with this work was primarily that his criticism of the inadequacy of American cost accounting was now widespread and generally accepted in the United States. I replied that the appreciation of Kaplan's contribution to the state of the American cost accounting was not my goal, but the question of whether his claim applies to have

⁹⁰⁵ See his article: Schoenfeld, H-M. *Die Entwicklung des Managerial Accounting*. (The development of Managerial Accounting) In: Management International Review, 12(1972) No. 2/3, p. 3-24.

⁹⁰⁶ See page 189f. and the detailed consideration in: Zwicker, E., *The Johnson and Kaplan Management Accounting System in the Light of the Integrated Target Commitment Planning*, Berlin 2003, www.Inzpla.de/IN27-2003e.pdf. (Text in German, title translated).

developed an "*entirely new management accounting system*", which he then also described in the text. He said that Kaplan had admitted in a discussion in which he himself participated that he had not developed such a new system.

To my reply that Kaplan's statement was nowhere in the literature and I could, therefore, only refer to what was in Kaplan's book, he admitted that this was an argument. He found the criticism to be factually correct, but as a person interested in harmony, it seemed too sharp to him. Especially the comparison of Kaplan with a theatre director, who announces *Hamlet* and then "*The Cousin from Nowhere*" will be played he thought to be too polemical (s.p.184).

I found this comparison (but I didn't answer him that) particularly fitting. One can be divided about the sharpness of criticism, and I asked him to let this certainly somewhat critical wording benefit my "youthful immaturity".⁹⁰⁷

I also discussed my criticism of Kaplan's Balanced Scorecard with him and reached much agreement on this point.⁹⁰⁸ He also provided me with a contact to Hanne Nørreklit, with whom he was befriended. In my view, Hanne Nørreklit has published one of the best reviews of the Balanced Scorecard concept. Her criticism of the Balanced Scorecard, which is quoted here, hits the core (s.p.193).⁹⁰⁹

We are connected by a special event. As mentioned, I was present in January 1997 when he was awarded the Dr. Kausch Prize at the University of St. Gallen. This was followed by a festive dinner in the restaurant "Am Gallusplatz". During the meal, Hanns Martin Schoenfeld reminded me that I had promised to bring him a paper he was interested in from Berlin. However, it was at my hotel. Since he wanted to leave the next day together with his wife already in the morning, I left the restaurant during the dinner, in order to pick up this document in the hotel only a few steps away. Not noticing that there was black ice, I already slipped on the first of the four steps of the entrance to the restaurant, fell down the stairs to the front and smashed my left shoulder joint. Then I dragged myself into the lobby of the restaurant and lay there half unconscious on the floor because of the severe pain. There I was found, and I was driven by ambulance to the Cantonal Hospital St. Gallen.

This accident and its consequences probably contributed to the development of a special personal relationship between Hanns Martin Schoenfeld and myself. And just after his wife's death, we talked on the phone a lot until his daughter, whom I also knew well personally, told me that he had passed away.

However, I would like to report one more thing about him, because this has obviously burdened him very much and he can report something here as a "contemporary witness" about the horrors of the Second World War.

⁹⁰⁷ My original description of the conversation with Jay W. Forrester (see page 16), which was a very "asymmetric" conversation, I changed due to his comments.

⁹⁰⁸ See also: Zwicker, E., *Integrated Target Commitment Planning and Balanced Scorecard*, Berlin 2003, www.Inzpla.de/IN29-2003g.pdf. (Text in German, title translated).

⁹⁰⁹ See: Zwicker, E., *Integrated Target Commitment Planning and Balanced Scorecard*..., op. cit., p. 29,

At the age of 16, he was still drafted into the army in 1945, but had no longer "enemy contact", and was immediately taken into American captivity as a prisoner of war. He was "transferred" by the Americans to the French and, therefore, became a French prisoner of war. There he was used for mine clearance. The prisoners had no metal detectors to detect the mines, they were only equipped with search needles and children's shovels, but otherwise, they had to search the area with their bare hands, inch by inch.

He told me time and again that in the neighborhood, other minesweepers and even friends at the same age „blew up" and he had actually already finished his life (16 years).

I thought his reports were a little over-dramatized. Then in 2008, I came across an article in the journal "Der Spiegel", which dealt precisely with the fate of these prisoners and pointed out that the prisoners were "*ruthlessly deployed*" and that their injury and death rate was "*extremely high*".⁹¹⁰ I sent him this article (9.9.2008) by E-Mail, and he told me on the phone, it was much worse than it was described there.

My accident in St. Gallen had also another consequence. **Gerhard Seicht**, whom I did not know personally until now, also took part in the banquet as one of the jury members of the Kauschpreis. He immediately offered to accompany me in the ambulance to the hospital. Therefore, he followed the first emergency operation until about two o'clock in the morning (there were three in all) and (what else the relatives do) made sure that everything went off correctly. Since then I have a titanium upper arm prosthesis.

It is strange that this is the first time I have personally met the man who, with his step-by-step marginal costing, has developed the flexible plan cost accounting into a decision calculation and whom I have long known from the literature. Later we met several times in Vienna at the "Heurigen" under more pleasant circumstances.

However, I also think something else is worth reporting. When **Georges Fischer**, then rector of the University of St. Gallen, learned that one of the participants, therefore one of the guests invited by him, had a severe accident, he took the time to visit me personally at the hospital and to wish me a speedy recovery. My friend Dietger Hahn used to say: "*One is measured by detail.*" And that's true here too.

MIT contacts

As reported, I was very interested in exchanging ideas with some colleagues working at MIT (s.p.224) because I read their writings and came to the decision that nobody in the area of development and computer-assisted application of planning models was more in agreement with that what concerned me.⁹¹¹ I have already reported on my employment with the writings of Jay W. Forrester and John D.C. Little and the conversations with them (s.p.16 and p. 285).

In addition to the discussions with Forrester and Little, I also had a conversation with

⁹¹⁰ Spiegel 35/2008, *Helden ohne Lobby*, p. 50. (*Heroes without a lobby*).

⁹¹¹ In Germany, I didn't know anyone who comes into question for this.

Michael Scott Morton, a pioneer in the field of “*decision support systems*”. I will report on this in the following. However, it also turned out that I met the then Dean of the Sloan School Abraham Siegel. He does not work in my field, but I found him as impressive as a personality that I will also report something about him.

Michael Scott Morton. If anyone knew anything at that time in the field of decision support systems, it was he. He coined the name “*decision support system*”. My goal was to acquaint him with the main features of the INZPLA-System, to get his opinion about it and to ask him if he knew of a similar system.

To do this, however, he had to be willing to have me describe the basic structure of this system. The chances of this were close to zero. Because who lets himself steal his time from a stranger who comes in without announcement and reports about some “system”? Despite all my concerns, I had even prepared to demonstrate the system to him on the computer.

Our meeting takes place in his office. He asked me just like John D.C. Little (s.p.285) what I was doing. And I told him that I deal with equation models that can be calculated ad hoc by a user and that with these models a certain planning procedure in the sense of a “*management by objectives*” can be realized. In my opinion, this would be a *decision support system* in the sense he defined it. However, this explanation did not seem to impress him very much.

But when I told him that I had reconstructed the complete numerical example of the company planning described in the book of Welsch in the form of an equation model and had thus performed a top-down planning and a sensitivity analysis, his interest suddenly aroused. He said that he appreciated the book of Welsch very much and pointed to his bookshelf behind him, where the book of Welsch was to be seen.

He said it's a pity I couldn't even show him the system with the Welsch model. I replied that this would be no problem and so the demonstration took place one day later, in which also Arnaldo Hax took part.⁹¹²

I showed them the Welsch model. Scott-Morton was impressed by the top-down calculation, which was performed with the help of an iteration procedure and required a series of computations of the entire equation model. And he was particularly impressed by the speed of the computation and expressed his surprise that an equation model with thousands of equations could be calculated so quickly.⁹¹³

The demonstration lasted about one and a half hours. It was the only time, within the en-

⁹¹² Arnaldo Hax was Professor of Operations Management at MIT and also worked in the field of computer-aided planning and modeling. This is also shown by his publications such as: *A Computer Based Operations Management System, On the Design of Hierarchical Production Planning Systems, Aggregate Production Planning; Production and Inventory Control, Applied Mathematical Programming*. He was an expert in the field of aggregation of models within hierarchical systems, a topic that interested me very much in my affinity for hierarchical systems (see page 155). We also met several times in Berlin and are still in Email contact.

⁹¹³ The current number of calculations was displayed on the screen. For the speed of a calculation, see page 628.

the history of the Integrated Target Commitment Planning, which I presented the INZPLA-System to colleagues at their own request and it was also the only time that I presented the INZPLA-System to colleagues at all.

In the discussion about the system, it became clear that both were not without reason professors at MIT. They asked such differentiated and in-depth questions about the structure and semantics of the "*management by objectives model*" as well as the planning procedures used and the problems of program development as nobody asked me before and after. They were really interested. It was a pleasure to talk with them.

Then I asked Michael Scott Morton if he knew as the "Decision Support Pope", a similar approach. He denied this and assured me that if someone in the USA were working on something similar, then he would know it. Michael Scott Morton wrote to me in May 2018, after he had received a version of my "History..." from me (with partly English text): *"I do indeed remember you, as you were one of the very few people in the world that we're beginning to apply DSS concepts to real world manufacturing problems. It was the creation of clever algorithms that these problems amenable to effective solutions — congratulations to you."*⁹¹⁴

Abraham Siegel was Dean of Sloan School at MIT from 1981 to 1987. We did not have the slightest professional contact. He dealt with industrial relations, as well as negotiation and organizational studies. However, as is sometimes the case, already at the first meeting one develops sympathies for each other, which can then lead to a longer friendly relationship. That was mainly because we had a good conversation. He had lived through the Second World War as a young man. For example, we talked about the Nazi era and post-war Germany on its way to democracy. That interested him. He was a very well educated man and also spoke some German.

We met several times in Boston and Berlin and always had stimulating discussions. I was invited to his home with Arnolfo Hax and met his wife, Lillian. Once Dietger Hahn was also present when we spent an entertaining evening together in Boston at an excellent evening meal. I showed him also around Berlin.

It is difficult to report about stimulating conversations. Already during the description of my conversations with Karl Deutsch (s.p.536), I had problems here. The serenity of a conversation is difficult to convey, but this is even truer of conveying the course of more serious conversations. I will only report two conversations that were part of our more harmless conversations.

When we talked about John F. Kennedy and also about his extra-professional activities, he told me that sex activists like Kennedy would be called "womanizers" in English, and he finds this word wonderful.

He asked me if there was a similarly apt word in German. I told him that I did not know such a word, but the word "womanizer" is also used as an anglicism in German.

I added further, as in the case of "*womanizer*", there would be a whole series of words in

⁹¹⁴ With an email from 17.5.2018, he allowed me to quote this text literally.

English that could not appropriately translated into German and that are so apt that they simply had been adopted as an anglicism. In my opinion, the words "bottom- up planning" and "top-down planning", which are central terms in the concept of the Integrated Target Commitment Planning, can only be adequately described in German by "Bottom-up-Planung" and "Top-down-Planung". And the wonderful word "*name dropper*" is also untranslatable.

In this context, I told him that in German there was no adjective to express that one had drunken enough and that his thirst is now quenched. One can say: "Ich bin hungrig" (*I am hungry*) and after hunger has been satisfied, this can be described with the sentence "Ich bin satt". (*I am sated*). But the situation is different when it comes to drinking. You can say, "Ich bin durstig" (*I am thirsty*). However, after your thirst is quenched, you cannot express it with a sentence of the form; "Ich bin XX", (*I am XX*) where XX is an adjective that provides the information "My thirst is quenched". There is no such adjective in German. There have been lengthy discussions in the feuilleton of a German newspaper whether an adequate adjective could be found. But it was not possible to find one.

I said to him; it is known that the English language has a much larger vocabulary than the German. Therefore, has the English language an adequate adjective for this?

He said "*I am full*" is only used for "full with food" and not with liquid and it is also a bit vulgar. After some time of reflection, he said that there was probably also no such word for it in English as in German.

Such considerations may be regarded as "over-sophisticated". However, I am not only interested in "equation languages" but also in natural languages. And it was very inspiring for me (and probably also for him) to talk to someone who is also interested in such topics.

Another story is even more personal. Abraham Siegel told me he had grandchildren. Thereupon I presented him with the "Hendrik Book". This book has a pre-history.

When our son Hendrik was six years old and attended the first class, he fell out of an oak tree while climbing around the beds with his friend Roland. The fall split the ball in the elbow joint of his left arm into individual segments. In the hospital, these segments of the elbow ball were drilled and provided with pins, which, in turn, were connected with wires that led to weights via a roller system. The segments of the elbow ball were held in such a position by the pull ropes that they could grow together again correctly. Hendrik looked particularly merciful at the beginning. Because he was not allowed to move a millimeter, even his head was clamped in a kind of cage.

Just at this time, a female photographer roamed through the children's department of the Steglitz Clinic to find a child who was to become the main actor in the illustrated story of a children's book entitled "*I am in hospital now*". In Hendrik, she found the right victim. The entire course of the disease, the life in the hospital and also the return to home were described in a fictional story. The book became a bestseller. It was published in several large editions, was translated into several languages and excerpts of the pictures were photographed in schoolbooks.⁹¹⁵

⁹¹⁵ Becker, A., Niggemeyer, E., *Ich bin jetzt im Krankenhaus, (I am in hospital now)*, Ravensburg, 1972

I donated this book to Abraham Siegel for his grandchildren and, as he told me, he read it to them (or recounted it). They were so enthusiastic that they really wanted to see Hendrik. This would have been possible in principle but would have led to disappointment. For Hendrik was at that time twenty-five years old.

****Hendrik was often asked about his arm by strange children afterward. And after addressing him on the beach promenade in Travemünde on the same day twice behind each other and asking: "*Hendrik, what does your arm do*", he said to me, "*Dad, I think I'm a really famed kid.*" Then I said to him, "*This is not important at all. All that matters is that your arm recovers completely.*" However, there is also a pleasant after-effect: Priv.-Doz. Dr. Carsten Schmidt was appointed chief physician of the Medical Clinic II of the Fulda Clinic on July 12, 2017. On his inauguration, he gave a speech on "*his motivation to study human medicine. According to Schmidt, the reading 'Ich bin jetzt im Krankenhaus' (I am in hospital now) from Becker/Niggemeyer was decisive for this.*"⁹¹⁶

Hendrik also wanted to become a physician, motivated by his own story "*I am in hospital now*". However, it went a little differently than with Carsten Schmidt. When he wanted to apply for a study place in medicine after graduating from high school, I said to him, "*Before you start studying medicine, it's best to get clinical work experience in a hospital to see how things are there in everyday life.*" He thought this suggestion was reasonable. However, he probably thought of being able to watch interesting operations and take part at the visits in the wake of the chief physician.

But only one famulus position was found in a geriatric department with senile dementia patients. Shortly after he started working, a confused patient went through the sickrooms and collected all the prostheses that had been placed on the patients' bedside tables. Hendrik's task was with much effort and patience to adapt this prosthesis to its wearer in a trial and error process. Although these and other activities on this ward were certainly not a representative sample of what a doctor in a hospital would expect, he told us at the end of the four weeks that it would probably be better if he studied law. And that's what he did.****

The story with the Egghead.

At the beginning of the meeting with Abraham Siegel, we had dinner with his associate dean Alvin Silk in a restaurant. After we had a lively chat and had eaten an "elk steak" (a specialty of the house), Abraham Siegel offered to address us by the first name.⁹¹⁷ I agreed, of course, and he said to me, "*Call me Ab*". Alvin Silk smiled friendly at me and followed Ab Siegel by saying "*call me Al*". Continuing the ritual of abbreviation, I said "*Call me Eck...*". While I was already pronouncing it, it occurred to me that Eck (sounding like "egg") was probably a somewhat unfortunate abbreviation and with a noticeable time delay I added the syllable "art". Both of them looked at me a little irritated, so I said "*Eckart*" clearly and with no delay. And Ab Siegel repeated friendly smiling, "*Oh yes -*

See the picture www.Inzpla.de/Hendr-Krhs.pdf. Hendrik 49 years later with me on the occasion of my 80-year birthday cycle tour on the Elbe cycle track. www.Inzpla.de/Radtour.pdf

⁹¹⁶ <https://www.fuldainfo.de/priv-doz-dr-schmidt-tritt-nachfolge-von-jaspersen-an>. (30.7.2017).

⁹¹⁷ Alvin Silk confirmed to me in an email from 17.5.2018 that he can remember the "elk steak" as well.

Eckart". My sons, however, said when I told them this, "*The name fits perfectly to you, you are an egghead, and you also have an egghead*". If children are so disrespectful, then something went wrong with the upbringing.

Academic teachers. With regard to the discussions with experts in my area of research, the question arises as to what suggestions I have received from the discussions with my academic mentors or teachers. I'm afraid I can't serve with that. Unlike many other colleagues, I have never been led by a mentor or teacher to my current field of expertise. Although I was employed as a research assistant in an industrial management department, my supervisor, a chartered accountant by nature, distinguished himself almost exclusively through absence and let his employees largely do what they wanted, and this was very convenient for me.

I got only a position as an assistant professor because these positions were offered in abundance by a special program of the government at that time and the established professors of the faculty did not find enough interested applicants among their employees. I have overcome the hurdle of my habilitation because Peter Hammann, with whose chair for marketing I had nothing more to do, stood up for me. He was only 32 years old (I was 31) when he received the call to the TU Berlin, and we were immediately united not only by personal sympathy and private contacts but also by the joy of quantitative analysis. Apart from the rapporteurs, my habilitation thesis was reviewed only by Friedrich Rapp. He was the only one to discuss it with me in great detail. However, he was no business economist but a physicist and professor of philosophy and a profound expert in the theory of science.

Unfortunately, I did not meet anyone at my faculty who dealt with the application of equation systems in economics and told me, "Do that, that's an interesting subject".

The interest in equations was as mentioned awakened by my physics teacher in my school days (s.p.621) and I entered this field at the university on one's own. The result was a comprehensive monograph on dynamic models and their application in the economic and social sciences.⁹¹⁸ I have remained true to this topic, the modeling of systems on the basis of equations, with a restriction to company models, until today.

A little trenchant, you could put it that way: Almost all management accounting specialists have reached their research field through their academic teachers. My way led me about working with computer-based equation models to the field of management accounting (or more precisely to the field of computer-based operational company planning and control.

I also acquired my knowledge of electronic data processing without being encouraged by an academic teacher. Already as a student, I earned myself an additional job as a system analyst at IBM during the semester break with the development of programs on the then high-tech computer 1401 with punch cards and 8 K bytes (8,192 bytes) of RAM. It was programmed in the assembler language Autocoder.

⁹¹⁸ Zwicker, E., *Simulation und Analyse dynamischer Systeme in den Wirtschafts- und Sozialwissenschaften*, Berlin 1981 (618 pages). (*Simulation and Analysis of dynamic Systems in economic and social Sciences.*)

Afterward I spent a lot of time as an assistant with a scholarship at the German Computer Center in Darmstadt developing a program system for generating simulation models. It was the only place in Germany where this was possible at that time (for university members). Day and night one typed his programs into punch cards, put the pile of punch cards fixed with a wide rubber band into a drawer, which was accepted by an operator on the other side of a glass wall, where the computer was located.

Afterward one waited longingly with other "programmer colleagues" (all university assistants) at worktables in a room directly in front of the drawer for a printout in order to be able to continue. Sometimes it took an hour or two to get such an expression back. After that, I always programmed (s.p.509) because I enjoyed it and met my need for precision. My research projects (and participation in research priority projects), which were approved by the DFG (German Research Foundation), ran through the areas of business informatics, although the topics always concerned areas of management accounting or the analysis of equation models.

At the DFG meetings of the research priority groups associated with overnight stays, I got to know many of the "first generation" of business information scientists such as Hans Robert Hansen, Peter Mertens, Ludwig Nastansky, Dieter Pressmar, August Wilhelm Scheer and Otto Rosenberg as a hiker between the subjects of production and business information technology. I am still friends with some of them, and I still maintain friendly relationships with the others.

My reflections on the analysis and use of models are strongly influenced by science theory. One book that impressed me very much was **Wolfgang Stegmüller's** four-volume work *"Probleme und Ergebnisse der Wissenschaftstheorie und Analytischen Philosophie"*. It provides an excellent overview of analytical philosophy (or philosophy of science). It is so well and clearly written that one can spare oneself the reading of the original contributions. Stegmüller's reflections and analyses are an eloquent example of the sentence: "Improving expression means improving thought."⁹¹⁹

I have had many conversations with science theorists. Among them was especially **Hans Poser** with whom I conducted as mentioned (s.p.410) a seminar on mathematical decision theory and the concept of rationality.⁹²⁰

Carl Hempel.

As chance would have it: Carl Hempel, alongside Karl Popper the founder of the Analytical Philosophy or Philosophy of Science, accepted an invitation from the Wissenschaftskolleg Berlin (Institute for Advanced Study) and came to Berlin for one year in 1983. He had time, and I had stimulating conversations with him. I made him aware, for example, that the "final equations" (autoregressively reduced equations) in (dynamic) difference equation models thus termed by Tinbergen correspond exactly to his postulat-

⁹¹⁹ See also the influence of Stegmüller on my style of argumentation. p. 589.

⁹²⁰ Hans Poser (now emeritus) was a mathematician and professor of philosophy at the TU Berlin and temporary chairman of the German Society for Philosophy.

ed construct of the "minimal covering law" of a scientific explanation, a central concept for his theory of scientific explanation.

Since Carl Hempel had intensively dealt with the topics of conceptualization and definition, I drew his attention to a special kind of circular definition equations, which I thought having discovered in cost-performance models.⁹²¹ Circular definitions are definitions which are not permitted by the definition theory since such a definitions contain in its defining part the term to be defined. It is obvious that there is no sense to trace a term back to itself in its definition.⁹²² I now asked Carl Hempel whether he was aware of cases which are characterized by the fact that the original circular definition of a term could (without additional information) be transformed into a non-circular definition and thus into a correct definition of the same term. He denied this question and also looked at me quite astonished, whether such a strange question.

Since I thought I had aroused his interest, I continued that such cases could occur in cost-performance models. They would apply to the definition equations of the transfer prices of cost centers that settle interdependently with each other.

Since he seemed to be further interested, I described such a case to him using a simple example. This example showed that the cost center "electricity generation" charges the other cost centers a cost price, for the delivering of its electricity. And this cost price called transfer price (TP_{EG}) is under circumstances described by a definition equation ($TP_{EG} = \dots$) which contains as a definition component the electricity transfer price (TP_{EG}) to be determined by it.

However, the formulation of such a circular definition is not absurd, but advisable from the companies' point of view. That is the case if, for example, the electricity generation center in a company requires cooling water and has to pay a price for this to the water generation center. And on the other side, the water generation center in this company requires electricity and has to pay a price for this to the electricity generation center. The determination (definition) of both (transfer) prices shows that they depend on each other. The definition equation of the electricity transfer price (TP_{EG}) must include in its definition part a component of the water consumption costs of the electricity generation, which results from the product of the water consumption quantity of electricity generation (CQ_{WA-EG}) multiplied by the transfer price of the water generation center (TP_{WA}), i.e., $CQ_{WA-EG} \cdot TP_{WA}$. It, therefore, applies: ⁹²³

$$TP_{EG} = F_1 (CQ_{WA-EG} \cdot TP_{WA}). \quad (158)$$

However, in order to calculate its transfer price for the water supply (TP_{WS}) the water generation center requires the electricity costs incurred as a product of its electricity con-

⁹²¹ See Hempel's work on definitions and terms: Hempel, C. G., *Fundamentals of Concept Formation in Empirical Science*, Chicago 1952.

⁹²² See also my reference to a lecture on definitions in economics held by me (p. 519) and the lecture notes which can be accessed there.

⁹²³ $F_i(\dots)$ is defined as a function of (...).

sumption quantity CQ_{EG-WA} multiplied by the transfer price of the electricity generation center (TP_{EG}), i.e., $CQ_{EG-WA} \cdot TP_{EG}$.

It, therefore, applies:⁹²⁴

$$TP_{WA} = F_2 (CQ_{EG-WA} \cdot TP_{EG}) \quad (159)$$

The definition equations (158) and (159), therefore, form a circular definition equation system or a system of circular definitions.⁹²⁵ If one inserts equation (159) in (158) then the typical form of a circular definition is obtained for the electricity transfer price (TP_{EG}).

$$TP_{EG} = F_1(CQ_{WA-EG} \cdot [F_2(CQ_{EG-WA} \cdot TP_{EG})]) \quad (160)$$

However, the "meaningful circular definition" of the electricity transfer price (TP_{EG}) following from this derivation can also, and this is the special thing about it, be transformed into a non-circular definition equation of the electricity transfer price (TP_{EG}), which makes it possible to calculate a value of this variable as a variable of the cost-performance model that makes sense in substance. All you need to do is to solve the (always linear) equation of the circular definition equation according to the electricity transfer price (TP_{EG}). The resulting (non-circular) definition equation of the electricity transfer price (TP_{EG}) can then be further used in the cost-performance model to determine the cost of the electricity transfer. And this value of the electricity transfer price is correct in assessing the circumstances.

Carl Hempel was quite surprised by this description but considered my argumentation to be conclusive and said that so far he was not aware of any similar case of such a "correctly transformable" circular definition. I even had the impression that he was extremely surprised by the result.

That is why I have described the derivation and solution of the circular definition in more detail here.

Thus, the cost and performance accounting with its interdependent settlement between cost centers has contributed in expanding the knowledge about the admissibility or non-admissibility of circular definitions.⁹²⁶

As a respectful reader and also a somewhat familiar with Herbert Simon's writings, I

⁹²⁴ In all such cases, these are always linear equations in which the terms " $CQ_{WA-PG} \cdot TP_{WA}$ " and " $CQ_{PG-WA} \cdot TP_{WA}$ " are additive definition components. For a systematic treatment of such a calculation between the water and electricity generation, see: Zwicker, E., *Simultaneous and recursive Planning Models: Structure, Semantics and Application*, Berlin 2003, p. 5f., www.Inzpla.de/IN25-2003c.pdf. (Text in German, title translated).

⁹²⁵ In the case of ThyssenKrupp Steel's planning model, which is discussed elsewhere, it is a circular system of 100,058 definition equations, which not only contains transfer prices but also intermediate values such as consumption quantities and costs. See page 627.

⁹²⁶ Many econometric models also contain simultaneous equations. One could think that these are also circular definitional equations. But that is not the case. Rather, they are simultaneous systems of hypothesis equations in which definition equations can also occur. But there are no "pure" simultaneous systems of definition equations. For this type of simultaneous equations, see: Zwicker, E., *Simultaneous and recursive Planning Models: Structure*, op. cit., p. 11, www.Inzpla.de/IN25-2003c.pdf. (Text in German, title translated).

drew Carl Hempel's attention to an article in which Simon argued that the entire "*logic of imperatives*" (or even the entire normative logic) could be replaced by the decision theory.⁹²⁷ More precisely, his thesis was that a logic of normative behavior could entirely be represented by using the declarative logic combined with certain conversion rules which are delivered by the decision theory. A special normative logic, in particular a "*logic of imperatives*", or "*logic of actions*", as developed by various authors would not be necessary for this.

Simon has dealt in the context of his theory of "*bounded rationality*" extensively with the field of possible forms of a normative logic. It is obvious that I was very interested in his reflections especially with regard to the "normative logic" of the Integrated Target Commitment Planning. Carl Hempel did not fully agree with Simon's argumentation, but we discussed it in detail. And it's easy to imagine that I was representing Simon's point of view.

I also discussed with him a critical article I had already published on the status of an empirically based business administration and the functions of business administration as a scientific discipline.⁹²⁸

Carl Hempel was exactly what Karl Popper demands of a rationalist when he said: "*a rationalist, even if he thinks he is intellectually superior to others, should reject all claims to authority*". An impressive person from whom one could learn a lot.

Karl Deutsch

Karl Deutsch was Professor of Political Science at the Harvard University. After retiring in 1977, he moved from Harvard to the Science Center in Berlin, where, until 1987, he headed a larger research group dedicated to developing a model of world development. The reverberation of Meadows world model had led various research groups (e.g., around Eduard Pestel) to attempt to develop forecasting models of the world that were more disaggregated than the Meadows model.

At the beginning of the research project, in 1977, a number of experts (or those who were considered to be experts) were invited to an information event. I also received an invitation without knowing who had arranged it.

It was a gathering of renowned German economists and social and political scientists. So I remember Niklas Luhmann, Erwin Scheuch, Richard Löwenthal, and Rainer Mackensen. Karl Deutsch and his staff presented the project and the invited elite praised in high tones how interesting and promising the development of such a differentiated world model would be.

Everyone has a "big performance" once in his life, however, insignificant he may be in the eyes of others. My "big performance" took place here, although no one applauded, but the opposite, namely a big silence, was the result.

⁹²⁷ Simon, H.A. *The Logic of heuristic Decision Making*, in: *The Logic of Decision and Action*, Rescher, N. (Ed.), Pittsburgh 1966, p. 1-20.

⁹²⁸ Zwicker, E., *Grenzen und Möglichkeiten einer empirisch fundierten Betriebswirtschaftslehre. (Limits and Possibilities of an empirically founded Business Economics)*, op. cit., p. 266f.
www.lnzpla.de/Grenzen-BWL.pdf.

Shortly before the end of the event, I called in and started talking about my research on the Meadows model. I pointed to the absurd results of the sensitivity analysis and the retrodiction of the Meadows model and described the curve-fitting procedure I have developed, with which any "desirable given" forecast process of such models can be achieved by slightly changing some model parameters.⁹²⁹ My tone was quite provocative because I could be sure that none of the participants could contradict anything substantial.⁹³⁰ However, more importantly, I was firmly convinced of what I said.

My large-scale attack on the world models culminated in the assertion: *"Give me a forecast model of world development, and I promise you that by slightly changing a few model parameters I can bring about any forecast course that you desire"*.⁹³¹

After a caesura followed the conclusion that with the development of such models the high water mark of scientific nonsense was exceeded and, to put it simply, such a project is only a waste of state funds. One should ask *"the 0-1 question"* for the project presented here.

My contribution struck in (at least that was my impression) like a bomb. After that, there was total silence. Nobody said anything and after some time of silence, the presentation of the new world model to be developed continued as if I had said nothing at all.

I had seen Karl Deutsch for the first time at this meeting, and I was sure it would be the last time. However, things turned out differently. Although the project had long since been concluded and the funds were already available, my appearance had obviously worried him somewhat. To my surprise, I received an invitation from the Secretary General of the Foundation, Helmut Meier, who had introduced himself to me immediately after the end of the event, to a dinner with our wives in Meier's private flat.

This was the beginning of a long exchange of ideas with Karl Deutsch. To anticipate it: Karl Deutsch was an impressive personality with a profound education and a wealth of knowledge, coupled with a restrainedly kind manner. We met at regular intervals during all the time he spent in Berlin.

In the beginning, the problems of the development of dynamic forecasting models were still in the foreground. Stewart Bremer's development team first intended to reconstruct the Meadows world model, which was formulated in DYNAMO, "for exercise" in the FORTRAN programming language. There were problems with the determination of the initial values, and I showed them how to "get it done".⁹³² Apart from such "little things", however, no intensive technical exchange of ideas took place.

⁹²⁹ See page 19.

⁹³⁰ Stewart Bremer, the head of the development project, was the only one of those present who had probably already developed a model, but he only spoke English.

⁹³¹ It was admittedly polemical, but I still believe that the claim is principally correct. Of course, I do not believe that it is possible to reconstruct "any" given time course with the described "curve fitting procedure" (see page 19). However, it should very often be possible to generate a time course by small combined value changes of the uncontrollable (environmental) model parameters, which largely reflects one's own desires about a "desirable course" for whatever reasons. Since today's much-noticed climate forecasting models also work with dynamic (difference equation) models, the same should apply to them.

⁹³² The initial values of level variables are specified in DYNAMO, which sounds a bit strange, not only by the entry of numerical values but also by so called initial equations. This can lead to problems.

There was apparently no need for the development team to use my curve fitting procedure to falsify insensitivity claims or my retrodiction procedure for backward forecasting. In view of the ten years that Karl Deutsch spent in Berlin, pure technical discussions on modeling and systems analysis only played a minor role.

Karl Deutsch had written a monograph entitled *"The Nerves of Government: Models of Political Communication and Control"*.⁹³³ He himself regarded this work as the peak of his scientific achievement. It is based on a "great analogy". In this work, Karl Deutsch tried to use terms such as control loop, positive and negative feedback, control variable, etc. for the descriptive analysis and normative design of political processes.

As you can see from my remarks on Küpper's control loop interpretation of control systems in companies, I am quite skeptical about such analogy applications (s.p.108). It is often the case that only a new sophisticated sounding terminology is used that awakens expectations that cannot be met. However, despite these concerns, I liked Karl Deutsch's work very much, because political processes are described and analyzed here in a completely different way.

Karl Deutsch was, as it is obvious from his book, very much concerned with the subject of *"analogies"* and *"analogous reasoning"*. This is a dangerous and at the same time also fascinating field. Attractive images and metaphors are also a form of analogy. Good metaphors are worth their weight in gold and finding them is a creative achievement

I talked extensively with Karl Deutsch about metaphors, and we agreed that the level of a conversation depends very much on the pictoriality of the language. Goethe's language is so fascinating because it is so rich in pictures. You only have to read his *"Faust"*. Here you can find one picture after the other, and many of them are now common property of the German-language treasure.

Another topic I discussed with Karl Deutsch was the question of the "adequate aggregation" of a model. In my opinion, the art of developing a good model is to choose an "adequate level of aggregation". However, what criteria are used to determine this level?

The required aggregation level is precisely determined in an Integrated Target Commitment Planning model. The model must have such an aggregation level that its parameters can be interpreted in the sense of the Integrated Target Commitment Planning, i.e., as basic targets, uncontrollable basic parameters, etc. If such a disaggregation does not succeed, you cannot carry out an Integrated Target Commitment Planning. However, if you want to develop a "normal" forecasting model, you cannot apply this criterion. At that time Karl Deutsch was concerned with the question of what level of aggregation the world model he planned, called GLOBUS, should have.

The conceptual starting point was the world model of Meadows, but his model should be much more differentiated. Today's computer technology makes it possible to develop

⁹³³ Deutsch, K. *The Nerves of Government: Models of Political Communication and Control*, New York, 1963.

models that are so disaggregated that (to exaggerate somewhat) the behavior of every inhabitant of this world could be described by a special behavioral equation. Of course, such an approach is completely absurd, both in terms of time and in terms of knowledge. However, which aggregation level should be chosen for the behavioral equations that describe the behavior of certain groups of people?

In my opinion, Popper's postulate applies here. It does not matter how you get a hypothesis. It can occur to you in your sleep or by looking at a crystal ball. The decisive point is that it can be falsified (by observation). If it is falsified, it must disappear from the scientific debate. If it proves itself on the basis of forecasts, then it will continue to be used. The right choice of the aggregation level, therefore, ultimately depends on the success of a forecast.

However, the question arises, whether there are procedures that make it easier to find "reliable hypotheses". This is the great field of the development of so-called inductive procedures. Such procedures are fully acceptable. However, since these are heuristics, their results can only be judged by their success. Forrester's feedback heuristic and his level-rate modeling are examples of such a model development heuristics (s.p.12). This also includes the assumption of an order quantity-price relationships to model the relationships between different reference objects in a cost-performance model of the Integrated Target Commitment Planning (s.p.24). And the so-called "Little's permission", i.e., the permission to develop empirically verifiable hypotheses using intermediate hypotheses with non-observation variables is also a heuristic concept for developing "*managerial models*" (s.p.240).

Karl Deutsch had an idea how one should to develop forecasting models. It should be a method for the development of models, with which at the same time the complexity of a model already developed could be reduced. In his opinion the first step of such a procedure should be to formulate a "*provisional model*". Then, with the help of a sensitivity analysis, the variables of this model should be determined, which are not "*main variables*". Once they've been identified the explanatory equations of these non-main variables should be deleted from the model. Non-main variables of the *provisional model* are according to Karl Deutsch those whose deletion has only a minor influence on the time development of the *relevant variables* of the model. *Relevant variables* of the model are variables, such as the world population in Meadows world model, whose time course is to be determined in any case.

He asked me what I thought about that. My answer was that I would consider such a model development heuristic to be rather complicated and not very promising. I explained this as follows:

If one finds certain equations in a "*provisional model*" which have parameters whose variation does not have a strong influence on the course of the "*relevant variables*" (or target variables) such as the world population, then one cannot simply delete these equations. For very often, their explained variables form the links of a complex network of feedback relationships in the form of equations that contain parameters exerting a not inconsidera-

ble influence on the “*relevant variables*”. Therefore, a variable whose equation should be deleted has an influence on the *relevant variables* (target variables) which is determined by all parameters of the equations in the whole feedback network.

With such an approach to delete the non-main variables of a preliminary model, two cases can be distinguished. The first case would be if a submodel X of the *provisional model* could be found, which contains none of the *relevant variables*. Additionally it must be a unilateral submodel, i.e., certain endogenous variables of this submodel X influence the residual model (as input variables), but the submodel X is not influenced by endogenous variables of the residual model. Such an isolated submodel, however, is unlikely to be found often.

In Meadows' world model, for example, all endogenous variables lie in one feedback loop. In large models with several hundred thousand equations, however, the identification of such an unilateral submodel cannot be arrived by a "sharp look". Such a submodel can in many cases only be determined by using a structure matrix of the *provisional model* and certain algorithms of graph theory to identify it.

If this submodel is removed, its original endogenous variables which are input variables of the residual model must be replaced by exogenous variables for which the values of the time path for the forecasting interval must be determined. In this case, no sensitivity analysis is required.

However, if you assume that the sensitivity of the parameters in the submodel should be considered in respect to your removal decision, then you can practice a stochastic simulation with the submodel. Each simulation run should work with parameters of the submodel, which are stochastically selected from a "plausible variation range" of these parameters. This variation range you have to determine. The goal of the simulation is to determine the resulting variation range of the time course of the *relevant variables* (target variables).

If the fluctuation range of the time course is “small”, then the endogenous variables that are entering the residual model (the output variables of the submodel) are converted into exogenous variables. The time course of these variables is to be specified exogenously. It should equal the mean value of the variation range of the endogenous input variables in this period, which resulted from the stochastic simulation.

In the second case, it is assumed that the submodel you have to identify possess as in the first case output variables into the residual model but also input variables from the residual model. Therefore, certain feedback circles can run over certain variables of the submodel, whose influence in turn (via certain input variables) leads to the residual model. As in the first case, the *relevant variables* (target variables) must not be contained in the submodel in question, because its variables should (possibly) be deleted.

However, according to which criterion should such a submodel with input and output variables in the residual model should be determined?

One possibility would be to determine a submodel that has as few input variables as possible in order to keep the number of possible feedback relationships that run across the

submodel small. However, one can also try to find submodels with a small number of output variables. You should generate a number of such submodels by structural analysis, perhaps a hundred at first. However, this is only the beginning.

Because then the sensitivity of the removed submodels must be checked with regard to the *relevant variables* (target variables). For this purpose, for example, 10,000 stochastic samples, are taken for all parameters of the *provisional model* within their assumed variation ranges. With these simulations, the variation range of the input variables of the submodel into the residual model is determined for the forecast period. The same also applies to the variation range of the forecast course of the *relevant variables* (target variables) in the residual model. As in the first case, the mean values of the fluctuation range provides the time course of the input variables, which must be specified (as exogenous variables) in the residual model.

Under these conditions, the *provisional model* is simulated with the same 10,000 stochastic samples of the model parameters that are still present in the residual model, and one looks at the variation range of the forecast course of the *relevant variables*. If there is no "major difference" between the ranges of variation of the course of the *relevant variables* determined from both simulations, the submodel can be removed.

However, the whole procedure is quite "fuzzy", because such criteria such as "plausible range of parameter variation" or "major difference between the ranges of the relevant variables" are not very clear.

I pointed out to Karl Deutsch that I would not go this way. But if he wanted to practice such a procedure to reduce the complexity of his *provisional model*, which seemed to be very extensive, then he could proceed as I described it. That would at least be a concretization of the procedure he aspired to use. But, how the "forecast quality" of the *relevant variables* changes in the process is completely open.

I offered Karl Deutsch to investigate his model using a method of structural analysis developed by us. With a computer-based procedure, it would be possible to find potential deletable sub-models with a preset number of input and output variables. This procedure of structural analyze also allows determining the "minimal traceability structure" of a model. A structural matrix of a model with such a "minimal traceability structure" corresponds to the influence diagram of this model in which the number of arrow lines pointing in the "traceability direction" of a feedback circle is minimized. This allows the "feedback structure" of a model to be assessed quite well because deleting this minimum number of traceability relations would result in a model without feedback relationship.⁹³⁴ He listened to it all without comment.

A few years later (1980), Karl Deutsch and Bruno Fritsch published a book entitled,⁹³⁵

⁹³⁴ The example of such a "trace-minimal structure matrix" can be found in the text quoted below. The minimum traceability structure matrix cited in this text was developed for a planning model of the "Industrial Chemicals" division of the Schering AG. See, Zwicker, E., *Simultaneous and recursive Planning Models: Structure, Semantics and Application*, Berlin 2003, p. 18, www.Inzpla.de/IN25-2003c.pdf. (Text in German, title translated).

⁹³⁵ The title in the text is a translation of the German-language book: Deutsch, K.W., Fritsch, B., *Zur*

“On the theory of simplification: reduction of complexity in data processing for world models.” In this work he propagates (with Fritsch) his model development heuristics, which he had presented in the context of the conversation mentioned above:

One should start from certain *"operationally defined variables"* which one thinks should be present in the model to be developed. These *"selected variables are combined to form a provisional system model"*. *"The first approaches to such a provisional model often come from intuition..."*. This *"provisional model"* is *"to be subjected to a sensitivity analysis. Such an analysis then selects from the larger set of variables...only those few variables whose moderate changes have the greatest influence on the time behavior of the relevant variables of this model"* (p.49). Such an investigation leads to the *"main variables"* of the model *"identified by a sensitivity analysis"*. It leads to the *"exclusion of all those variables which were not highlighted by a sensitivity analysis as main variables of the model"* (p.53).

In addition to these relatively general suggestions on how to proceed, Deutsch and Fritsch did not elaborate further in which way a *"sensitivity analysis"* should be carried out to determine these *"main variables"* of the *"provisional model"*. I do not know whether Karl Deutsch used such a sensitivity analysis to determine the *"main variables"* which would be the final endogenous variables of his GLOBUS model in the way I suggested. The procedure I have described is also a kind of *sensitivity analysis*. This is because the sensitivity of the *relevant variables* (target variables) is determined with regard to the removal or no-removal of the submodel.

However, I still believe that such an approach might not have been very successful due to the high combined parameter sensitivity that can be observed in such models.

What Peter Gärdenfors said more than 35 years ago about the development of dynamic models is still true today. As part of a review of the construction of dynamic models, he deals in two sections with the topics *"choice of variables"* and *"choice of equations"*. In the context of his *"discussion of the choice of modeling equations"*, he considers the question whether a variable should be included in a model to be developed or not. This can be done in two ways. On the one hand, it can be described in the model by a hypothesis equation that has to be inserted into the model. However, it would also be possible to design it as an exogenous variable of the model, whose time course would then have to be specified exogenously by the model developer.

The question posed by Gärdenfors, whether the hypothesis equation of a variable in question should be included in the final model or not, corresponds exactly to the question posed by Karl Deutsch.

Theorie der Vereinfachung: Reduktion von Komplexität in der Datenverarbeitung für Weltmodelle, (On the theory of simplification: Reduction of complexity in data processing for world models) Königstein 1980. Bruno Fritsch was a professor of economics at the ETH Zurich. He was a friend of Karl Deutsch and a fellow at the Institute for Advanced Study in Berlin from 1982 to 1983. He was also very often in Berlin during the rest of his time. See page 545.

Peter Gärdenfors rightly notes that *"the choice of model equations often is the most difficult part when constructing dynamics models"* and it is not only the most difficult part but also *"the problems connected with choice of variables and choice of model equations ... are of fundamental importance for the success of the dynamic model to be constructed"*. On the basis of his considerations, he arrives at a conclusion: *"It's hardly possible to formulate any general rules for which variables should be included as state variables or as input variables."* His statement may sound trivial, but it is fundamental and still applies today just as at that time. In my opinion, it could be aggravated by replacing the word *"hardly"* by *"not"*.

**** Moreover, Gärdenfors text can still be recommended today as a systematic overview for obtaining, building and analyzing dynamic models as well as their planning and forecasting. This is due to the fact that, in contrast to other authors, he deals with the subject of *"planning and forecasting with dynamic models"* from a predominantly scientific-theoretical and methodological point of view, but nevertheless demonstrates it using simple examples. **** 936

According to my impression, Karl Deutsch was no "model builder", but rather a kind of patron and protector, whose outstanding name secured the entire project and who was at his disposal with his wealth of knowledge. The actual project leader of the research group was Stewart Bremer, and the essential publications to this project ran under his name.⁹³⁷ In the conferences at which the model was presented and discussed, Karl Deutsch never tried to impersonate himself as the developer of the GLOBUS model. At the beginning of these meetings, he used to say, *"The model is Steward's baby"*.

Our regular meetings and discussions soon had nothing to do with the development of the GLOBUS model. Karl Deutsch proved to be an extremely educated and highly cultured man, and it was a pleasure to talk to him, and above all, it was a pleasure listening to him. He had a pointedly brilliant talent for formulating.

Soon we realized that we were both Goethe's admirers. We agreed on Goethe; he formulated many thoughts so succinctly that it is no longer possible to express them even better. And his poetry is incomparable.

It is difficult, if not impossible, to reproduce the atmosphere of a stimulating conversation. This is just one example, even if it fails. I told Karl Deutsch that I once listened to a lecture about Goethe and the lecturer mentioned that Goethe's son Karl August had traveled to Italy with Goethe's biographer "Neckermann" (instead of Eckermann). Afterward, the audience could no longer calm down with laughter.⁹³⁸

⁹³⁶ Gärdenfors, P., *Dynamic models as tools for forecasting and planning: A presentation and some methodological aspects*. In: *Theory and Decision*, 1982, 14(3), p. 237-273.

⁹³⁷ See, for example, Bremer, S. A. *The Globus Model: Computer Simulation of Worldwide Political and Economic Developments*, Boulder 1987, (940 pages)
Bremer, S. A. *The national macro-economic Framework of the GLOBUS-Model*, Berlin 1981.
Bremer, S. A. *GLOBUS-Model, Anmerkungen zur theoretischen Struktur*, Wissenschaftszentrum, Berlin 1983.

⁹³⁸ Eckermann and (N)eckermann sound almost the same in German because the "N" is voiceless. Eckermann was Goethe's most famous biographer and was his secretary for many years. Neckermann is

He told me that such mistakes caused by the brain could be distinguished between mishearing, misspeaking, misreading and miswriting.⁹³⁹

According to Karl Deutsch, Goethe already distinguished in a treatise between miswriting and mishearing and drew up a list of typical “miswriting” and “mishearing”. Goethe, however, had not differentiated between the mistakes of “misreading” and “misspeaking”.⁹⁴⁰

For “misreading” there would be a fine example of Lichtenberg in which he reported that a colleague of Classical Studies at his university always read “*Agamemnon*” if in a text the word “*angenommen*” (assumed) came up. Sigmund Freud dealt for the first time with the phenomenon of “misspeaking” in his study “On the Psychopathology of Everyday Life”. Karl Deutsch then developed interesting thoughts on the psychological roots of “misspeaking” and raised the question to what extent the assertion that it was a “Freudian slip” met the criterion of being an empirical assertion, i.e., being falsifiable.

Of course, he had dealt with this topic; otherwise, he could not have said so much about it, but his remarks were only a response to the report on *Neckermann's* or *Eckermann's* trip to Italy with Karl August. Moreover, this topic hardly belonged to his area of expertise.

By mentioning the name of “Lichtenberg”, we came to speak about Lichtenberg and his aphorisms and sentences, which made him so famous. Then it turned out that us as “book readers and book writers” had a common favorite aphorism among all his aphorisms, namely: “*If a book and a head collide, and it sounds hollow, is it always the book?*” Karl Deutsch told me that he had already translated this aphorism, which he liked so much as I did, into English and described to me on the basis of which considerations he had chosen which formulations in order to let the picture and rhythm of language take effect in the same way also in English. Unfortunately, I cannot remember the details.

The conversations with Karl Deutsch were friendly talks. He did not show the slightest hint of wanting to distinguish himself with his knowledge and his brilliant formulation skills. If he had noticed that I was not interested in a topic, he would have changed it immediately. My colleague Hans Blohm used to remark: “*A Conversation consists in not sticking to the subject*”. It was in this spirit that our discussions took place.

Therefore, we talked about many things, and it was always stimulating but also entertaining, from the rain dance of the Hopi Indians to the topic of how successfully yellow fever during the construction of the Panama Canal has been combated. I was very impressed by how Karl Deutsch dealt with such topics, the wealth of knowledge, sovereignty, and friendliness with which he discussed subjects.

He was very interested in the subject of “forecasting”. This was obvious in view of his

one of the best-known German travel companies, which also organizes trips to Italy. One of its slogans was “*Travel with Neckermann*” but not “*with Eckermann*”.

⁹³⁹ I remember it well because I was taking notes about this conversation.

⁹⁴⁰ It's true: See the text string in Google “*den Sprachgelehrten ist es längst bekannt*”. Only at that time there was no Internet. To mishear (sich verheören), to misspeak (sich versprechen), to misread (sich verlesen), to miswrite (sich verschreiben).

project. The same was true for me because the Integrated Target Commitment Planning is nothing more than a forecast in which the planner influences certain parameters (basic targets, decision parameters, and decision variables) in a targeted manner. That is why we have discussed this issue on a number of occasions.

One topic was Popper's claim (Popper's forecast reef) that all long-term social forecasts fail because the technical progress cannot be predicted (endogenously). Many pioneers of technical development provide striking examples of this by totally underestimating the technical progress of their own contribution. There are long lists of such mispredictions as from the Wright brothers (airplane), Marconi (radio), Rutherford (nuclear power), etc.

When Bruno Fritsch, a friend and colleague of Karl Deutsch, who was a fellow at the Institute for Advanced Study in Berlin at the time, gave his "presentation performance" on the topic "*Possibilities and limits of scientific forecasting*" in May 1983, there was a controversial, even fierce discussion among the audience. The question was whether it was at all appropriate to speak of "scientifically based forecasts" when forecasting the social and economic development. Shortly afterward we met and wrote together a limerick about the futility of forecasts in view of the somewhat sad situation that a "forecaster" always faces.⁹⁴¹

In our conversation about forecasts, Karl Deutsch asked me if I would know Goethe's biggest misprediction. I looked at him in astonishment but also interested and wondered what that could be. Because a contemporary prediction by Goethe, such as whether Napoleon would win the Russia campaign or not, is of no interest to anyone today. It would have been completely below Karl Deutsch's level to pass that off as an interesting question. After my amazed look, he went on. In a conversation with Eckermann, Goethe pointed out that there have been good poets before him and will be good poets after him so that his poetry will soon be forgotten. However, his theory of colors would not be forgotten, because it would last as a scientific contribution over time.⁹⁴² We agreed: It was good that things turned out differently.⁹⁴³

Karl Deutsch knew almost all important American politicians and social scientists personally. Henry Kissinger was his faculty colleague at Harvard. Karl Deutsch gave me the opportunity to meet some of the most important American researchers in the field of social sciences, such as Daniel Bell or William Kruskal, in person in Berlin and to show some of them around in Berlin.

Karl Deutsch told me that he was planning to organize an international conference in Berlin, in which their leading experts will present the progress of the social sciences of the last decades. This conference was also carried out in 1982 and ran under the ambitious title "Advances in the Social Sciences 1900 - 1980". He also invited me to this confer-

⁹⁴¹ www.Inzpla.de/Prognosen.pdf.

⁹⁴² The exact quotation can be found at: www.wissen-im-netz.info/literatur/goethe/biografie/eckermann/1829/18290219.htm. Google Catchword: "*Auf alles, was ich als Poet geleistet habe*".

⁹⁴³ For Goethe's color theory, see page 222.

ence. I was aware that I would not participate because I was one of the leading experts in the discipline. And when I studied the list of invited participants and read names such as Jan Tinbergen, Daniel Bell, Wilhelm Krelle and Gerhart Bruckmann there, I decided to act according to the principle at this illustrious event: *"Better seem to be incompetent than talk and eliminate all doubts"*.

But already after some discussions, which I followed attentively, I realized that also here only water was used for cooking. I had the impression that I was able to contribute something with my knowledge in the fields of model development and the theory of science that did not immediately turn out to be "incompetent". Therefore, I did not feel compelled and allowed myself to critically "question" some of the status quo contributions.⁹⁴⁴

Karl Deutsch celebrated his 70th birthday in Berlin. For this reason, the Wissenschaftszentrum Berlin organized a festive colloquium in November 1982, at which Richard von Weizsäcker and the former Minister of Research Heinz Riesenhuber gave the festive speeches. It was a great honor for Karl Deutsch to be appreciated so highly.⁹⁴⁵

In January 1983, the Technical University of Berlin awarded him an honorary doctorate. He already had six honorary doctorates, but this was the first of a technical university.⁹⁴⁶

Karl Deutsch is honored in the Encyclopedia of World Biography as one of the *"foremost social scientists in the post-World War II era. Few, if any, other thinkers in this field attained his level of intellectual originality, professional importance, and peer-group recognition"*.⁹⁴⁷

Superlatives always provoke contradictions. I cannot say anything about his *"professional importance"* or *"peer-group recognition"*. However, I can fully agree with the judgment about his *"intellectual originality"*.

Analogies and language

The conversation with Karl Deutsch about analogies and metaphors and other subjects took place on a high linguistic level. But that wasn't because of me but because of him. The conversations with him allowed me to admire his unique ability to express himself (in German). He was a real "language master". After I had finished writing the description of our conversations to be read here, a wealth of associations about "language" had been awakened in my head, so I decided to interrupt the wider descriptions of the encounter with impressive people in order to lose a few words about the topic "languages", but not about "equation languages", which are my actual field of work, rather about "verbal languages".

When I gave a lecture on *"Rational Reasoning in Economics and Social Sciences"* decades ago (s.p.518) I also dealt with metaphors and analogies and, in general, with the po-

⁹⁴⁴ Since the entire discussion was protocolled, everything is reread able. See: Deutsch, K.W., Markovits, A.S., Platt, J. (Ed.), *Advances in the Social Sciences, 1900-1980. What, Who, Where, How*, Cambridge Mass, 1986. See there the pages 194-196, 258-261 and 281-285.

⁹⁴⁵ See some photos of this event www.Inzpla.de/Deutsch.pdf.

⁹⁴⁶ See photos of this event www.Inzpla.de/Deutsch.pdf.

⁹⁴⁷ www.encyclopedia.com/doc/1G2-3404701751.html.

tential expression of (verbal) languages. This occupation has really awakened my interest in "verbal languages".

It is unbelievable what can be expressed with the vocabulary of a language and its rules for forming sentences. And you can express it better and worse. For me, Goethe is an example of how thoughts and maxims can be formulated in a concise way that is unsurpassable.

In order to study which nuances a language allows to express a thought, I collected over the years thirty-three divergent English translations of Mephisto's monologue "*From time to time I see the Old One...*" from the epilogue of Faust I.⁹⁴⁸

All translations differ somewhat from each other and provide an example of the fantastic possibilities of expression and nuance of a thought through linguistic variation.⁹⁴⁹

How is it possible to develop a thought, which is then translated into a linguistic form, and this linguistic translation then simply flies off one's lips in a conversation? That's a miracle. The "miracle of language" is rightly spoken of. To it counts also the miracle of language formation and still more comprehensively the miracle of knowledge formation. For knowledge formation is closely connected with language formation.

The formation of sentences that represent certain linguistic utterances and are "understood" by others must, like everything else, follow certain law-like relationships and ultimately be describable by hypotheses. How is it possible for someone to come up with an apt analogy or comparison that no one has yet come up with? Will such a creative process ever be described by a formal deterministic or stochastic model? These thoughts went through my head decades ago when I was teaching my course.

Then everything was superimposed by the time-consuming development of the concept and especially the program system of the Integrated Target Commitment Planning.⁹⁵⁰ Only the collection of the Faust translations into English continued unperturbed. But my pleasure in "language" and concise formulations was always there. It was not for nothing that I tried to formulate important thoughts and maxims and to bring them into rhyme if possible. From the "*trivialities in a tailcoat*" (s.p.507) to the endeavor to translate Goethe's uniquely formulated "limitation maxim" (s.p.554) into English as succinctly as possible. The reason of this translation was, which may sound ridiculous, that I still wanted to be involved in the formulation somehow.

After finishing my active work at the university in 2011 and thus ending the development of the INZPLA program system, I had more time for other things. Therefore it did not escape me that Douglas Hofstadter had written a book with Emmanuel Sander in 2013 entitled "*Surfaces and Essences: Analogy as the Fuel and Fire of Thinking*".

⁹⁴⁸ I also show how eight of today's relevant translation programs (e.g. Google Translate) have translated these verses from Mephisto into English. See www.Inzpla.de/Faust.pdf.

⁹⁴⁹ But also "equation languages" have their justification for the accurate representation of connections. And that is exactly what this "History..." should show.

⁹⁵⁰ See also the footnote on page 630.

Since I had read his work "*Escher Gödel Bach*" immediately after its publication (1999) and was enthusiastic about it (almost a cult book), I immediately acquired this new book from Hofstadter. With nearly 600 pages it was a little bit voluminous. But it was worth it. Hofstadter's central message is: "*I argue that the sequential process of thinking is driven at all times by unconscious analogy-making carried out simultaneously at various levels of abstraction*". The book underpins this message with vivid examples and well-founded explanations. Only afterwards did it really become clear to me how important analogies are and that they control our entire lives.

As stimulating as Hofstadter's reflections may be, he does not go into how the finding of analogies or comparisons can be "explained". What happens in the brain when an analogy is made?

In 2004 James Watson gave a lecture at the FU Berlin. Of course, I have not missed taking part at such an extraordinary event. In his speech, he also referred to the state of the development of molecular biology. He emphasized that of all the areas of molecular biology that are concerned with the functions of the human body, the least known is the way the brain functions. One would know actually as well as nothing about it. His colleague Francis Crick, with whom he had received the Nobel Prize, had worked for years on the functioning of the brain and although he had been an excellent scientist, nothing had come of it.

Watson concluded his consideration of the unexplored nature of brain processes with the following statement. If someone were to succeed in explaining the functioning of the brain in a satisfying way on a neurobiological and molecular level, then he would become (and he turned his face to a mischievous smile) "*even more famous than Watson and Crick*". He is probably right about that.

However, this should also lead to an explanation of the phenomenon of language formation, knowledge formation and thinking. In my opinion of "explaining" it should then also be possible to develop a simulation model of brain processes on the basis of the hypotheses found, with which thinking, knowledge and thus also the formation of analogies can be understood and it would also be necessary to simulate variants of these processes with different model parameters. Whether this is so desirable, I am not quite sure, despite my enthusiasm for science and especially for simulation models. The famous mathematician David Hilbert had the saying "*We must know - we will know*" affixed to his tombstone. It will surely come to pass some day, because "knowledge about the knowledge" is also part of it.

Herbert Simon

A scientist who impressed and influenced me very much is Herbert Simon. I came across his work when I "searched" literature for contributions on dynamic models and their science-theoretical interpretation and justification for my dissertation.

Simon has made significant contributions to the analysis of models, their causal interpretation, their empirical foundation and their aggregation. He was the first (long before For-

rester) who described an inventory system with a differential equation model, which he interpreted as a control loop system in order to work out the commonalities to technical control loop systems.

As reported, (s.p.473) he formulated a "*model of adaptive motivated behavior*" together with March in the form of a system of differential equations. Here, terms such as "*satisficing*" and "*level of aspiration*", which play a central role in his theory of "*bounded rationality*", are formulated by him for the first time in the form of a closed mathematical model.

He was the first to formulate the so-called safety equivalence theorem for stochastic dynamic optimizations, which makes it possible to work with optimal linear decision rules. Based on this theorem, he and other authors developed a model for minimizing production costs in a paint factory that works with these decision rules. This model is a "classic" model of multi-stage stochastic planning processes (s.p.454).

Herbert Simon has influenced me in many ways. His contributions show that the methodological and scientific-theoretical reflection of one's own approach is very important, especially when applying formal methods. In addition to the models he developed and analyzed to describe human behavior (*models of men*), he also used verbal arguments to present his theses. He worked with subtle analogies and vivid metaphors and thus used the entire spectrum of possible forms of argumentation. The way he treated cognitive science problems is exemplary to me. For this reason, I would like to go into more detail about Herbert Simon in the following. For he influenced my "scientific working style" (if you can say so) like no other.

Simon's contributions are, as already mentioned, not only of a business-related nature. He has been active in all areas of "cognitive science" and also in the theory of science with unbelievable success.⁹⁵¹ He is rightly considered one of the fathers of artificial intelligence. He dealt intensively with the axiomatization of physical theories (such as classical mechanics) and made valuable contributions to the question of the hierarchization of systems.

One question he dealt with intensively was the question of how people solve problems. So it made sense to look at the predicate logic as well, and what was the result? He has (with Newell) developed a computer program called Logic Theorist, which can discover proofs for theorems, but only "if it is lucky". With this heuristic "program of proofs", 38 of the first 52 theorems, which Bertrand Russell and Alfred Whitehead had proven in their Principia Mathematica, were proved once again and in part more elegantly. Russell wrote him that using this program could have saved him ten years of hard work. In 1975, together with Newell, he received the Turing Prize for his work in the field of artificial

⁹⁵¹ Jared L. Cohon, President of Carnegie Tech, said about Herbert Simon: "*Few if any, scientists and scholars in the world have had as great an influence as has Herb across so many fields - economics, computer science, psychology, and artificial intelligence among them.*" The decision-making behavior in companies was also an important area of his research, and this area is a part of business administration or business economics.

intelligence. It is considered as the highest award in the field of computer science and is comparable to the Nobel Prize or the Fields Medal.

Herbert Simon was one of the first to recognize the importance of the computer.⁹⁵² He was never an unreflective user of computers (*computing without theory*), but the computer alone served him to formulate and explore his theories (*the program is the theory*). And he used the computer in many ways to develop and analyze models of human behavior.

Herbert Simon has also, as already mentioned at the beginning, made considerable contributions to the mathematical methods of model analysis. Thus, he formulated (with Hawkins) a theorem, which states under which conditions input-output matrices possess a positive solution. Such a criterion is indispensable for input-output accounting. Together with Ando, he formulated another theorem, which states under which conditions one can identify submodels in (dynamic) difference equation models whose (dynamic) behavior can be analyzed "approximately" detached from the entire model.⁹⁵³ The term "subsystem analysis" is often used, but only Herbert Simon has demonstrated with Ando how (or more precisely under what conditions) such a subsystem analysis (with a submodel) is possible when describing the relationships with dynamic models.

However, despite these achievements, Simon was not a "pure mathematical economist" whose main concern was to develop mathematical methods for model analysis. He knew the limits of formal analysis very well, yes, he even warned of the excessive use of mathematics. It is only intended to make problems more transparent. He himself considered this demand. Much of his reflection is purely verbal. However, his formal and scientific theoretical background resulted in the fact that he never let himself be carried away by "verbal derailments". His explanations are always stringent and well-founded.

He also did not shy away from presenting connections in essayistic form, but his essays are excellent, and some reach the level of Max Weber's scientific essays in their sovereignty, originality, and clarity, which still represent a peak of essays in the economic and social sciences today.

Alfred Marshall, who made fundamental contributions to the theoretical building of economics, once said, "When I deal with a complex problem, I try to formalize it and analyze it in its ramifications. Once I have understood the problem at this level, I have a firm basis to speak only verbally about it."⁹⁵⁴ Herbert Simon had such a solid foundation in everything he said, and that is why many of his purely verbal treatises are not only new but always well-founded.

⁹⁵² The computer science department at Carnegie Tech was founded by him.

⁹⁵³ For a description of this theorem, see: Zwicker, E., *Simulation and Analysis of dynamic Systems ...*, op. cit., Chapter "Subsystem splitting in dynamic models" p. 369f., www.Inzpla.de/DS-399-521.pdf. (Text in German, title translated).

⁹⁵⁴ The quote is only quoted according to the sense. However, it is certainly by Marshall, for when I read this quote somewhere decades ago, I immediately thought it was an important maxim to follow, and I still hold the same view today.

Many consider dedicated confessions inappropriate today, but I can't help to say (which was already obvious) that I have a great admiration for Herbert Simon. He was and still is unique in the versatility of his research activities and the analytical sharpness with which he conducted this research.⁹⁵⁵

Although Herbert Simon received the Nobel Prize for his theory of "*bounded rationality*", he should have received it for his complete work, in which the theory of "*bounded rationality*" is certainly of great, but not the only importance. He aptly formulated the aim of his research: "*I have had two guiding principles - to work for the 'hardening' of the social sciences so that they will be better equipped with the tools they need for their difficult research tasks; and to work for close relations between natural scientists and social scientists so that they can jointly contribute their special knowledge and skills to those many complex questions of public policy that call for both kinds of wisdom*"... "⁹⁵⁶

This is a task that he has not only succeeded excellently but is also very important.⁹⁵⁷

Walter Goldberg

However, Herbert Simon is also associated with a special occurrence. As reported, I met Walter Goldberg when he invited me to a lecture on the world model of Meadows at the University of Gothenburg (s.p.20). Walter Goldberg was also director of the Institute for Management at the Wissenschaftszentrum in Berlin from 1973 to 1978, and he also lived in Berlin. Until his death, I had many personal and family contacts and stimulating conversations to him. An impressive man with a profound education. Every conversation with him was a good conversation.

Walter Goldberg told me that he had proposed Herbert Simon for the Nobel Prize and that he was also talking about it with some of the permanent members of the committee.⁹⁵⁸ I was very fond of it, and you can imagine that I reaffirmed it in saying that Herbert Simon more than deserved the award. Another supporter who confirmed Walter Goldberg's view was Wolfgang Müller. He was at that time a fellow at the Science Center like Walter Goldberg at the Institute of Management. He knew Herbert Simon well from a stay at the Carnegie Institute of Technology in Pittsburgh and had published a working paper with him.⁹⁵⁹

When Herbert Simon then received the price, we congratulated Walter Goldberg on having succeeded in helping to ensure that a non-economist also received the price for the first time.⁹⁶⁰ Simon may not be a business economist (he cannot be categorized at all), but as Sune Carlson emphasized in his laudation at the award ceremony, his contribution is in

⁹⁵⁵ See also for a further appreciation of Herbert Simon in chapter 38 Praising yes - but why and whom?, on page 584.

⁹⁵⁶ Simon, H. A. *Rational Decision-Making in Business Organizations*, in: *Nobel Lecture Economic Sciences 1969-1980*, Lindbeck, A., (Ed.), New York, 1992, p. 342.

⁹⁵⁷ And with my attempts to describe companies through models and to standardize the logic of their planning, I believe, to have also contributed a little to this task.

⁹⁵⁸ See also Herbert Simon's remarks about Walter Goldberg in his memoirs, Simon, H. A., *Models of my Life*, Cambridge, Mass., 1996, p. 320.

⁹⁵⁹ Wolfgang Müller, who like Walter Goldberg was also a business economist, later became a professor of business administration at the University of Frankfurt.

⁹⁶⁰ On the occasion of the award of the Nobel Prize to Herbert Simon, Wolfgang Müller published an article in which he paid tribute to Simon's achievements. See, DIE ZEIT of 3.11.1978, p. 35.

the field of business administration, because the decision-making behavior in companies was the focus of his considerations.

Walter Goldberg, who himself was a business economist, hoped, as he told me, that the awarding of the prize to Herbert Simon would in future no longer practically exclude business administration contributions from the awarding of a Nobel Prize in economics, as has been the case to date. A few months after the award ceremony (in March 1979), Herbert Simon traveled to Berlin to visit Walter Goldberg. Unfortunately, I was confined to bed with a high fever due to an extremely violent flu. That's never how I met Herbert Simon personally.

It turned out that Walter Goldberg was interested in the development of the Integrated Target Commitment Planning, although the focus of his activities at that time was no longer in this area. At our meetings, he asked me almost always about the progress of the development without me being the first to touch on this point. We discussed various topics, which occur during the development, and I was interested to know his view about it. One point of our discussions was, for example, the linking of the Integrated Target Commitment Planning with Herbert Simon's theory of a satisficing decision maker. Here I presented him my thesis that Simon's satisfaction assertion is no longer valid as a general behavioral hypothesis if the decision maker determines a decision on the basis of a decision model using an optimization procedure. Above all, I tried to point out to him that a "satisficing behavior" in the sense of a normative procedure at the level of an operational company planning model could only be applied in the top-down step of an Integrated Target Commitment Planning and that here Simon's decision variables "mutate" into the basic targets of an Integrated Target Commitment Planning.

But he was also interested in the entire system of the Integrated Target Commitment Planning and Control and considered it being a new planning and control theory that represents a real innovation. Our discussions showed me that he was very well versed in the field of computer-aided planning and also in the simulation of models.⁹⁶¹

In addition to our other private contacts, I informed him at intervals about my thoughts and activities regarding the Integrated Target Commitment Planning. And when he left Berlin after seven years to settle in Wiesbaden, he showed further interest in the development of this system. He urged me to put this planning and control theory into practice as soon as possible in order to demonstrate its validity. That would be the real accolade. I tried my best, but it just didn't go any faster. Unfortunately, I could not tell him anything

⁹⁶¹ In recognition of Walter Goldberg's merits, Rolf Wolff notes: Walter Goldberg... "*pioneered the early Swedish attempts to teach computer science and to use computers as a tool for improving managerial decision making, the use of decision-support systems and so on in business firms and in public administration. Walter Goldberg had visionary ideas about the use of these new technologies...*". Wolff, Rolf: *Organizing Industrial Development*, Berlin 1986, p. 267. See also: Goldberg, W. (Ed.) *Computer simulation versus analytical solutions for business and economic models*, University of Gothenburg, 1973, and Goldberg, W., *Information systems and decision making*, Göteborg studies in business administration, Vol. 4. 1970.

more about the application in practice, which he advised me so urgently. He would certainly have been pleased to learn how Integrated Target Commitment Planning using a "gigamodel" was successfully implemented at ThyssenKrupp Steel.⁹⁶²

Praise or not praise of limitation

At the celebration of my colleague Dieter Pressmar's 65th birthday, August Wilhelm Scheer delivered a speech at the University of Hamburg. A large number of university teachers from the field of business informatics took part. Scheer said that in his opinion, it would be useless to constantly deal with new developments in the field of business information technology. One should deal exclusively and in the long run with one thing, and only then would something come out of it. He went on to say that in our field he only knows two people for whom this was the case, and these were Dieter Pressmar (the jubilarian) and Eckart Zwicker.⁹⁶³

If he also quoted us, he meant above all a third person (and everyone in the room knew it), namely himself. And his claim actually applies to him. He has spent most of his life developing a system for modeling the business processes of companies. For this purpose, he developed a theory that describes these processes under certain views. The description of the business processes with regard to these views then served as the basis for a normative redesign of the processes described in this way. He implemented this theory on process description with the help of a software system called ARIS. In order to spread this system, he founded a company. The ARIS system has been widely accepted in practice and is used worldwide.

I only know two application systems that have successfully implemented theories in the field of business administration with the help of computers. One is the SAP-CO system, in which elements of the flexible plan cost accounting have been applied, and the other is the ARIS system for process modeling. August Wilhelm Scheer is in the field of applied business administration the successful example of a scientist who succeeded by "limitation".

After all, he had used Dieter Pressmar and me as the "vehicle" of his message. And he was right about both of us in terms of the duration and exclusivity of work on one thing. Dieter Pressmar has spent his whole life working almost exclusively on the subject of "sequence optimization" (machine scheduling) and I, as this text shows, with model-based systems of an operational company planning and control. However, unlike August Wilhelm Scheer's ARIS system, our systems have never gone beyond a prototype.⁹⁶⁴

A limitation is obviously necessary, but is it desirable? My strong limitation to a narrow area, the years of reflection and constant circles of thoughts about the topic "development and analysis of equation models", has some pathological features. Sometimes I can't resist

⁹⁶² Walter Goldberg passed away on 10 December 2005 in Wiesbaden.

⁹⁶³ And with a view into the audience: *"Where is he sitting? Get up Eckart"*. Of course, I didn't do that, I just waved my right hand for a moment.

⁹⁶⁴ This has also led to small differences in the development of assets. While the development of these systems did not change the financial situation for Dieter Pressmar and me, August Wilhelm Scheer, as he told me, was "Euro billionaire" for two days with the shares of his company during the "stock hype".

the thought that someone who has been working so intensively on just one subject for many years, at least leads a somewhat "restricted life".

At a conference I attended recently, I met a colleague who looked at me with a somewhat pitiful smile and asked me, *"Are you still occupied with your simulation models?"* They're not only simulation models, but somehow he's right. I then quote a verse by Johann Wolfgang von Goethe for myself and hope that the limitation will at least produce what Goethe believes that it can produce:⁹⁶⁵

**Vergebens streben ungebundene Geister,
in der Beschränkung zeigt sich erst der Meister.**

At least the first verse of this rhyme seems so accurate to me that I translated the whole rhyme into English twice.

**Boundless spirits strive in vain,
A master limits his terrain.**

and

**Boundless spirits reap frustration,
A master grows by limitation.**

But then I met Horst B. At the sixty-year meeting of my primary school class at the Kalandsschule in Lübeck, my former classmate Horst B. (formerly a vocational school teacher) told me that he had specialized in astrology. He offered to create a horoscope for me. When I said, *"Ok, that's a good idea, you can send it to me by e-mail"*, and after I wrote my date of birth and my e-mail address on a piece of paper, he said, *"But I still need the hour of your birth"*. I replied, *"For that I would have to ask my mother, and she is no longer alive."* Then thereupon he replied, *"Then I can't create a horoscope for you"*. Is it also true in this case to say, *"A master grows by limitation"*? Or could one not say better for those who want to apply this rhyme to themselves:

**Limited spirits cherish the imagination
becoming masters just by limitation**

Anyway, basically, it is all very simple: I enjoy working with a system that I think all the wheels fit into one another, and I keep coming up with something new. It is a good feeling to believe that you have a clear view of an area and know it better than anyone else. One could speak of a kind of "toy train on a higher level". However, it has a serious background. Perhaps that is why the term "toy train" is misleading. This toy train should not become a fruitless glass bead game but serve a practical purpose. A coherent operational planning and control procedure for companies should be developed, which is applicable in practice and is also seen as progress in practice. This is the touchstone of the entire project.

⁹⁶⁵ A slight rewriting of the Sonnets by J.W. von Goethe: Nature and Art.

37. Critique as a way of clarifying terms and concepts

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1. Introduction

In this "History...", reference is made to the contributions of various authors with whom I have dealt during the development and application of models. It is only a selection, but an important one. The question is obvious why I have dealt so extensively with the contributions of other authors on operational planning and control in this text and also in the additional texts that can be accessed online, and why I have criticized them, from the perspective of the Integrated Target Commitment Planning.

There is a simple reason for this. The Integrated Target Commitment Planning and Control is a normative theory, which differs in a fundamental way from the existing approaches in the field of operational planning and control of companies.

Therefore, in the light of this model-based normative theory, much can be criticized which has been formulated too vaguely in the relevant literature, should have been dealt with or is considered superfluous.

It seemed to me to be useful to make such a consideration. Perhaps it could make it clear to some readers that the Integrated Target Commitment Planning is a procedure that should be dealt with.

However, the Dieter-Schneider-Syndrome initially prevented me from making this criticism. This syndrome led me to refrain from any negative criticism of the contributions of other colleagues in order not to be perceived as a second Dieter Schneider.

The development of the Dieter-Schneider-Syndrome but also its overcoming is described elsewhere (s.p.450). After this syndrome no longer exerted any influence on me, the way was open for me to criticize the relevant contributions to operational planning and control from the model-based view of the Integrated Target Commitment Planning and Control.

And who do you choose for such criticism? Of course, above all the contributions of the most renowned English and German-speaking experts in this field.

In the English-speaking area these are the texts of Robert S. Kaplan (p.184-195) and Teemu Malmi (p.195-217), in the German-speaking area the contributions of Hans-Ulrich Küpper (p.306-319) and Alfred Wagenhofer (p.414-449).

The model-based view, from which my criticism proceeds, is based primarily on the principles of the Integrated Target Commitment Planning, but also on more general model-based views, which were discussed, in my book on *"Simulation and Analysis of Dynamic Systems in the Economic and Social Sciences"*.⁹⁶⁶ The criticisms of the contributions of the four authors mentioned above, but also of some others, can be found at various places in this text. In the following, with reference to these places, it is emphasized to which insights these criticisms have led me.

In the second section *"Forms of a model-based critique"*, examples are used to show how model-based criticism can be applied to certain normative approaches. Here, an attempt is always made to reconstruct these normative approaches, which are not or only incompletely described by models, as models on the basis of which planning and control can be carried out according to the Integrated Target Commitment Planning. From such a model-based viewpoint, many approaches reveal shortcomings and deficits that would remain undiscovered in a non-model-based presentation.

In the third section *"Definition of a model-based normative theory of operational planning and control"*, we examine the question of what the relevant experts have said about such a definition. As a result, a proposal for the definition of a model-based theory of operational planning and control (operative controlling) is presented

The fourth section *"Definitions, Classifications and Hierarchies"* is chiefly dedicated to the topic of defining and classifying from a model-based view. When working with models, the question arises as to which requirements should be placed on the necessary conceptual apparatus from the view of these models. And this also applies to the definition and classification of some fundamental concepts of operational planning and control, which are also reflected in the models. Furthermore, the relationships between hierarchical classifications and hierarchies in general are analyzed. With regard to this conceptual foundation, I believe that from a model-based view, a number of shortcomings have been discovered in the current literature.

The fifth section of this chapter bears the heading: *How has the model-based criticism of other texts influenced the development of the Integrated Target Commitment Planning?* To this end, I will refer back to the contributions of the four top representatives in the area of operational controlling, i.e. Küpper, Wagenhofer, Kaplan and Malmi, who have already been discussed elsewhere, and report on the suggestions I have received from them for the development of the Integrated Target Commitment Planning.

The sixth section is entitled *"John D.C. Little – Is a fundamental criticism of an icon allowed?"*. John D.C. Little is an icon of operations research and one of MIT's most distinguished professors. His fame is mainly based on his paper on the Decision Calculus Concept. And just this essay was criticized by me (s.p.224-289) in a rather destroying manner. In this section I will report about the problems and considerations that came up with the criticism of Little.

⁹⁶⁶ See page 631.

In the seventh section, entitled "*Who likes to be publicly criticized?*", some questions on the topic of "criticism" are discussed, such as whether criticism has an effect on those who are criticized and how one oneself reacts to criticism. In view of the fact that I have criticized some of the top representatives in the field of operational planning and control so massively and even drastically, this is an obvious question.

2. Forms of a model-based critique

The model-based critique of normative concepts in the field of operational planning and control of companies can be distinguished according to whether the normative concept in question is practiced on the basis of an equation model. If this is not the case, one can distinguish between two further cases. In the first case a purely verbal description of the normative concept is given. The second case describes a hybrid situation. Here, on the one hand, certain relationships that are necessary to carry out a complete model-based planning are described only verbally or by means of preliminary model stages such as certain influence schemes. On the other hand, however, the explanations for the identification of the normative concept in question also contain equations that the model required for the execution of completely model-based planning must contain if it would be formulated. An example is the definition equation of the value-based sales of an article as a product of price times sales quantity or the operating result.

This allows to distinguish between the following three cases of a model-based criticism:

First: *The critique of purely verbal descriptions of a normative concept in the light of it's (successfully or unsuccessfully) completely model-based reconstruction.*

Second: *The critique of normative concepts with incomplete quantitative relations in the light of a completely model-based reconstruction.*

Thirdly: *The critique of structurally correct models with regard to their semantic deficits and problematic analysis and planning procedures.*

Some examples of these three cases are given below

First of all, however, it is worth mentioning a point that makes the model-based critique of normative concepts an elaborate matter. According to Wolfgang Stegmüller, the logician and science theorist Patrick Suppes is "*one of the brightest minds of the present*". Patrick Suppes has analysed and criticized the writings of Hans Reichenbach and Adolf Grünbaum on space and time. In doing so, he apparently considered it necessary to produce a critique of these writings, which comprised far more than a thousand pages.⁹⁶⁷

This is an extreme example. But it is undeniable that in many cases there is a great discrepancy between a thesis presented and the argumentative effort to refute it in a well-founded way, with regard to the formulation of this thesis and its criticism.

In my opinion, such an imbalance cannot be avoided whenever a model-based criticism of verbally presented normative concepts in the area of operational planning and control of companies is to be carried out. The reasoning behind this is that a model-based critique

⁹⁶⁷ See Stegmüller, W., *Hauptströmungen der Gegenwartsphilosophie*, Vol. II, 7. Ed., Stuttgart 1986, p. 349.

of the first two cases mentioned, i.e. a purely verbal description or even a verbal description enriched with rudimentary quantitative relations, makes it necessary to start from an equation model. The verbally described relationships must be specified in such a way that they can be described by an equation model.

Even if the relationships in question are considered in the light of an already existing cost-performance model of the Integrated Target Commitment Planning and the procedures to be carried out with it, the tracing back of a verbal description in question to the more precise model context that is actually only possible for this is very costly. This is because often several assumptions and case distinctions have to be made.

If, in addition, a procedure such as a top-down planning or a control procedure is to be criticized, the procedure in question must be worked out in addition to the traceability to an equation model, and it must be shown how unclear and even inaccurate the verbal description is.

Nevertheless, this procedure was used in this text, especially in the texts that can be accessed online.

The reason for accepting this effort was to show how many of the normative approaches to operational planning and control described in the literature only receive an appropriate model-based normative version at the level of the Integrated Target Commitment Planning. However, a number of normative concepts that have been model-based and in most cases also analyzed specifically in the light of the Integrated Target Commitment Planning and Control show that they are unacceptable.

With this we come to the already announced procedure of describing certain examples of model-based criticism.

Critique of purely verbal descriptions of a normative concept in the light of its successfully or unsuccessfully completely model-based reconstruction.

Top-down planning. The first example is the top-down planning described by Küpper in purely verbal terms. As has been explained (s.p.315), it is deficient and misleading. In order to describe this top-down planning as a model-based procedure in such a way that someone who has understood it can also implement it by using Excel a not inconsiderable transfer of knowledge is required. A reader interested in the top-down planning of the Integrated Target Commitment Planning would have to read several pages of this „History..." to understand the "logic" of the top-down procedure propagated here. And if another author were to describe a different top-down procedure, which is also to be based on a model, it would be no different.

You can also describe top-down planning of the Integrated Target Commitment Planning verbally. However, this is only possible if you have a clear overview of it at the model level. Alfred Marshall (s.p.550) has correctly identified what is required in such cases. In his opinion, if it is possible to analyse and understand a relationship on a formal level, i.e. here on a model level, and if this is successful, then, in his opinion, there are no difficulties in expressing oneself verbally, i.e. less precisely, in an appropriate form. In Küp-

per's remarks, on the other hand, it becomes clear that he certainly did not previously move on a model level for this purpose. It is all just talk.

Link between performance measures and corporate goals. Another example refers to the relationship between the ratios as "*performance measures*" and the ratios as "*company targets*", as described verbally by Ewert and Wagenhofer in a separate chapter called "*Ratios as performance measures*". As mentioned (s.p.437), from a "model-based viewpoint" this is confused talk. Forty-four pages of text were required to clarify this assertion.⁹⁶⁸

In the light of a model-based approach, an equation model would have to be developed which describes the relationships between the "*performance ratios*" of the "*decentralized decision-makers*" and the "*corporate targets*" which are to be regarded as top targets. Ewert and Wagenhofer do not cite a single concrete *performance ratio* that could be used in a model to link it to the "corporate targets".

Everybody should read their presentation on this question to recognize which confusing considerations are offered to a reader here under the title "*Internal Corporate Accounting*" in their standard work as state of the art.⁹⁶⁹ It should be pointed out that in the light of the Integrated Target Commitment Planning, the basic targets of the area managers can be interpreted as performance ratios of the "*decentralized decision makers*".⁹⁷⁰ And the internal "*company target*" that is common in operational planning practice is the operating result.

Necessity of an inventory in the cost of sales and total cost method. The third example refers to Küpper's assertion that no inventory is required when using the cost-of-sales accounting method. As already stated elsewhere, this assertion is incorrect (s.p.307). To refute Küpper's assertion, one could argue that, as is well known, when using the total cost method, the operating result is determined by correcting the difference between total sales and total costs by the rate of change of inventories. However, you need cost-of-sales accounting to be able to carry out the necessary valuation of the inventories (according to LIFO, FIFO, and so on). This is because it is needed to determine the unit costs of the articles entering the inventories. In addition, the cost-of-sales method (using inventory update tables of an actual cost-performance model) also determines the quantity-based initial and final stock levels as well as their inflow and outflow quantities by updating. Under such circumstances, why is a physical inventory necessary in period accounting?

But this is only a superficial refutation of Küpper's claim. If one considers his assertion on a model level, a completely different consideration is necessary. It is necessary to clarify the question of what the situation is at the level of an actual cost-performance model

⁹⁶⁸ Zwicker, E., *Ratios as Performance Measures in the Light of the Integrated Target Commitment Planning - Critical analysis of chapter 10 of Ewert and Wagenhofer's book "Interne Unternehmensrechnung"*, Berlin 2015, www.Inzpla.de/IN45-EW-Kap-10.pdf. (Text in German, title translated).

⁹⁶⁹ See also the further critical comments on p.437.

⁹⁷⁰ For the interpretation of the basic targets as performance ratios and targets of the "*decentralized decision makers*", see Zwicker, E. *Ratios as Performance Measures...*, op. cit., p. 20f.

(with an inventory flow modeling) when the decision is made whether to take physical inventory or not. If no physical inventory should be made which is an updating of the inventory is considered to be sufficient.⁹⁷¹ The question therefore arises, what does the model look like in one case or another. This question will be examined in the following and it will be recognized what effort is required to clarify Küpper's assertion on a model-based way.

In his text, Küpper describes the differences between the cost of sales and total cost accounting. In his opinion, a disadvantage of the period accounting method is *"the need to record inventories of semi-finished and finished products in order to be able to determine changes in inventory"*.⁹⁷² For the cost-of-sales accounting method, on the other hand, the following applies: *"Cost-of-sales accounting does not require you to record inventories of intermediate and finished products."*⁹⁷³ This is an assertion formulated in two short sentences. The model-based clarification of this assertion requires a little more text, namely the following:

Küpper's assertion refers to actual cost-performance accounting, because only there are the actual stocks of semi-finished and finished products recorded and possibly determined by a physical inventory. In the light of the Integrated Target Commitment Planning, Küpper's assertion means: If an actual cost-performance model is generated in the form of an actual total cost model (i.e., in the form of the total cost method), then it is necessary to determine the actual inventories of semi-finished and finished products through a physical inventory.

If, on the other hand, an actual cost performance model is developed in the version of an actual cost-of-sales model (that is, in the form of the cost-of-sales accounting method), it is not necessary to carry out a physical inventory. Instead, the final inventories of actual quantities are determined by updating the actual inflows and outflows of semi-finished and finished products.

This approach contradicts the modeling philosophy of the Integrated Target Commitment Planning. After generating a plan cost-performance model on a full cost basis using the INZPLA configuration system (or by transferring a planned full cost version from the SAP-CO module), the system allows "automatically", i.e. computer-aided, to derive the other versions of a planned cost-performance model corresponding to the full cost version, i.e. in addition to the cost-of-sales model in the form of the full cost model, two further versions of this type, in the form of a marginal and direct cost model. In addition to these three cost-of-sales versions, a total cost version, that is, a total cost model, can also be generated. This means that four planned cost-performance models are available within the framework of an Integrated Target Commitment Planning, which can also be calcu-

⁹⁷¹ A simple inventory update table is described in Fig. 14 on page 69. For building cost-performance models with a inventory flow modeling, see Zwicker, E *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 34f., www.Inzpla.de/IN06-2000a.pdf. (Text in German, title translated).

⁹⁷² Schweitzer, M., Küpper, H. U., *Systeme der Kosten- und Erlösrechnung*, 9. Ed., 2008, p.192.

⁹⁷³ Schweitzer, M., Küpper, H. U., *Systeme ...*, p 194.

lated independently of each other and always lead to the same value of the planned operating result. They therefore differ only in their "intermediate variable", while the reduced equation of the operating result is the same in all model versions. With all four versions, you can therefore carry out a planning alternative in the form of a calculation of the model that leads to the same value of the operating result.⁹⁷⁴

At the same time, however, and this is important for the following, the structural equations of all actual model versions can also be created automatically on the basis of the plan full cost version. These actual model versions include the actual full cost model, the actual marginal cost model, the actual direct cost model and the actual total cost model. The calculation of each of these actual models always leads to the same actual operating result.

The generation of these actual versions is possible because the model configuration system "knows" which structural changes are to be made due to the semantics of the plan full cost model. In order to generate the actual versions of the plan cost-performance models, the model developer must still decide whether the actual full cost version of the cost-performance model to be developed is to be an inventory update version or a physical inventory check version.

In the case of a physical inventory check version, the final inventory levels determined by an actual update of the incoming and outgoing inventories are only regarded as provisional and are replaced by the inventory levels determined by a physical inventory. In the case of the inventory update version, the final inventory levels determined by an actual update of the incoming and outgoing inventories are regarded as the final actual inventories.

If the model parameters of the actual full cost model are supplied with their actual values at the end of the plan year, then a calculable actual full cost model exists, depending on the decision made as to whether the update or physical inventory version should be used. When you decide on a physical inventory version, you must also enter the inventories of finished and semi finished products determined by the physical inventory.

Whether or not you need in Küpper's formulation to *"to record inventories of intermediate and finished products"* therefore depends on a decision to be made regarding the actual full cost version. If you want to compare the total cost method or, more precisely, the actual total cost version of a cost-performance model with other model versions, the question of whether or not physical inventory must be carried out is pointless. Because the planner decides from the beginning whether the actual total cost version should be generated as an inventory or update version.

The configuration system then (automatically) creates the actual marginal cost version, the actual direct cost version and the actual total cost version based on the inventory or

⁹⁷⁴ In the case of the ThyssenKrupp Steel model, however, a version was used that only led to the full plan cost and marginal cost models being calculated in one run. Such a "double calculation" of the plan operating result is always carried out.

update version of this actual full cost version. These can then be an inventory version or an update version.

However, the question is whether this explanation is sufficient. It might also be necessary to provide more detailed information about the structure and semantics of actual models. As described (s.p.112), a distinction can be made between three types of actual model, and in the present case, the actual model is an ex-post planning model.

Küpper's assertion on the necessity or non-necessity of an physical inventory in the cost-of-sales and total cost accounting method is his only assertion that is in direct contradiction to the structural equations of a cost-performance model of the Integrated Target Commitment Planning contained in the INZPLA-hyperstructure model. Otherwise, his text moves on a level of certainty that does not evidently contradict either the structural characteristics of the INZPLA-hyperstructural model or the various procedures of this planning and control procedure.

Critique of normative concepts with incomplete quantitative relations in the light of a completely model-based reconstruction

Balanced Scorecard Planning. As a first example, the concept of the Balanced Scorecard should be mentioned. As described (s.p.190), this concept requires the definition of up to 25 Balanced Scorecard measures, whose set point values are to be planned. At least one of them should come from the financial area. If there is a relationship between these ratios, this should be indicated by an arrow diagram.

It is all the information provided by Norton and Kaplan, which must be taken into account if one has made the decision to implement a Balanced Scorecard Planning, i.e. a normative concept, in such a way that it is to be operated on the basis of an equation model (i.e. model-based).

The question of whether it is possible to realize a Balanced Scorecard Planning in the form of an Integrated Target Commitment Planning on the basis of this sparse "model-relevant" information was examined by means of an example. In the process, 19 balanced scorecard ratios were defined operationally. The results are briefly reported in this text (s.p.191). The detailed study, which can be accessed online, required more than thirty pages.⁹⁷⁵ Using the model-based reconstruction of this example, it was shown that it is practically impossible to perform a Balanced Scorecard Planning using an equation model. This clearly shows how model-based reconstruction reveals the meagerness of a concept celebrated as a great innovation on a verbal level. The emperor's new clothes send their regards.

Cost control calculation. The second example of this category is the "*cost control calculation*" propagated by Ewert and Wagenhofer. It has already been critically commented on elsewhere in this text (s.p.435). It took 121 pages to reconstruct this "*cost control calculation*" based on models. Only with this effort was it possible to make clear the short-

⁹⁷⁵ See: Zwicker, E., *Integrated Target Commitment Planning and Balanced Scorecard*, Berlin 2003, , www.Inzpla.de/IN29-2003g.pdf. (Text in German, title translated).

comings of Ewert-Wagenhofer's control procedure.⁹⁷⁶ As already mentioned (s.p.435), the reconstruction of their "*cost control calculation*" shows that one has to distinguish between two contradictory "*control calculations*", which (by me) were called *cost control calculation 1* and *cost control calculation 2*. *Cost control calculation 1* is again divided into two "*sub-control calculations*" which compete with each other. The criteria given by Ewert and Wagenhofer for selecting one of these two procedures of cost control-calculation-1 are unclear and what is understandable makes no sense.

However, a fatal error that characterizes all Ewert-Wagenhofer's "*control calculations*" is that they do not consider the so-called *model-based principle of controllability*, which states that an agent (e.g. an area manager) can only be held responsible for a (quantitative) setpoint-actual variance if he can influence it.⁹⁷⁷

Cost object profit calculation. The third example is the cost object profit calculation described by Kilger (s.p.106). Kilger highlights it as a new type of procedure. It is not presented in the form of an equation model, but solely on the basis of an example in the form of an extensive table with 81 columns and 4 columns full of numbers, which are connected by calculation rules.

As even Kilger admits the presentation is "*relatively complicated*" in my opinion it is very complicated.⁹⁷⁸ It took me quite some time to understand and reconstruct it. Since the cost unit profitability analysis plays a central role in Kilger's system, I reconstructed his example using a model-based approach in the light of a plan cost-performance model and his corresponding actual model. This reconstruction with various case distinctions and a terminology, which was specially developed for this purpose, required almost forty pages.⁹⁷⁹ In my opinion, only such a model-based reconstruction can show that Kilger's approach does not represent a profitability analysis, but can at best be interpreted as a simple cumulative plan-actual variance analysis of certain profit figures.

Critique of structurally correct models with regard to their semantic deficits and problematic analysis and planning procedures.

Küpper's hidden-action agency planning. As a first example, the quantitative description of the hidden-action-agency theory cited by Küpper will be referred to. This quantitative description consists (s.p.309) of the three empirically insubstantial functions $\phi(x|a_i)$, $s = F_s(x)$ und $V = F_v(a_i)$.

To describe the interrelationships in the area of operational planning and control with such a three-equation model is completely superfluous if it is not possible to further con-

⁹⁷⁶ The following text is taken primarily from page 435. Zwicker, E., *Control Calculations in the Light of the Integrated Target Commitment Planning - Critical analysis of chapter 7 "Kontrollrechnungen"* from the work "Interne Unternehmensrechnung" by Ewert and Wagenhofer, (121pages) www.Inzpla.de/IN45-EW-Kap-7.pdf. (Text in German, title translated).

⁹⁷⁷ For the model-based principle of controllability as the control paradigm of the Integrated Target Commitment Planning and Control, see p. 597.

⁹⁷⁸ The following comments can be found in a similar form on page 106.

⁹⁷⁹ See: Zwicker, E., *Control and Variance Analysis....* op. cit., p.235-271 www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated).

cretize these interrelationships. This concretization must lead to hypotheses that describe the interrelationships required for a hidden-action-agency planning on the basis of the cost-performance models of companies where such planning with these models is applied. Küpper's presentation is precisely the case that Malmi and Granlund (s.p.208) reject as a non-area-specific theory.

As already mentioned elsewhere (s.p.382), I demonstrated how the (normative) hidden action agency theory could be used to plan the operating result using a simple but calculable cost-performance model. This investigation leads to absurd relations between the remuneration of the agent and the profit of the principal. The result is that such a hidden-action-agency planning makes no sense in the context of operational company planning with a cost-performance model.

The development of this cost-performance model as well as the investigation of different variants of a hidden-action-agency planning required 55 pages.⁹⁸⁰ As far as the effort which was required for this reconstruction, it should be added that without knowledge of the basic elements of a model-based planning, the development of this cost-performance model as well as the variants of a hidden-action-agency planning demonstrated with it by means of numerical examples will hardly be comprehensible.

Littles Decision Calculus Planning

In his two articles describing his decision-calculus concept, Little uses differently models to demonstrate his method. The GROOVY model in his first article consists of seven structural equations. In contrast, the BRANDAID model in his second article has only one structural hypothesis equation (s.p.260) of the sales quantity to be planned. All other relationships discussed in this model do not lead to (calculable) structural equations.

In such a case, what else is there to criticize when, as in the case of the GROOVY model, the structural equations are available? According to the standards of decision theory, in order to carry out planning, only a maximization of the article contribution margin of the sales quantity with respect to the decision variable advertising costs would have to be carried out.

The criticism here is aimed primarily at the model development heuristics used by Little. In order to come to the conclusion that this model development heuristic (called *Little's permission*) is permissible in principle but completely unsuitable for practical purposes, a total of 29 pages (s.p.244-272) were required in this text.⁹⁸¹ The main reason for this is that this procedure requires a model developer to make unreasonable subjective and even

⁹⁸⁰ See for a detailed description of this procedure: Zwicker, E., *The hidden action Agency Planning, demonstrated with the Example of simple Cost-Performance Models*, Berlin 2011, p. 8-54 www.Inzpla.de/IN38-2011a.pdf. (Text in German, title translated).

⁹⁸¹ The entire text of chapter 18 "Little's Decision-Calculus-Modeling ...", 87 pages long, includes Littles' suggestions for the design of models which are not used in his models, the discussion of the "SONAL model" as a computable successor model, the meeting with Little and finally the examination of Simon's structural break assertion regarding the formulation of sales volume hypotheses.

abstruse parameter estimates in the context of so-called non-observation hypothesis equations.

Pseudo-target hierarchies

In the case of the pseudo-target hierarchies (s.p.366), which I have critically evaluated, there is a structurally correct model, as with Little's GROOVY model, which in this case consists only of definition equations. The model-based criticism of such (pseudo-) target hierarchies consists in the assertion that such hierarchies suggest false dependency relationships to a user that do not exist. A sufficient and, in my opinion, plausible claim is that a hierarchical system of definition equations can only be accepted if all model parameters influence only the top variable of the hierarchy.⁹⁸² The topic "pseudo-target hierarchies" would not be of great importance if not all "target systems" discussed in the literature turned out to be pseudo-target hierarchies (s.p.371).

For every demand that consists in a general prohibition, it is the task of the one who has formulated such a prohibition to look also for cases in which the non-compliance with the prohibition leads to certain advantages that make it appear reasonable to deviate from the prohibition when it occurs.⁹⁸³ Within the framework of the Integrated Target Commitment Planning, I have found only one case (s.p.368), where the non-compliance with the prohibition, especially the prohibition of using the definition equation of RoI, is associated with an "advantage" for the planner. However, the assumptions leading to this case are unlikely to occur in practice.

3. Definition of a model-based normative theory of operational controlling

Küpper's inadequate remarks about "*interdependencies*", which form the "*central object of a theory of controlling*" (of management accounting), led me to the question of what a theory of controlling could actually consist of. Let us recall his remarks on this subject (s.p.312) "*Interdependencies mean that statements of fact cannot be determined independently of one another without reducing the achievement of targets. The effects on each other and their retroactive effect must be taken into account in the individual decision*".

From these vague formulations I believe that it is possible to deduce the formulation of an instruction, which is expressed by the verb "*must*". I therefore assume that the "*theory of controlling*" (management accounting) envisaged by Küpper is a normative theory. And thus the question arises how realistic is the demand to develop a normative *theory of controlling* (management accounting).

The formulation of assertions of impossibility should be carefully considered, because they have proven to be wrong in many areas of science. Nevertheless, I claim that it will not be possible to formulate a general normative theory of controlling. Such a normative theory would have to be able to provide a reasoned judgment for every question arising in

⁹⁸² This is only a sufficient criterion. A sufficient and necessary criterion is that no "truncation" of model parameters is possible when determining the reduced equation of the peak variable. See p.371

⁹⁸³ See also my attempt (S.606f.) to shake the general demand of the prohibition of circular definitions in its general validity by a counter-example which leads to a reasonable result.

a company in the area of controlling, which of the possible actions of a pending decision is to be chosen.

What should such rules of behavior look like if they should be applicable to each possible individual case? I can only think of one rule of behavior which, so to speak, summarizes the whole theory of normative controlling (management accounting) in one sentence, and it is: "*Only the eye of the Lord makes the cows fat*". Whether this normative theory, consisting of a single (even implicit) behavioral rule, is capable of prescribing the "right behavior" for each individual case in the area of management accounting is probably rather questionable.

However, there is another contribution in the literature on the topic of a normative theory of management accounting. In their contribution "*In Search of Management Accounting Theory*" (s.p.204-211). Malmi and Granlund deal in detail with the question of what is meant by a normative theory of management accounting. Their definition of a "*complete normative theory*" has been criticized elsewhere (s.p.206). Why does their definition of a complete normative theory of management accounting give cause for criticism?

It is the same problem that was already evident with Küpper when he spoke of a "theory of controlling". In my opinion, it is not possible to give a definition of the term "*normative management accounting theory*" that is relevant for practical purposes at the verbal level of description chosen by Malmi and Granlund.

Malmi and Granlund are of the opinion that no "*complete*" management accounting theory has been developed so far. They therefore describe (s.p.204) certain approaches found in the literature, which they call "*preliminary normative theories*".

These "*preliminary normative theories*" discussed by Malmi and Granlund provided a good starting point for me (s.p.204) to compare them with the Integrated Target Commitment Planning. In the framework of this comparison, it was shown that these approaches lead to a "*complete*" normative management accounting theory if they could be concretized in such a way that their empirical relationships are described by a model of the Integrated Target Commitment Planning and their planning and control is based on the rules of this normative theory.

In case of the Balanced Scorecard cited by Malmi and Granlund as an example of "*preliminary normative theory*", however, such a concretization is hardly possible (s.p.189). This is because it has been shown that the attempt to use equations to trace the Balanced Scorecard ratios, which are (mostly) endogenous variables and thus top targets, back to specific basic targets is unlikely to succeed. And even if this should be successful, it would be almost impossible to carry out an Integrated Target Commitment Planning with this model in view of the large number of maximum 25 setpoint values as planning targets (s.p.190). Thus, this "*preliminary normative theory*" the way to a "*complete*" normative theory is blocked.

For other "*preliminary normative theories*" cited by Malmi and Granlund, on the other hand, it has been shown that it is possible to reconstruct them as a partial theory of the Integrated Target Commitment Planning and Control, thus giving them the status of a pure normative theory (s.p.207).

I have adopted the concept of a "*preliminary theory*" coined by Malmi and Granlund in that I agree with their view that the approaches they call *preliminary theories* are also preliminary in my view. However, it is necessary to clarify what I understand by a complete normative theory in the field of management accounting. Because Malmi and Granlund's definition of a *complete* normative theory is, as mentioned (s.p.204), not acceptable to me. This definition of a *complete* normative theory to be formulated should be restricted to the case of a *complete model-based* normative theory.

However, a definition of Integrated Target Commitment Planning and Control should be made first. As will be shown, in the light of this definition, the Integrated Target Commitment Planning and Control proves to be a variant of the still to be defined concept of a "*complete model-based normative theory for the operational planning and control of companies*". The definition of the Integrated Target Commitment Planning and Control is as follows:

The Integrated Target Commitment Planning and Control is a normative theory represented by a system of behavioral rules for planning and controlling a company on the basis of numbers. These rules of conduct must be required to be applicable to a potentially unlimited range of companies. Their applicability is demonstrated by the fact that this normative theory includes a hyperstructural model which allows the model of a company in question to be generated by entering its company-specific parameters, and is thus able to describe the empirical relationships required for its planning in the form of equations. These required empirical relationships of the company in question must describe the link between its basic and top targets declared for planning in the form of equations.

But why is the Integrated Target Commitment Planning a "complete" normative theory and not a rudimentary one? As has been explained elsewhere, it is difficult to define what characteristics a normative theory must fulfil in the area of operational planning and control in order to be called a "complete" normative theory.⁹⁸⁴ I would like to propose a definition that I think is reasonable. A complete model-based normative theory in the field of operational planning and control should have the following characteristics:

1. Planning must be based on a (equation) model.
2. The (top) target variables to be planned by the corporate management must be endogenous variables of the model.
3. The variables assumed by the planner to be influenceable in order to achieve these target variables must be contained in the model in the form of clearly determinable parameters.
4. The structural equations of this model must combine the target variables with these influenceable parameters.
5. A clearly comprehensible procedure must be available, which states how the desired target variables are realized by the choice of the influenceable parameters.

⁹⁸⁴ See in detail: Zwicker, E., *Is the Integrated Target Commitment Planning a Procedure or a normative Theory?* p. 6, Berlin 2016, www.Inzpla.de/IN48-2016.pdf. (Text in German, title translated)

6. There must be a procedure (a kind of control) available, with which, after the values of the influenceable parameters determined in the course of planning have been realized, it must be possible to check, after the planning period, to what extent the planning intended by the model has been realized.

These are rather general requirements. For example, it is not required that the parameters that can be influenced should be target commitment parameters for which an area manager is responsible, i.e. "the ability to influence" is not further specified. Furthermore, it is not required that, as is the case with the Integrated Target Commitment Planning and Control, that the "planning success" should be checked by means of a setpoint-actual analysis, in which the principle of controllability must be taken into account) (s.p.597). Furthermore, it is not required that a hyperstructure model must be available, with which one can configure exactly the planning model that is required for the upcoming planning case on the basis of an individual specification of the parameters. In view of the fact that this is a normative planning theory to be applied, one could even demand, as is the case with the INZPLA-system, that the execution of this planning and control should be supported as far as possible by a computer system.

Apart from the Integrated Target Commitment Planning and Control, no planning and control procedure can be found in the literature that fulfils only the first four characteristics of a normative theory of operational planning and control.

As mentioned above, the normative theory of an Integrated Target Commitment Planning and Control includes a hyperstructural model that is capable of describing the relationships between the top and basic targets of a large number of companies. This hyperstructure model does not only exist on paper, but has been implemented within the INZPLA-system. Its applicability can be demonstrated (s.p.213) by the fact that all cost-performance models created using the SAP-CO system, can be reconstructed as an alternative, containing in the set of objects of the cost-performance models of the hyperstructure model. And the SAP CO system has about 100,000 users.⁹⁸⁵

Within the framework of deterministic decision theory, which, however, applies to all areas of life, such a hyperstructure model is not assumed. It is only assumed that there is some hypothesis that links the decision variables in question with the target variable to be optimized.⁹⁸⁶

A not too biased reader might perhaps recognize that the transition I have described between some of the *"preliminary normative theories"* in the field of accounting described by Malmi and Granlund towards a *closed model-based planning and control system*, namely Integrated Target Commitment Planning and Control, could be described as progress. For me, the development of this *"normative theory of operational planning and*

⁹⁸⁵ However, as described, the hyperstructure model also contains model relationships such as an inventory flow modeling, which is not available in the SAP-CO-configuration system (s.p.354).

⁹⁸⁶ See the discussion of the differences between the Integrated Target Commitment Planning and the classical decision theory p.492f.

control of companies" is not only a progress compared to what has been achieved so far, but a considerable leap forward, and, if everything is taken into account, it is not unreasonable to speak of a quantum leap.⁹⁸⁷ But there are probably different opinions.⁹⁸⁸

At the above-mentioned conference in Vienna, Teemu Malmi, as the conclusion of his speech and thus also the conclusion of the conference, made an almost emphatic appeal to the audience: *"Let us try to develop MCS theories"* (s.p.195) and in their text Malmi and Granlund extend this demand to all "accounting theories", if they demand: *"Let us try to develop MA theories that are useful for accounting practice"*. As I already claimed in Vienna, the Integrated Target Commitment Planning and Control is exactly such a *"management accounting (MA) theory that is useful for accounting practice"*. It would be best if Teemu Malmi, in support of his claim that Integrated Target Commitment Planning and Control is not a theory (s.p.196), would write another article explaining why my claim is false. But perhaps it might be possible to convince him that after all it is a "normative theory".

4. Model-based definitions, classifications and hierarchies

In the field of model-based operational planning and control, it is necessary to work relatively precisely, because the quantitative relationships that can be shown there must lead to a model that is consistent in itself. However, such a model must not only meet certain syntactical requirements. It is also necessary that the underlying terms are correct. And this is achieved by their "clear definition". It is also necessary to ensure that the classificatory relationships between the terms used comply with the relevant standards of a classification. Otherwise, irrevocable definitional contradictions may arise, as is the case with the Agthe-Mellerowicz scheme (s.p.439).

Definitions. In the field of operational controlling, definitions of central terms are made which often could have been defined more clearly from a model-based view. The same applies to the classification of terms.

Paul Riebel, for example, understands a *"reference object"* (s.p.139) to be a *"an object of calculation and investigation to be objectively and temporally delimited, to which money or quantities are allocated"*. Riebel defines this term in the context of his cost theory, which deals with the relations between quantitative quantities. Such a definition can be understood to cover all kinds of things. If one tries to explicate his definition of a *"reference object"* as a structural element of an existing plan cost-performance model, it has been shown that such a reference object cannot be identified in such a model (s.p.140).⁹⁸⁹ In order to appreciate this statement correctly, it should be pointed out that Riebel did not

⁹⁸⁷ Walter Goldberg (s.p.551) and Hanns Martin Schoenfeld (s.p.524) were of the opinion that the last is not an exaggerated formulation..

⁹⁸⁸ It's a pity that the conversation with Larry Ellison did not happen (s.p.360). Maybe I would have been able to convince him of the "quantum leap" after I had no success in winning Hasso Plattner for the Integrated Target Commitment Planning as reported (s.p.347). Then the "quantum leap" would have been able to prove itself in practice and would not have had to live on paper after it had proven its worth at some companies like ThyssenKrupp Steel (s.p.336).

⁹⁸⁹ At least I didn't succeed.

use a "cost model" that deviated from the usual and was described by a structural equation, on the basis of which it might have been possible to explain this term in a clear model-based way.

In contrast, it is quite possible to identify so-called reference objects in a plan cost-performance model, to which one can assign both certain individual costs and individual revenues. If a decision is made to eliminate these objects, the individual costs and individual revenues the individual costs assigned to them are superfluous. The difference between the individual revenues and the individual costs is the so-called contribution margin₂ of the reference object (s.p.187). Riebel's definition of a reference object is not covered by this definition.

The same is true for Riebel's definition of the term "*reference object hierarchy*". Riebel claims that the reference objects can form a hierarchy and defines the term "reference object hierarchy" as "*an ascending order from subordinate, more specific to superordinate, more general objects of investigation*".⁹⁹⁰

Again, this is a definition that cannot be used to explain a certain form of a reference object hierarchy on the basis of a given plan cost-performance model. Riebel gives two examples for a better understanding of this definition, which describe its "*reference objects*" and their hierarchical connection not in the context of the equations of a cost-performance model, but only in the form of a hierarchy diagram.⁹⁹¹

I have tried to reconstruct these two examples of a reference object hierarchy as a "meaningful" reference object hierarchy of a given cost-performance model. This reconstruction led to irrevocable contradictions. If Paul Riebel had "modelled" his definitions and the argumentation that followed them in the light of a cost-performance model, such an example would probably not have come about.

Within the framework of a model-based approach, different profit hierarchies can be generated on the basis of a cost-performance model, the elements of which can be interpreted as reference objects. These hierarchies can be called up in the INZPLA-system and used, for example, to perform a drill-down analysis.⁹⁹² Their reference objects correspond exactly to the demands Riebel makes on "his" reference objects, namely that they can serve as (decision) objects for a yes-no decision.

Riebel's statements were accepted by the experts without contradiction. Since I advocate model-based conceptualization in the field of operational planning and control, I am unfortunately forced to criticize even renowned representatives of this discipline who do not use a model-based approach, although it would be appropriate to do so.⁹⁹³ If, in the

⁹⁹⁰ Zwicker, E., *Variable Kosten vs. Fixe Kosten, Einzelkosten vs. Gemeinkosten in der einschlägigen Kostenrechnung und der Integrierten Zielverpflichtungsplanung*, Berlin 2003, S.26, www.Inzpla.de/IN24-2003b.pdf.

⁹⁹¹ See : Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, Berlin, 2001, www.Inzpla.de/IN11-2001a.pdf, p. 68f. (Text in German, title translated).

⁹⁹² See the example on page 116. and the detailed treatment of the developed hierarchical profit segment systems in: Zwicker, E., *Explorative and normative Analysis...* op. cit.

⁹⁹³ In an obituary, Reinhard H. Schmidt describes Paul Riebel as "*a scientist who can be counted among the formative personalities of business economics of the last 50 years*" and continues: "*Paul Riebel is known to the experts as by far the most influential researcher of his generation in the field of internal accounting*". In <https://d-nb.info/1103499254/34> from 14.12.2019.

context of an operational planning, definitions are not made on the basis of models, even though this would be possible, then there is a risk that they will fail.

The topic "*Definitions and Classifications*" has a certain historical background for me. In the summer semester 1962/63, I attended during my studies in the field of industrial engineering a course with the title "Betriebswirtschaftliche Organisationslehre" (Organizational theory of companies). This course was mainly characterized by the fact that the professor used various terms from the field of organization and explained how different authors defined these terms. In other words, an enumeration of the proposed definitions of different authors. To crown the definition of the term "organisation", Professor X also gave the definition he had chosen, which was: organisation = (def) "*controlled overview maximal securing of cause-effect relationships*".⁹⁹⁴

This was the peak of all the definitions he otherwise presented. For who can decide on the basis of such a definition whether the Red Cross, Daimler-Benz AG or the Catholic Church are an organization? The set of objects determined on the basis of this definition would probably contain zero elements.⁹⁹⁵

When I heard all this, I thought, who does it benefit? What's the point? This queer event finally helped to dispel my prejudice that professors are a consistently intellectually outstanding professional group.⁹⁹⁶

The consequence was that, when selecting the freely available courses in business economics, I decided to concentrate as far as possible on quantitative subjects in order to avoid such "performances". My dissertation on "*deterministically dynamic explanatory models in business economics*" shows that I have succeeded in taking the quantitative way.

The subject "computer science" did not exist as a field of study at that time, otherwise I would certainly have chosen it. Rather, I was later also one of the university teachers who helped shape the subject of Business Information Systems (s.p.344, 532). This is perhaps also evident from two calls I received to chairs of the subject Business Information Systems, although I initially represented the subject "*System and Planning Theory*" and then switched to the subject "*Controlling*" with the development of the INZPLA-system.

But back to the definitions. My "traumatic definition experience" and especially the "*controlled overview maximal securing of cause-effect relationships*", which seems to me to

⁹⁹⁴ "*Kontrollierte übersichtsmaximale Wirkzusammenhangsicherung.*"

⁹⁹⁵ As I do not report anything friendly about him, I do not want to mention the name of Prof X. It may not seem very plausible that this strange definition for "organization" was the reason for me to deal with definitions. As you can see, in my course "*Basic Questions of Business Economics*," which I held for many years (s.p.519), I have already given this definition as a deterrent example: Zwicker, E., *Defining and Classifying in Business Administration*, TU Berlin, no year, p.6, www.Inzpla.de/Definitionen.pdf. (Text in German, title translated). The page of Prof X's book, where nothing but this for me so "momentous definition" is visible, can be accessed via www.Inzpla.de/Def-Organisation.pdf.

⁹⁹⁶ What an enrichment it would have been if I had heard a lecture by Herbert Simon or James March on "Organizations" instead. For their classic "*Organizations*" had already been published in 1958. See March, J.G., Simon, H.A., *Organizations*, Urbana 1958.

be completely absurd, led to the decision to deal with the topic "definitions" in a more systematic way. There should be some rules how to proceed with the definition.

There were no introductory writings on the subject of "Theory of Definitions" at that time and the only available work was Dubislav's *"The Definition"* (as I now know, a "classic"). It was a rather demanding work and most of what you I could read there was above my level. But at least I learned that Aristotle already dealt with definitions and his claim that one can define a term by selecting the superordinate generic term of the object to be defined and then adding the species-forming difference that characterizes this object immediately made sense to me. The work also contained some further remarks about the use and meaning of definitions, which I could still understand. Since then I have developed a kind of "definition consciousness" and the same applies to "classification". This quirk has been preserved until today.

As soon as I read a text, I asked myself - What is defined here? Which terms are used undefined and therefore have to be clear? What kind of definition is used? Is the definition at all necessary to formulate an important claim or factual assertion? Or is it "just for fun", because defining is so satisfying?

When I find classifications in texts, corresponding questions came to my mind. The consequence of this was that in the context of my already mentioned lecture (s.p.519) on *"Basic Questions of Business Economics"* I dedicated a relative long text to the topic "Definitions and Classifications".^{997*****}

After this insertion to explain my "sensitivity" for definitions and classifications, we turn again to my initial demand that terms have to be defined model-based, if possible. One might think that Paul Riebel with his definitions is an exceptional case. But that is not true.

In the context of cost accounting, almost all authors use two pairs of terms which serve to divide the total costs of a company into two components. These are the pair of terms *"fixed costs vs. variable costs"* and *"individual costs vs. overhead costs"*.

In my opinion, these costs can only be defined on a model-based way. This is the case if they are so identifiable in a cost-performance model in question that their numerical value can be determined. With this in mind, I have examined in a text (available here online) how four well-known authors of cost accounting (including Schweitzer and Küpper) define these terms, and whether these definitions are sufficient to identify these four terms as specific variables in the hyperstructure model of an INZPLA cost-performance model.⁹⁹⁸

In all cases it turned out that the definitions (in my judgement) are not sufficient to determine the numerical values of a plan cost-performance model describing a planning alternative.

⁹⁹⁷ Zwicker, E., *Defining and Classifying in Business Administration*, TU Berlin, no year, (62 pages), www.Inzpla.de/Definitionen.pdf. (Text in German, title translated).

⁹⁹⁸ Zwicker, E., *Variable Costs vs. Fixed Costs, Individual costs vs. Overhead Costs in the relevant Cost Accounting Concepts and the Integrated Target Commitment Planning*, Berlin 2003, www.Inzpla.de/IN24-2003b.pdf. (Text in German, title translated).

The definitions of Dieter Schneider are particularly noteworthy. In the text containing his definitions, he points out the "*intellectual uncleanness in the basic concepts of financial, income and cost accounting*". However, the "*carelessness*" in the use of the terms will now "*disappear in the future*" by using his new definitions (s.p.139). The "new definitions" which he provides for the pair of terms "*fixed costs vs. variable costs*" and "*individual costs vs. overhead costs*" are, in my opinion, even less clear than those given by the authors he criticizes.⁹⁹⁹

In this text, the overlap diagram of total costs developed by Schweizer and Küpper was shown and criticized (s.p.137). In addition to the two classic pairs of terms mentioned, this diagram also distinguishes between real and unreal overhead costs. This distinction is rejected by me because unreal overhead costs do not occur in a cost-performance model. But I also criticized the other definitions given by Schweitzer and Küpper in their overlap diagram. From my point of view, these definitions are not acceptable. For example, there are ambiguities regarding the definition of individual costs, which would first have to be eliminated.

Classifications

As with the definitions, similar deficits can be found in the classifications used in operational planning and control and thus also in internal accounting.

An example is the classification of Malmi and Brown in their article "*Management Control Systems as a Package ...*", (s.p.197), with which they want to systematize the types of Management Control Systems presented in the literature.

Malmi and Brown use a three-level classification, but this is rather unsatisfactory. As can be seen from Fig. 51 on page 197 they distinguish five types of "management control systems" on the lowest level, namely *planning*, *cybernetic*, *reward and compensation*, *administrative* and *cultural controls*. Since the variants of a "management control system" compiled by Malmi and Brown from the literature were formulated in such a vague manner by the authors who described these variants, Malmi and Brown could not as already mentioned (s.p.200), with the best will, succeed in making a satisfactory classification. That would be a classification which in starting from the features of the overall definition of the term "management control system", shows through which additional characteristic values one can reach the types of a management control system described by the individual authors. In view of the circumstances described above, no one should be able to do this. However, even a typology that is less strict than a classification cannot be successful in such a case (s.p.200).

Malmi and Brown's attempts to classify the existing approaches into a schema lead to considerable dislocations. Thus, as already mentioned (s.p.200), they classify the concept of the Balanced Scorecard under the category of cybernetic planning and control, alt-

⁹⁹⁹ See: Zwicker, E., *Variable Costs vs. Fixed Costs, Individual costs vs. Overhead...*, op. cit, p. 36-47, www.Inzpla.de/IN24-2003b.pdf. (Text in German, title translated).

though Kaplan and Norton explicitly state that the Balanced Scorecard is not used for control.

The entire system of the Integrated Target Commitment Planning and Control is characterized by a hierarchical classification across several levels which is shown in Fig. 25 and Fig. 38 on pages 109 and 144.

A second classification of the Integrated Target Commitment Planning according to the procedures and the model types used is shown in Fig. 39 on page 145 using a two-dimensional classification scheme. Fig. 39 shows which planning procedures can be used for which models (of the Integrated Target Commitment Planning). The models correspond to the columns and the planning procedures to the rows of the two-dimensional classification scheme. Both dimensions contain (as in the case of the two-dimensional profit segment systems) an edge hierarchy of the planning procedures and the model types.

The classifications of the Integrated Target Commitment Planning and Control described above according to the procedures used (Fig. 25 and 38) and according to the procedures and model types used (Fig. 39) were only applied to the extent that they proved to be "informative". "Informative" means that the terms listed in a classification are also "used". Therefore, these classifications show under which circumstances a procedure or model stated in the classification is to be applied. And this application is feasible within the INZPLA-system.

The classification of the control procedures of the Integrated Target Commitment Planning is carried out in the context of the classification of the types of variance analyses. Here, a distinction is made between normative and explicative variance analysis. The "normative variance analysis" of the pure Integrated Target Commitment Planning (1.2. in Fig. 25) corresponds to the control procedure of this planning procedure. It represents a control procedure in the form of a "setpoint-actual control of responsibility variables". This type of a setpoint-actual control has also been systematized as a subsystem of a general procedure of a responsibility-based setpoint-actual control. The classificatory connection with this general form of a responsibility-related setpoint-actual control, which not only includes the control procedure of the Integrated Target Commitment Planning, is shown in Fig. 52 on page 201.

Further examples of a classification within the system of the Integrated Target Commitment Planning are provided by the one- and two-dimensional profit segment hierarchies mentioned in this text, which divide the operating result hierarchically over several levels into certain subgroups of contribution margins.¹⁰⁰⁰

¹⁰⁰⁰ It was developed by me as a two-dimensional multi-level classification system of certain profit figures, which can be controlled via two so-called edge hierarchies, with the operating result as the peak figure, and was integrated into the INZPLA system as an exploratory procedure. It is described in its main features on pages 114-130. For a detailed description, see: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, Berlin, 2001, www.Inzpla.de/IN11-2001a.pdf. (Text in German, title translated).

Hierarchies and hierarchical classifications

My preference for hierarchies has clearly expressed elsewhere (s.p.155). It can also be seen from the fact that the INZPLA-system uses a wide range of hierarchies to show connections between certain objects. Hierarchies also include hierarchical classification systems. However, hierarchies and hierarchical classification systems are not identical. Rather, hierarchical classification systems form a subset of possible hierarchies. A few remarks will be made below on the relationships between these two terms.

The term "classification" covers a wide field. This includes, for example, the classification of patterns, data mining classification and classification within the framework of cluster procedures.¹⁰⁰¹ In the following, we will only deal with a classification which consists of a so-called superset containing certain elements which are divided into certain subsets based on differentiating features which contain all elements of the superset. This condition should be referred to as the exhaustion condition. If this differentiation is continued, a multi-level classification hierarchy is obtained.

Not every hierarchy corresponds to such a classification hierarchy. To identify a hierarchy, it is sufficient to define a subordinate relationship between an object and its subordinate objects.

A *hierarchical system of equations* is characterized by the fact that all parameters of this system alone influence its only peak size. Under what circumstances, however, does a classification hierarchy correspond to such a hierarchical system of equations whose variables can be arranged hierarchically?

Such an equation system implies a classification hierarchy if each endogenous variable in the variable hierarchy is described by a sum of components of the same kind. The parameters of the system of equations form the elements of the lowest level. Each of these additive definition components on a level is in turn described by another definition equation with only additive components. The type identical components in the hierarchy must have the same unit as, for example, "Euro" or "Units in thousands".

Such a classification hierarchy, which corresponds to a hierarchical system of equations, is the primary cost hierarchy used in a company in cost accounting. In such a hierarchy the total costs at the top of the hierarchy can be divided into material and personnel costs at the first level of differentiation, and these two cost figures are often broken down into deeper levels using further definition equations.¹⁰⁰²

In the context of an Integrated Target Commitment Planning, quite a number of hierarchical definition equation systems are used that do not fulfill this condition and therefore are no classification hierarchies.

¹⁰⁰¹ Steinhausen, D., Langer, K. *Clusteranalyse: Einführung in Methoden und Verfahren der automatischen Klassifikation*, Berlin 1979 and Niemann, H., *Klassifikation von Mustern*, Heidelberg, 2013.

¹⁰⁰² See for an example: Zwicker, E., *Area Target Commitment Planning and Control of primary and secondary Areas of Responsibility in the System of the Integrated Target Commitment Planning*, Berlin 2000, www.inzpla.de/IN09-2000d.pdf, p.54f (Text in German, title translated).

The relationship between hierarchies and hierarchical classification systems is demonstrated below using the computer-supported hierarchy generator for profit hierarchies that is a component of the INZPLA-system.

In the description of the two-dimensional hierarchical profit segment system (s.p.74), it was shown that a number of other hierarchies can be generated using so-called edge hierarchies. The both edge hierarchies used in the example are an article hierarchy and a region hierarchy. These two hierarchies are classification hierarchies that fulfill the exhaustion condition. This is because the number of subordinate articles or regions of a hierarchy element corresponds exactly to the number of elements (articles or regions) that the higher-level hierarchy element (an article or region group) possesses.

Using these two primary classification hierarchies (or edge hierarchies), the hierarchy generator of the INZPLA-system can generate a wide range of different secondary non-edge hierarchies. In the case of the example described, it was shown that it was possible (s.p.122) to generate on the base of this two dimensional hierarchical classification system a total of fourteen different secondary non-edge hierarchies.

A specific sales quantity can be assigned to each hierarchy element of these secondary non-edge hierarchies. It is therefore also called a sales segment. You can now assign additional variables to the sales quantities in the sales segments, which allows you to generate another class of structurally identical hierarchies containing certain elements that can be uniquely assigned to the sales quantities. These are termed tertiary non-edge hierarchies.

These variables assigned to the sales quantities are the contribution margins₁, the contribution margins₂, the net profits and the individual fixed costs of the sales segment in question in the sales segment hierarchy. Only the three profit figures are relevant for analysis purposes.

This means that three tertiary non-edge hierarchies are available for drill-down analysis, namely the contribution margin₁ hierarchy, the contribution margin₂ hierarchy and the net profit hierarchy. Only the net profit hierarchy is a classification hierarchy. The two other hierarchies are characterized by the fact that the contribution margins of their subordinate sales segments are added together, but the individual fixed costs of the sales segment in question are subtracted from their totals. This violates the exhaustion condition.

In the case of the hierarchy generator for cost hierarchies (s.p.155) which was also developed for the INZPLA-system, the hierarchy of the primary cost element hierarchy and the cost center hierarchy functioned as edge hierarchies. Both edge hierarchies form a hierarchical classification system. With the help of this hierarchy generator for creating cost hierarchies, you can develop a large number of different secondary non-edge cost hierarchies whose elements represent specific cost values. All cost hierarchies generated in this way are hierarchical classification systems, because the values of the relationships be-

tween a higher-level cost segment and its subordinate cost segments fulfill the exhaustion condition.

The edge hierarchy of the primary cost elements should not be confused with the hierarchy of the area costs, which can also be generated (s.p.156). The basis here is again a cost center hierarchy. Each cost center in this cost center hierarchy is assigned the numerical value of its area costs, resulting in a hierarchy of area costs.

The area costs of a higher-level center are calculated as the sum of the area costs of the lower-level centers minus the internal delivery costs between these lower-level centers. This hierarchy of area costs there is no classification hierarchy since the exhaustion condition is not fulfilled.

In my opinion (s.p.117) the concept of using (primary) edge hierarchies to generate complete profit and cost hierarchies but also only to generate certain hierarchy chains was developed by me. This was followed by the development of hierarchy generators with which you can generate different profit and cost hierarchies within the INZPLA-system using these edge hierarchies.

Using the concept of edge hierarchies, it is also possible to perform a user-controlled drill-down analysis of certain user-defined chains of profit or cost hierarchies. A numerical example of such a drill-down analysis, starting from the operating result and leading across the hierarchy chain of a specific profit hierarchy, is demonstrated in detail in this text (s.p.118) using an example.

And the starting point of all this was a frustrating lecture. You never know what some things are good for.

One last remark on hierarchies. With my preference for hierarchies, the realization was inevitable that in the literature on business administration, even by renowned representatives of the field, pseudo-target hierarchies (as I have called them) are developed, the use of which, to emphasize it again here (s.p.372 a. 565), I do consider to be delusive and useless.

Definitions, classifications and hierarchies have kept me very occupied, as you can perhaps see. And this is not unimportant, because they form the basis of all scientific activity. But the conceptual apparatus developed here and the elaboration of its classificatory relationships form only an important basis, and this serves to develop a practice-relevant normative theory for the operational planning and control of companies. But the "crowning" or "non-crowning" of my occupation with definitions is described elsewhere (s.p.606). There I report on my attempt to bring down the paradigm of the prohibition of circular definitions, which has been unquestioned since antiquity, by an undeniable example of an "acceptable circular definition". Whether this leads to a climax or a low point of my engagement with definitions, however, depends on whether this example is conclusive or erroneous.

5. How has the model-based criticism of other texts influenced the development of the Integrated Target Commitment Planning

The contributions of the four leading representatives in the field of operational planning and control, namely Kaplan, Malmi, Wagenhofer and Küpper, have been analysed and criticized at various points in this text "*in the light of the Integrated Target Commitment Planning*". Here, in conclusion, the only question to be addressed is what the contributions of these authors have actually contributed to the development of Integrated Target Commitment Planning and Control.

Wagenhofer and Küpper:

Ewert and Wagenhofer's work, as described, was only systematically read by me after my meeting with Wagenhofer in Graz (s.p.416). At this point in time, the decisive development of the Integrated Target Commitment Planning had long been completed. Your work could therefore not make any contribution at all. But in retrospect, I can only say that if I had read it before, it would have made no contribution either.

The situation is different with Küpper's publications. I have followed his both books for controlling and cost accounting throughout the whole development of the Integrated Target Commitment Planning. But the result is the same as with Wagenhofer. There was nothing to learn from his two books with regard to the development of a model-based planning system. Based on the many criticisms of Küpper's approach, I hope to be able to justify at least this somewhat harsh judgement. And the same applies to the work of Ewert and Wagenhofer, whose criticism was much more rigorous but also more extensive.

However, Küpper and Wagenhofer have still made a contribution to the development of the Integrated Target Commitment Planning, if only in a special way.

As already mentioned, Wagenhofer made it clear to me in Graz (s.p.448) that he was not interested in a technical discussion with me about the Integrated Target Commitment Planning. On my return from Graz, I then tried to read in Hugendubel's bookshop in Munich, in Ewert and Wagenhofer's work on "Internal Accounting", everything that would report there on the agency theory (s.p.399). But all I found on the shelves was Küpper's controlling book. And as further reported the study of Küpper's text on hidden-action agency theory ultimately led to the development of hidden-effort agency theory.

Without the conversation with Wagenhofer and the resulting study of Küpper's text in Hugendubel's bookstore, I am quite sure that the development of the hidden-effort agency theory would not have taken place. And this is the only indirect contribution Küpper and Wagenhofer have made to the development of the Integrated Target Commitment Planning. This story is important because the development of hidden-effort agency theory is a keystone in the development of the normative theory of the Integrated Target Commitment Planning and Control. This is because with the integration of the hidden-effort agency theory, as already mentioned, the Integrated Target Commitment Planning and Control became a normative theory that encompasses the concept of "management by objectives", the classical deterministic decision theory, the normative version of Simon's

theory of a satisfying decision-maker and, finally, an area-specific form of normative agency theory.

Kaplan. Although I have carefully read and analyzed Kaplan's two main publications in the field of operational planning (s.p.184-195), they have not contributed anything to the further development of the Integrated Target Commitment Planning and Control. Like Küpper and Wagenhofer's contributions, they are at a level that, from a model-based perspective, does not contain anything that could have been taken over to improve the Integrated Target Commitment Planning and Control.

However, as with Küpper and Wagenhofer, Kaplan has indirectly contributed to a planning process that is not the subject of the Integrated Target Commitment Planning, but which can be used as a further planning variant, based on the same model used for the Integrated Target Commitment Planning. This is the elimination planning described elsewhere (s.p.187), which is a variant of an optimizing planning.

As reported (s.p.184), Kaplan and Johnson have published a work that has been highly acclaimed by the professional community called *"Relevance Lost: The Rise and Fall of Management Accounting"*. There he announces in the preface that he wants to present an *"entirely new Management Accounting System"*. This "novelty" is documented in the demand to eliminate those articles with a negative unit contribution margin (s.p.186). As mentioned, Wolfgang Kilger already described such an elimination planning more than fifty years ago.

But Kaplan's elimination procedure, unlike Kilger's, assumes a special situation. He claims (s.p.187), that costs that were assumed to be fixed in the context of an annual planning become variable in the context of a planning that now assumes a planning horizon of $1+X$ years, and thus can be allocated to certain articles as variable costs. This should lead to a situation where the positive contribution margins of these articles in the case of one-year planning become negative when using $1+X$ annual planning, with the consequence that these articles should be eliminated. This method of an eliminating planning, which is a transformation of fixed costs into variable costs as explained in detail, is an absurdity (s.p.186).

However, it has stimulated me to think about how, in the system of the Integrated Target Commitment Planning, a decision on the elimination of certain articles could be reached. The first conclusion I reached was that the criterion for eliminating an article should be its contribution margin₂, i.e. its sales revenue less its variable costs and its individual article fixed costs (s.p.187). Afterwards, however, I came to the further conclusion that it is also possible to eliminate entire article groups if their article group contribution margin₂ is negative. Finally, I developed an optimization model and integrated it into the INZPLA-system, with which the operating result can be maximized by eliminating certain articles and article groups (p.130 and 186).¹⁰⁰³

¹⁰⁰³ Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., p. 47f., www.inzpla.de/IN11-2001a.pdf. (Text in German, title translated).

I don't think this procedure is bad, although it is a kind of "optimization under unrealistic assumptions". The reason is that it is based on the (unreal) case that it is possible to completely reduce both the total variable costs of an article or article group and its individual fixed costs within the framework of the upcoming annual planning. In my opinion, but also according to the heads of controlling of some companies I interviewed, the result can provide useful information for the future design of a planning. Because in the context of the planning years following the forthcoming planning year, some of these eliminations may be realized if the structure and the numerical framework of the model in question, which is relevant for the decision, is not changed significantly.

The impetus for this development was provided solely by Kaplan's inadequate explanations of his decommissioning planning.

Malmi. Malmi's assertion in Vienna that the Integrated Target Commitment Planning and Control is not a normative theory has triggered a multitude of activities in my work, which are documented in various texts (s.p.196). An important point was that I thought about what can actually be understood by a "normative theory" and formulated the consideration of this in a text.

Already with Küpper's rudimentary remarks on a normative theory of controlling (s.p.312) I had the impression that it would hardly be possible to formulate such a theory at this level of representation. But it was only Malmi and Granlund's reflections on a normative theory of management accounting that convinced me that it would be almost impossible to develop an application-relevant normative theory of management accounting at a verbal level that would not be exhausted in trivialities. It can only be model-based, if at all.

Malmi and Granlund's contribution has thus led to propose the definition of a model-based normative theory of management accounting (s.p.565), in which the normative theory of the Integrated Target Commitment Planning and Control forms a subset of the set of objects covered by this definition. This is the first contribution of Teemu Malmi and Markus Granlund to the classification of the Integrated Target Commitment Planning as a variant of a general model-based normative theory.

Malmi's second contribution results from his essay with Brown on management control systems (s.p.197). In my view (s.p.200), the features of certain variants of a "*management control system*" cited by Malmi and Brown are not precise enough to be fruitfully used in any normative concept for the application of management control systems. This has given me the idea of systematizing the responsibility-based setpoint-actual control used in the system of the Integrated Target Commitment Planning and Control as a subset of a general normative control theory that I have conceived, which is also characterized by a "responsibility-based setpoint-actual control" (s.p.201), the setpoint value of which originates from a planning. Without Malmi and Brown's contribution, this general normative theory of a setpoint-actual control would not have been developed.

6. John D.C. Little - Is a fundamental criticism of an icon allowed?

My criticism of the contributions of the four top representatives in the area of the operational planning and control should already be considered by many readers as "strong stuff". But it is far surpassed by the criticism of Little's concept of the Decision Calculus. This criticism does not contain such drastic formulations as those of the four top representatives. But it is much more massive. And this is due to the extraordinary discrepancy between the extremely negative appreciation of Little's contribution and the extreme recognition Little enjoys in the scientific community. In his scientific reputation he surpasses the top representatives I criticized many times over. And this reputation is mainly due to his "groundbreaking essay" on the Decision Calculus Concept, i.e. the contribution that I criticized in a quite excessive way.

Little's contribution to the Decision Calculus Concept was awarded (s.p.283) as "*one of the ten most influential papers published in Management Science*". His contribution to the Decision Calculus Concept titled "*Models and Managers: The Concept of a Decision Calculus*", which he published in 1970, was reprinted 34 years later, in 2004, because of its fundamental importance, once again completely in the journal Management Science, i.e. the place of its original publication, a unique process in the history of this prominent journal. It is worth noting, however, that Little was named a "*MIT Institute Professor*", an award (s.p.284) given to some twelve MIT scientists who are all "*world leaders in their field*".¹⁰⁰⁴

When I first held the photocopy of Little's fame article "*Models and Managers*" in my hands, I had already the expectation caused by the many references to this groundbreaking text of participating in a kind of "revelation". But already at the first reading, in the light of my model-based view, I came across an abundance of questionableness and these questionableness deepened with each further reading of Little's text. At the end of my intensive studies the whole text was considered to be a complete failure

I have dedicated a relatively large part of the entire text of my "History..." to the criticism of John D. C. Little and the related questions about model-based sales volume planning. The idea was: If no one is interested in the Integrated Target Commitment Planning, then this model-based critique of Little's Decision Calculus Concept might be of interest to one or another.

The only relevant thing about Little's text is that his approach can be reconstructed as a methodological postulate for developing models, which I call "Little's permission". In my view, it has the status of a paradigm (s.p.595) because it leads to a fundamental expansion of the possibilities to generate empirical hypotheses. However, Little may not have been aware that the way he proceeded can be interpreted as a method for developing models that allows to do something that was previously "actually" forbidden. And this "permission" is in my view the only relevant thing of the whole text.

In my criticism I take no regard for the high rank of his author. But should I also make this vehement criticism public? To dare a total confrontation with such a luminary requires a certain overcoming. When Ulrich von Hutten opened his attacks on the Pope's teachings (a life-threatening undertaking at the time), his slogan with which he encour-

¹⁰⁰⁴ See in detail about these awards, see page 283f.

aged himself was *"I dared it"*. This was how I felt when I formulated my criticism of the then "Pope of Operations Research".

No text in this "History..." I have revised, redesigned and polished so often as this one. And I can only quote Theodor Fontane. In his opinion it is *"one of the most difficult and embarrassing tasks of the profession... also celebrities, yes, which is worse, even those who are considered greats and celebrities themselves, to have to say unwelcome things"*. But Fontane continues: *"bad is bad, and it has to be said. Afterwards others can come with the explanations and mitigations."* It is exactly the case.

7. Who likes to be publicly criticized?

This question can be clearly answered with one word, namely: *Nobody*. Elsewhere, I have described (s.p.324) what would happen if Hans-Ulrich Küpper, using well-founded arguments, succeeded in "unhinging" the Integrated Target Commitment Planning step by step in a public debate. Such successful criticism would, as already admitted there, also "unhinge me".¹⁰⁰⁵ One is not as sensitive when criticizing as when being criticized.

In fact, my sensitivity to a publicly expressed criticism was already evident when Teemu Malmi (s.p.196) told me in front of the entire audience in Vienna that the Integrated Target Commitment Planning and Control was not a normative theory.¹⁰⁰⁶

No matter how well-founded the criticism may be, it almost never goes down well with the criticized person. This applies to all areas of life. The music critic Joachim Kaiser revered Arthur Rubinstein and celebrated him as *"a real miracle"*. And how did Rubinstein react to this admiration? He remarked to him: *"Mr. Kaiser, what you have written about me positively, I will forget immediately. But I will keep your occasional negative remarks as long as I live."*¹⁰⁰⁷

It is not to be expected that the authors I criticize, who currently dominate the scientific community of controlling, will themselves come to the conclusion that they are "on the wrong way". This is not possible and also understandable, because their contributions were not exactly judged in a friendly way by me, and one can even say that some of them can be considered as polemical. As far as the drastic nature of a criticism is concerned, I would like once again quote to Fontane (s.p.449). *"He who weighs up anxiously says nothing. Only the sharp drawing, which already touches the caricature, makes an effect."* And as far as success in convincing someone that he is wrong is concerned, Otto von Bismarck is not entirely wrong when he claims *"In order to successfully refute a wrong thought, you have to write a whole book and you can't convince the person who said it."*¹⁰⁰⁸ Even the next generation of academic scholars in the field of management accountings will unlikely to be convinced that in the area of an operational planning and control only a model-based approach is appropriate, and not a remaining on a verbal level with occasional "quantitative slips". The influence of their spiritual fathers who dominate the scene today should not be underestimated. But it cannot be ruled out that at some point the view of model-based operational planning and control propagated here will gain more influence after all.

¹⁰⁰⁵ For the arguments that could be used to effectively tackle the Integrated Target Commitment Planning, see page 321.

¹⁰⁰⁶ But my annoyance about it led me at least to an extreme development of activity, see p.208.

¹⁰⁰⁷ Kaiser, J., *Ich bin der letzte Mohikaner*, Berlin 2008, p. 26 u. 42.

¹⁰⁰⁸ See to Otto von Bismarck <http://zefys.staatsbibliothek-berlin.de/amtspresse/ansicht/issue//2065>.

38. Praising yes - but why and whom?

It is truly amazing how established and experienced adults depend on the praise of others, even align their behavior extensively with being praised or gaining prestige. In general, a scientist can only be praised for his performance by his colleagues, because they are the only ones who can properly judge and evaluate their relevance. As far as the behavior of colleagues is concerned, however, there is no better label than the already quoted poem by Oskar Blumenthal *"Gaining recognition from your peers ..."* and especially for business economics the also quoted poem *"You want to impress with writings..."* (s.p.515). Praise and criticism prove to be important elements of any communication in the scientific world but also in other areas of life. The way they are formulated and communicated plays a major role for those involved. For this reason, the following is intended to provide a few remarks on how the praise and criticism in this "History..." is dealt with.

It introduces people for whom I have great respect and some of whom I even admire. The meeting took place through personal conversations but also by reading what they had written. It is described at different places in this "History...". But in the following some of them will be described again. Since I am not sparing with praise, I will first give some thoughts about why people praise and how to judge praise.

The following chapter is therefore devoted to the topic of "praise", which in the scientific field means "appreciation of the achievements of others". "Praise" is the opposite of "criticism". And "criticizing" has already been treated as a topic.

A poor drip is the man who cannot praise others.

From a purely scientific point of view, it is the task of a scientists working in the same field to criticize the contributions of his colleagues and not more. But criticism should also be a productive one and not, as with Dieter Schneider (s.p.452), just one of increasing one's self-esteem.

A criterion for the balance of a critic's criticism is perhaps whether he does not only criticize or even destroy everything, but also praises something.

The scientific progress of a discipline is shown by the fact that new hypotheses and whole theories prove themselves by not being falsified so far (by critics). But new hypotheses or also new normative concepts should not only be acknowledged by the experts, but should also be judged by them with regard to their innovative relevance. Such an assessment may, however, also lead to an appreciation or, more simply, to a praise. Books on the history of a discipline are dedicated to the goal of not only describing the development of a discipline, but also recognizing the achievements of some experts in this discipline.

If, however, one reads some book reviews that overflow with praise, then one wonders whether this praise is justified or was written by an author only in the hope of being praised later in the same way or even more strongly. For example, if you look at the hymns of praise on Kaplan's works, you can only shake your head in view of what is offered there. As mentioned above, the Balanced Scorecard System was described in a Harvard Business Review article as *"as one of the most important management practise of the past 75 years"* (s.p.189).

One could now get the impression that in my "History..." I only act as a critic. And this impression could especially be caused by the extremely long criticism of Little's Decision Calculus Concept. (The reason for this "excess" has already been communicated s.p. 581). But this does not apply to the relationship between those who are criticized and those who are praised. If a praise is justified from my point of view, I am even happy to praise someone. Here are just a few examples:

For **Wolfgang Kilger's** work "*Flexible Plankostenrechnung...*" I have an extraordinarily high regard (s.p.517) and this is expressed in all clarity. He has (as his wife told me) worked intensively on this book all his life. A successful life's work that can only be treated with the utmost respect. Without him, the Integrated Target Commitment Planning would not have been developed (s.p.624). Elsewhere (s.p.516) I have described why I am his greatest admirer and at the same time his greatest critic and why I was afraid to enter into a conversation with him.

Herbert Simon is really admired by me and I have read a lot about what he has published. Simon was really ingenious. Everything he touched, he achieved innovative and groundbreaking. The remarks about him (s.p.548) can only be understood as a hymn of praise which cannot be more extreme. But others also see Herbert Simon as an exceptional phenomenon. Thus Daniel Kahneman (like Herbert Simon Nobel Laureate for Economics) honors Herbert Simon's achievement with the statement "*Simon was one of the outstanding scientists of the 20th century*".¹⁰⁰⁹

After an intensive study of Herbert Simon's theory of satisficing decision making, I developed a normative concept, that in my opinion represents a further development of his theory.¹⁰¹⁰

Thus it was showed by me how Herbert Simon's (descriptive theory) of a satisficing decision maker, for whom he was awarded the Nobel Prize for Economics, can be "*normatively captured*" in the case of an operational company planning and control. In this case, a decision maker is required to practice such a satisficing planning (decision making) during the planning process of an Integrated Target Commitment Planning. The step in which this satisficing planning has to be carried out is the top-down step. In this case, Simon's "*actions that are expected to be satisfactory*" (s.p.480) that is, the selected values of the action variables for executing a satisficing planning, correspond to the top down values of the basic targets which have to be determined by the corporate management.

I also claim that a model-based operational company planning in the sense of Simon's theory of a satisficing decision maker can only be realized within the concept of the Integrated Target Commitment Planning. For a normative version of Simon's descriptive theory of a satisficing decision-maker requires, so my claim, a planning procedure that distinguishes between decision variables and basic targets (s.p.488). And this is only the case with the Integrated Target Commitment Planning. I would be very interested to know what Herbert Simon would have said about it.

¹⁰⁰⁹ Kahneman, D., *Schnelles Denken, langsames Denken*, Munich, 2012, 22nd edition, p. 590

¹⁰¹⁰ See the pages 480- 496 and 552.

As mentioned (s.p.491) Sune Carlson pointed out in his laudation to Herbert Simon on the occasion of the award of the Nobel Prize that "*Simon's theories and observations on decision making in organizations apply well to the systems and techniques of planning, budgeting and control that are used in business and public administration.*" In case of the Integrated Target Commitment Planning Simon's normatively turned theory of a satisficing decision maker is in fact *appl(ied) well to ... planning, budgeting and control... that are used in business.*

Simon's theory, which applies to all areas of life, is limited in the case of the Integrated Target Commitment Planning only to companies in order to carry out their operational planning. However this is exactly the area from which Simon started when he developed his descriptive theory. In this field of an operational company planning Simon's satisficing planning (or satisficing decision making) is now integrated as a well-defined (*normative*) partial step of a comprehensive operational planning and control procedure of a company.¹⁰¹¹

A lot I owe to **Gunnar Eliasson's** research and explanations. But also the style of his book is sovereign and stringent (s.p. 27, 159 a. 477). His work is a prime example of how an empirical investigation can be consistently combined with a theory. I know of no better work in the field of economics. You only need to read a few pages to see the level of this work in the treatise of its question.

Charles Bonini's book is an excellent work (s.p.474). It is exemplary how he operationalized the statements of the "*behavioral theory of the firm*" and Simon's satisficing behavior theory within the framework of an elaborate difference equation model and then investigates this model with regard to certain implications by using simulations. We have the greatest affinity with each other in the combination of theories of a company and its simulation on the basis of computer models. I know of no other work which has further developed Bonini's approach, not because it leads to a dead end, but because his model cannot be surpassed.

As reported, I came across **Hermann Simon** in the context of the criticism of John D.C. Little (s.p.289). With well-founded arguments, he "*dared*" to cast doubt on the relevance of the "*sales response functions*" whose discussion is regarded by almost all quantitative marketing experts as the main field of their activities (s.p.289). And my so-called "*Simon's assertion of a structural break*" characterizes one of his arguments. Reading his "*Pricing Man*" convinced me of the importance of "*pricing*" and showed me how one can still work with price-sales functions in operational models (s.p.296).

If one reads (s.p.298) how Hermann Simon, as an originally analytical theorist of price theory, developed into the world's leading expert in the field of pricing, i.e. the application of these theories, then nobody can remain unimpressed. Such a career is unique. And what it means to compare his "*Pricing Book*" with the book "*My years with General Mo-*

¹⁰¹¹ For details, see pages 479-496 and 624.

tors" of Alfred Sloan (s.p.297) can only be judged by someone who knows what cult status this work enjoys in the USA. This man impressed me so much that I also read his memoirs *"Two worlds, one life..."*¹⁰¹²

I don't want to praise him again, but I can only recommend everyone to read it. An extraordinary way of life and a unique life achievement. In view of my praise at that time, I wrote about two years ago (s.p.297) in order not to give rise to any false ideas that I had never met Hermann Simon personally before. This is still true today (10-2019) and I wonder if such a meeting is meaningful at all, because actually my picture of him cannot improve any more, only the opposite can be the case.¹⁰¹³

Praise for normative non model-based approaches to operational planning.

A reader of this "History..." might think that I consistently criticize all contributions in the literature to operational planning and control, and thus in particular the contributions to cost planning and control, because they do not practice a pure model-based view. This is also the assertion of a pre-reader.

Such an assertion is not easy to dismiss. I consider the model-based consideration of a "calculating system" such as cost-performance accounting to be the most appropriate approach since such "calculations" are nothing more than calculations using an equation model. This *model-based view* of accounting allows to criticize a number of features of the approaches of cost-performance accounting developed so far. But it also shows how to do it better.¹⁰¹⁴ But this does not mean that all analyses and considerations in the field of operational planning and control must necessarily be model-based. In my opinion, a model-based approach leads however to some advantages.

Wolfgang Kilger's *"Flexible plan cost accounting"* is "pure cost planning", but this planning is not model-based. I only reconstructed it model-based. On the basis of Kilger's representation of flexible plan cost accounting, anyone can develop and carry out cost planning without having to know anything about the Integrated Target Commitment Planning. However, (to put it mildly) such a planning according to Kilger's regulations, which were realized in the SAP-CO system, could possibly lead to certain difficulties and inconsistencies, which would not occur when planning the operating result with the INZPLA-system. And a stringent and comprehensive *"responsibility-based planning"* is only possible by applying the principles of the Integrated Target Commitment Planning. This does not even mention the many analyses that can only be performed on the basis of an equation model and are therefore not available in the SAP CO system.¹⁰¹⁵

¹⁰¹² Simon, H, *Zwei Welten, ein Leben: Vom Eifelkind zum Global Player*, Frankfurt, 2018

¹⁰¹³ Thomas Mann once remarked. People always want to get to know me personally. What's the point? They should read my books. That's the best part of me.

¹⁰¹⁴ See, for example, Küpper's inaccurate assertion about the advantages and disadvantages of the cost of sales method and the total cost method (s.p.559) or the criticism of the inadequacy of Kilger's allocation method with *"coverage reference sizes"* (s.p.22).

¹⁰¹⁵ For more information about the deficits in the cost planning described by Kilger, which are also reflected in the SAP-CO system, see pages 325, 516 and 621.

In **Anthony Hopwood's** work "*Accounting and Human Behaviour*", which is analysed and appreciated in detail in this "History..." (s.p.218) there is not the slightest approach to a model-based representation of management accounting. Therefore, I did not carry out any model-based reconstruction of certain connections described by Hopwood, as is the case with the Balanced Scorecard Concept of Kaplan and Norton (s.p.191). The amazing and so impressive thing about Hopwood's text is that he formulates in an excellent way, purely verbally, the normative principles underlying the Integrated Target Commitment Planning.

He spoke from my heart by pointing out that in the field of planning, the clarification of the relationship between planning by target commitment of responsibility areas and an optimizing planning is an extremely urgent problem. And he is the first and only author to refer to this problem (s.p.220). Within the framework of the Integrated Target Commitment Planning, it is shown how these two planning procedures can be reconciled *model-based* without contradiction (s.p.45).

In order to get to know the man who wrote such an excellent book, I attended, as mentioned (s.p.222), his lecture at the conference of university lecturers for business administration. And to my surprise, I not only met an outstanding scholar there, but also an impressive personality.¹⁰¹⁶

Richard Mattessich is in my opinion the only expert who has analysed accounting in a systematic way, i.e. as a system. The title of his German written book "*Die wissenschaftlichen Grundlagen des Rechnungswesen*", (*The Scientific Basis of Accounting*), describes exactly the content of this work. He was the first to describe the matrix representation of accounting (s.p.9).¹⁰¹⁷ All models developed in my field for a comprehensive company planning work with such an accounting matrix. It proves to be an excellent construct for the model-based representation of accounting.

Just as important, if not more important, is Mattessich's Manifesto for a change of course in the accounting discipline, entitled "*Critique of accounting - Examination of the foundations and normative structure of accounting*". This contribution was extensively appreciated by me (s.p.211). In my opinion, it represents one of the most important contributions to the field of accounting. Mattessich calls on "*the entire accounting community*" to make a radical change in the direction of research in its field. He demands the academic representatives of accounting that they should not regard their field as a "*pure science*", but develop "*purpose oriented models*" that serve the practice. Mattessich sees "*the creation of a considerable number of accounting models, each with specific hypotheses tailor made to a specific accounting objective*" as an "*ultimate vision*".

¹⁰¹⁶ As I could only recognize from one of his obituaries, Anthony Hopwood was also one of the most important representatives in the field of management accounting. He was awarded five honorary doctorates, was elected to the Hall of Fame of the American Accounting Association, and received a host of other awards. See www.theguardian.com/education/2010/jun/28/anthony-hopwood-obituary

¹⁰¹⁷ See also: Mattessich, Richard, *Towards a General and Axiomatic Foundation of Accountancy – with an Introduction to the Matrix Formulation of Accounting Systems*, in: Accounting Research 8, p. 328-355.

It is an outstanding work, which every expert in accounting should at least take note of. As a representative of a model-based operational planning and control I can, of course, fully agree with Mattessich's statements and demands. And the Integrated Target Commitment Planning (s.p.212) makes a significant contribution to this. It could even be seen as a system that exactly meets Mattessich's requirements.

Praise for descriptive non model-based theories on operational planning. Descriptive behavioral theories that describe the behavior of people in the area of accounting are also not criticized, if at all, because they are not model-based oriented. Their theses are only considered from a model-based view and may be specified under certain circumstances. This applies, for example, to **Mouritsen's** and **Kreiner's** descriptive theory of accounting based "*promise decision making*" (s.p.460), which is analyzed in the light of the Integrated Target Commitment Planning. It will be shown how the explorative theory of "*promise decision making*" which has been verbally described by Mouritsen and Kreiner can be connected with the normative theory of the Integrated Target Commitment Planning. Mouritsen and Kreiner's theory is recognized as a contribution to the extension of descriptive decision theory.

The connection of this theory with the Integrated Target Commitment Planning, which I have described, makes it possible to interpret the basic target commitments of the Integrated Target Commitment Planning as a concretisation of the "*promise decisions*" of Mouritsen and Kreiner's theory of accounting based "*promise decision making*" (s.p.460-467) and thus to place them in the broader theoretical context of their theory

Praise of personalities outside of management accounting

The reports on Karl Deutsch (s.p.536), Hasso Plattner (s.p.344), Carl Hempel (s.p.533), Walter Goldberg (s.p.551) and Wolfgang Stegmüller (s.p.533) enriched with praise are completely detached from the area of management accounting. To two of them only a short addition will be made.

Karl Deutsch had a high reputation in the scientific community and when I met him for the first time, he already had six honorary doctorates. But that says nothing. Dieter Schneider had also four of them (s.p.455). I have formed my own judgement. As basis serve the detailed discussions with him running over years and his writings (s.p.543).

The same applies to **Hasso Plattner**. He is described by others as a "*technical genius*" and "*visionary*" (s.p.355). That may be true, but it didn't impress me. I was interested in him because I spent decades working on the SAP system, which he had helped to develop to a large extent. And like me, he was a system developer. However, there is one not insignificant difference between us: He developed the world's most important and successful business software system and mine did not exceed the status of a prototype.

I "visited" for many hours his video lectures (s.p.349) at the Hasso-Plattner-Institute online and read his authoritative publications. This was the basis for my explanations, which lead to an impressive picture of his person.

I was also interested in Hasso Plattner's ability as a simple analyst and system developer at IBM to realize his ideas in a system that dominates the world market. But it is also important that we have at least one thing in common. Like Hasso Plattner, I have pro-

grammed excessively in younger years (s.p.509 a. 532). This brings with it similarities, because programming leads to a working style that requires precision and meticulousness. And only if you own these or have acquired them is it possible to develop large systems. In any case, I find the man highly impressive and my judgement that he "*in his contribution to industrial progress is comparable to Henry Ford or Werner von Siemens*" (s.p.348) is my full seriousness. And that, although he didn't show the reaction I had hoped for in my "lecture" in the Hasso-Plattner-Institute in Potsdam, which only served the purpose of winning him over to the INZPLA-system (s.p.346).

You praise me and I praise you.¹⁰¹⁸

The question arises: Why does anyone praise? And the question arises in particular, why should anyone praise me for the development of the INZPLA-system? I developed the INZPLA-system and think its good (s.p.554). For most professionals, however, this model-based view is probably too foreign to deal with. And the appreciation of a concept is only possible if one takes a deeper look on it.

What Küpper, as the leading specialist representative of German-speaking management accounting, has presented for confusing remarks on the construction of models (s.p.310), does not, however, lead one to expect anything good. In the university field I am probably the first and at the same time probably also the last Mohican in the area of a systematically applied model-based operational planning and control of companies. Why should one concern oneself with the activities of such an exotic? I could live with that (s.p.554), the most important thing is that I enjoyed it and from my point of view something reasonable came out of it.

With every praise you can ask yourself about the motive. And there are different answers to that. Already La Rochefoucauld remarked; "*Usually one praises only to be praised again*". But it can also be the expectation of anything in return. However, La Rochefoucauld also points out: "*A beautiful action to praise from the bottom of one's heart means to participate in it in a certain sense*". There is something to it, and especially when "*beautiful action*" is replaced by "*great performance*".

The multi-volume work by **Wolfgang Stegmüller** (s.p.533), which was my entry into the theory of science, I found so excellent that I would give something to have written it myself. It has shaped both my way of formulation and my style of argumentation. My subsequent "*participation*" in this work consisted not only in praise, but also in the fact that I created a multi-page list of concise formulations and argumentation schemes that are nowhere better than in Stegmüller's book. In order to internalize his clear treatment of a topic, I copied a whole series of his particularly successful passages by hand and then read them out loud several times.

My endeavor to translate important maxims, which do not come from me, but which I fully agree with, into English, is also an expression of this need to somehow "*participate*" in something already created (s.p.547).¹⁰¹⁹

¹⁰¹⁸ You praise me, and I praise you that is useful for us two.

¹⁰¹⁹ This also includes my "heroic attempt" to translate in this version the entire Korf poem i.e. my "con-

This "*participation*" in my veneration of **Herbert Simon** is more than clearly recognizable. Everything he wrote, and I read a lot about him, I would have liked to have written myself. But it is impossible to emulate him at his level. Unfortunately, I lack some prerequisites for this. My achievements are several floors below his level. Nothing can be done about it. But with my extraordinary laudation for him (s.p.548), which can already be called enthusiastic, I actually take part (you may laugh about it) a bit in what he has created. And with my "normative version" of his descriptive theory of a satisficing decision maker, I have also contributed to continuing something he has created.¹⁰²⁰

So you don't always praise in order to take advantage of it. There are also other reasons. But what about receiving praise? I have tried from an early age not to be influenced by praise. Unfortunately, this is not always possible, especially if you appreciate the praiser. Over the years, I have submitted my texts to a number of staff members with the request to analyse them critically. One thing I always made clear to them: "*Don't get the idea of praising anything about this text. The only thing is to criticize it and the more justified and fundamental the criticism, the better*".

You should listen to others when it comes to well-founded criticism or suggestions, but what people or colleagues in particular say about you, and thus express praise or criticism, is completely irrelevant.¹⁰²¹ A party is often characterized by the fact that people are talking about those who are not present or have already left. And that has always been the case everywhere. It was not without reason that it was customary in Vienna for a housewife to say goodbye to the hostess of a coffee gossip "*I bit um gut Nachred*". One could translate it with: "*Please talk good about me after I leave*."¹⁰²² And in my experience this also applies to "professorial meetings" at conferences, symposia or elsewhere. It is always an "after-talk".

Following Axel Hunschas "*scandalous slander*" (s.p.508) of my never happened messed up invitation to a dinner, I intentionally contributed to acquire the reputation of a foolish, maybe even slightly moronic professor at the TU-Berlin by another "*scandalous slander*" on myself made by myself (s.p.508). And I enjoyed meeting colleagues who obviously believed this story. What do I care about praise or blame?

ducting poem", which has been hanging next to my monitor on the wall for decades, from German into English. It is contained in my "last lecture", see page 644.

¹⁰²⁰ See pages 480-496 and 552.

¹⁰²¹ See my poem "*When a reputation is not sought...*", on p. 513. The same applies accordingly to a "*praise*".

¹⁰²² "*Please talk good about me after I leave*" is only a weak translation of the Viennese coloured short sentence "*I bitt um gut Nachred*". From the meaning it should read: "*After I leave, of course, you'll talk more or less badly about me. But please don't talk too badly.*"

39. Paradigms of model development and their use

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1. Introduction

In science, individual representatives, groups or even all members of a discipline assume certain fixed conceptions, which include what could also be classified under terms such as *guiding principles, methods, assumptions, demands, solution procedures* and the like. For such consciously or unconsciously "fixed conception" of handling an activity in a scientific field one can also use the name "paradigm". However, it is typical that this term cannot be clearly defined.

Since Thomas S. Kuhn, in his groundbreaking work "*The Structure of Scientific Revolutions*", used the concept of a *paradigm shift* as the hallmark of a scientific revolution, the concept of a paradigm has received a great deal of attention. According to Kuhn, paradigms are "*universally recognized scientific achievements that, for a time, provide model problems and solutions for a community of practitioners*".¹⁰²³ But Kuhn does not provide a stringent definition of a paradigm either.

It was only through Kuhn's book that I really realized how important it is to deal with the "solid" that underlies a scientific activity but also every statement in any context. Since then, the concept of a "paradigm" has been firmly anchored in my conceptual world, but not in Kuhn's sense. For, unlike Kuhn, a change in what I regard as a paradigm does not have to trigger a "revolution". For me, paradigms already exist, even if they are only general guidelines, methods, assumptions, requirements or solution processes in a subject area such as operational planning and control. It only has to be "something" whose conscious or unconscious compliance or non-compliance is "of decisive importance" for the field in question. And what is "of decisive importance" or even revolutionary naturally depends again on more or less subjective assessments.

It has become a habit for me, when reading foreign texts, but (at a distance of time) also my own, to pursue the question of which paradigms underlie these texts. Sometimes an author already characterizes his paradigms by calling them, for example, the "decisive" premises of his approach. This becomes particularly clear when he still marks them by a

¹⁰²³ Kuhn, Thomas S. *The Structure of Scientific Revolutions*, 3rd edition. Chicago, p.3

name. But there are also cases where the approach described by an author is based on certain "tacit paradigms" that are not clearly emphasized. These are, if they are not self-evident, of particular interest.

It is obvious to distinguish between different types of such paradigms. If one believes having discovered a paradigm, then one should try to make it more precise in its epistemological status. For example, is it a general empirical assertion or a demand or a system of instructions on how to act? But there are also paradigms, such as certain ways of interpreting a system, which more or less elude such a stringent classification.

An important paradigm that is also undisputed in Kuhn's sense is Popper's falsification criterion, which is the most important postulate of his falsification theory. It asserts (s.p.241) that a statement is only an empirical assertion if observable circumstances can be shown, at the occurrence of which it can be said that the assertion is false.

But Popper also connects a further postulate with this criterion, which states that the person who believes he has established a new general empirical hypothesis should put all his energy into finding observations that make his hypothesis false (to falsify it).

This is quite a lot to ask of someone who thinks he has just formulated a new empirical hypothesis. According to Karl Popper, scientific honesty demands this. At the very least, colleagues in the field should develop such falsification activities. Otherwise there will be no scientific progress.

But Popper's demand can also be extended to other contexts, namely to everything that is called paradigms here. His demand to undertake serious and elaborate activities to falsify the self-formulated hypotheses can accordingly be described as the "efforts to bring about a fall" of your own paradigms. The same applies to the paradigms established by others. Such efforts are not only aimed at whether a paradigm in question can be "brought down" under the accepted conditions, but also serve to clarify the question under which changed conditions this paradigm loses its validity and can thus be brought down.

In other words: everything that is considered a (significant) paradigm in a subject area should be "critically questioned". However, this immediately raises the question of what open and hidden "fixed concepts" I have found in the literature on model-based operational planning and control that seem so significant to me that I consider it appropriate to call them paradigms.

Furthermore, the question shall be pursued, which paradigms were formulated by myself and why do I not regard them as trivialities, but rather as "paradigms" in the field of operational planning and control, which are worth to be discussed. And furthermore, the question arises whether their validity should not be rejected or at least under what circumstances this is the case.

Already in the Bible there is the saying: *"Seek and you shall find"*. Since my "paradigm awareness" has been sharpened by Thomas Kuhn's book, I often come across certain "things" in scientific texts which, according to my understanding of the term, are "paradigms" and which are questioned by me with regard to their claim to validity.

The first paradigms that I "discovered" and analyzed are five paradigms of Forrester's System Dynamics concept (s.p.12). They are discussed in the second section "*Paradigms of System Dynamics Modeling*".

But no less important for me is a paradigm I think I found in the text of John D.C. Little, in which he describes his Decision Calculus Concept. This paradigm, called by me "Little's permission" (s.p.239), is discussed in the third section called "*Little's Permission as a Paradigm*".

These six paradigms, which were not explicitly formulated by Forrester and Little, could only be deduced from their approach. After their discussion, a paradigm going back to Hermann Simon on the applicability of forecasting models in the sales area is discussed. This is done in the fourth section called "*Simon's structural Break Assertion as a Paradigm*".

Then, in the fifth section entitled "*Paradigms of the Integrated Target Commitment Planning and Control*" two paradigms of this normative planning and control theory are discussed.

The first paradigm describes an essential feature of the planning process, while the second paradigm is considered as an essential feature of the control process of this normative theory. This is followed by the question of whether, and if so, to what extent, these two paradigms have already been discussed in the relevant literature.

Paradigms are characterized (in my opinion) by the fact that it is necessary to be able to specify circumstances, whose occurrence makes them lose their validity, i.e. to be brought down. Given the importance I attach to the two paradigms of the Integrated Target Commitment Planning and Control, the sixth section is entitled "*How can the paradigms of the Integrated Target Commitment Planning be brought down?*"

The seventh section is entitled, "*Should the Prohibition of circular Definitions be kept as a Paradigm?*" The paradigm of the prohibition of circular definitions discussed here occurs only indirectly in the context of the Integrated Target Commitment Planning. It caught my attention when I studied the procedures for cost allocations between cost centers that settle interdependently. The equations that describe these costs can be interpreted as a system of simultaneously linked definition equations. However, such simultaneously linked definition equations represent circular definitions. And these are, according to the classical theory of definitions, not allowed. The prohibition of circular definitions is a fixed and undisputed paradigm of today's definition theory.

This section uses the example of cost centers that settle simultaneously to show that the general prohibition of any kind of circular definitions can no longer be maintained because the circular definitions that occur here lead to practically usable results. The consequence of this is that this paradigm of a general prohibition of circular definitions, which has been undisputed since antiquity, has been brought down by the practical use of circular definitions (simultaneous definition equation systems) in plan cost-performance models. However, there are counter-arguments, which are also discussed.

2. Paradigms of System Dynamics Modeling

The System Dynamics concept for modeling dynamic models, which goes back to Forrester, was characterized from me by formulating five paradigms (s.p.14). These are the *level-rate interpretation*, the *feedback heuristic*, the *infinitesimal postulate*, the *requirement of system closeness* and the *recursion demand*. The "discovery" and designation of these paradigms goes back to me, since Forrester did not comment on them. Their identification gave me the idea to develop a model-building method based on an exchange of three of these paradigms, which is superior to the model-building method of Forrester's System Dynamics. It was referred to by me as FOLR modeling.¹⁰²⁴

In this modeling concept, the feedback heuristic and the level-rate interpretation were retained, but the infinitesimal postulate was replaced by the so-called discrete-time premise, and the requirement of system closeness by the openness principle. Finally the recursion demand was abolished, thus allowing the use of simultaneous equations.¹⁰²⁵ The FOLR modeling concept is superior to the System Dynamics modeling concept in that it can be used to describe a much larger set of empirically possible systems.

However, the FOLR modeling also have its limits. On the one hand, as described, feedback relationships can be found relatively rarely in companies (s.p.15), so that the feedback heuristic, for a better identification and modeling of feedbacks, is unlikely to be widely used. Furthermore, relatively few levels occur in the modeling of relationships in companies, so that the approach of formulating a model-based on these levels is not very successful. It is therefore possible to show the limits of the paradigms underlying Forrester's method of modeling heuristics but also the limits of FOLR modeling.

Following the discussion of what I call "paradigms", the question arises whether it is justified to call these prescriptions and at the same time prohibitions of the System Dynamics concept as paradigms. In this regard, I would like to refer to the conversation I described (s.p.16) with Thomas S. Kuhn, in which I asked him exactly this question, whether the five paradigms of the System Dynamics concept can be called "mini-paradigms" from his point of view, and he answered that one "could" do so.

My proposal to replace three of Forrester's paradigms with competing paradigms can probably be called a paradigm shift. However, I have never known if anyone has used the FOLR modeling concept to create a model. While it is clearly superior to the System Dynamics approach, which is still widely used today, it seems that no one in my solely German-language work discovered it for themselves or was convinced of its advantages. But this non-observance does not bother me. I learned a lot about the structure of modeling concepts, so that I was able to better judge other concepts like Little's Decision Calculus Concept. And when I developed my configuration system for cost-performance models based on a hyperstructure model (s.p.479) and the associated regulations for the generation of a singular plan and actual cost-performance model of a company, which

¹⁰²⁴ FOLR = **F**eedback **o**riented **l**evel **r**ate modeling.

¹⁰²⁵ Zwicker, E., *Simulation and Analysis of dynamic Systems in the economic and social Sciences* Berlin 1881, p. 480 - 521, www.Inzpla.de/DS-399-521.pdf. (Text in German, title translated).

forms the basis of the comprehensive planning and control procedure of the Integrated Target Commitment Planning and Control, I did not use my own FOLR modeling concept either.

3. Little's permission as a paradigm

In the text on Little's Decision Calculus Concept, I described a procedure for developing empirically verifiable hypothesis equations, which was called *Little's permission*. It is not one of the six demands so often cited that, which according to Little (s.p.228), must be observed when developing Decision Calculus models. Rather, it was reconstructed by me solely on the basis of Little's approach in the development of his BRANDAID model. It can be said with certainty that Little was not aware of the new method of model development he used with his approach, because his text does not provide the slightest indication of this.

As mentioned above (s.p.225), it is the procedure that the non-empirically verifiable "non-observation hypotheses" in the form of equations, which are considered inadmissible by classical theory of science, may nevertheless be developed by a model developer. This is "permitted" if it is possible to derive a hypothesis in the form of a reduced equation on the basis of the hypothesis system developed by him, which proves to be an empirically verifiable hypothesis.

In my opinion, this modeling heuristic is a paradigm shift. Up to now, it has been considered an irrefutable paradigm of Popper's falsification theory that one may only develop hypotheses (here: hypothesis equations) that are empirically verifiable, i.e. falsifiable. Little's permission now "allows" to formulate so-called "non-observation hypotheses" as well, but as mentioned above with the restriction that ultimately an empirically testable hypothesis (here: hypothesis equation) can be derived from them. Whether this paradigm shift, which in the form of a modification of Popper's strict falsifiability paradigm in the case of hypothesis equations actually took place first by myself, here on the basis of Little's procedure, and has not already been described elsewhere, remains open as in such cases. From my point of view, the heuristic for the development of empirically verifiable hypothesis equations, marked by "Little's permission", is the only relevant part of Little's contribution.

4. Simon's structural Break Assertion as a Paradigm

Karl Popper has made the claim that it is not possible to make a successful forecast of the development of a society because it is necessary to take the technical progress into account. And this is not possible because the technical progress cannot be predicted endogenously. This assertion is a fundamental paradigm for me and I have called it the "*Popper's forecast reef*" (s.p.545), to express pictorially that the "*forecasting ship*" fails because of the "*reef*" of the technical progress.

In connection with the study of Meadows' model (s.p.18), I have also studied social forecasting models that preceded his forecast, such as Malthus' or Marx's forecast. In all cases, it turned out that the forecasts, which in principle were plausible, misjudged the tech-

nological progress.¹⁰²⁶ In the assessment of future social developments *Popper's forecast reef* is of extreme relevance to me.

In my efforts to find sales-quantity-models in the form of equations that could be incorporated into the hyperstructure model of the Integrated Target Commitment Planning, I came across a contribution by Hermann Simon, as described (s.p.289), in which he "*dares*" to contradict the entire scientific community in the field of model-based sales quantity forecasting. This is because he claims that (econometric) forecasts based on observed values from the past do not lead to success because of the structural changes that occur in reality even in the short term. This assertion has been called *Simon's structural break assertion* and I consider it an important criterion in the field of quantitative modeling in the sales area. Both *Popper's forecast reef* and *Simon's structural break assertion* are paradigms for me because they are of fundamental importance in their areas of application.

Both statements are general empirical hypotheses. They are therefore falsifiable in their total claim (to be brought down) if empirical findings can be found that contradict them.

5. The Paradigms of the Integrated Target Commitment Planning and Control

Within the framework of the Integrated Target Commitment Planning and Control, two important concepts come into play, whose introduction can be seen as a paradigm shift in the area of operational planning and control. They are referred to as the planning and control paradigm of the Integrated Target Commitment Planning and are discussed below.

5.1 The Planning Paradigm of the Integrated Target Commitment Planning and Control

Up to now, the parameters of deterministic planning models have only been differentiated into uncontrollable and decision variables. This is a paradigm of decision theory, which is based on this classification.

The Integrated Target Commitment Planning, on the other hand, distinguishes between four different types of model parameters, the *uncontrollable basic parameters*, the *basic targets*, the *decision parameters* and the *decision variables*. The introduction of these terms, on whose basis a completely new planning procedure is propagated compared to optimizing planning, is a paradigm shift in this area. In my opinion, it can even be seen as a "mini-revolution", because the absolute predominance of the optimizing planning has thus been eliminated in the area of an operational model-based company planning.

Furthermore, I maintain that the Integrated Target Commitment Planning method completely outshines the optimizing planning with regard to its applicability in companies (s.p.468, 409). The target commitment paradigm dominates therefore in this area the optimization paradigm, which has so far been the only valid paradigm in the theory of model-based planning.

¹⁰²⁶ See also here on the misjudgment of many technical developments, page 545.

This target commitment paradigm is based on a not uncomplicated system of requirements that can be described as a closed and inherently consistent normative planning theory. In contrast to the normative theory of (a deterministic) optimizing planning, this normative theory is much more detailed (s.p.469). If it is demanded that the normative theory based on this paradigm should be explained in all details, then such an explanation can be found in this "History..." and but above all in the additionally accessible texts.

But what about the requirement that every effort should be made to bring down a paradigm under discussion, or at least to point out circumstances in which it does not apply. As noted elsewhere, this would primarily be a task for the expert colleagues (s.p.592). And as mentioned above, Küpper and Wagenhofer, who have been so severely criticized by me, would probably be best motivated to bring down this whole normative theory. Elsewhere, I have already made some suggestions to Hans-Ulrich Küpper as to how he could best proceed (s.p.321).

One suggestion was to "attack" directly the planning paradigm, i.e. the classification of the model parameters into the four types mentioned above. Because it forms the conceptual basis on which the entire planning and control procedure is founded.

A whole series of attacks against certain assumptions of the Integrated Target Commitment Planning can be made. However, these do not concern the target commitment paradigm of the Integrated Target Commitment Planning. They are dealt with at various points in the extensive documentation. However their removal would not bring down this paradigm of the Integrated Target Commitment Planning, but it would lead to a reduction of the "comfort level" of this planning procedure, such as a complication of the procedural steps.

5.2 The Control Paradigm of the Integrated Target Commitment Planning

The realization of an Integrated Target Commitment Planning must always be followed by a control. Thus, as already mentioned, the whole procedure should always be correctly referred to as "Integrated Target Commitment Planning and Control".

The control associated with the Integrated Target Commitment Planning is also based on a paradigm for which I use the term *model-based principle of controllability* (s.p.78). The control procedure propagated here can be seen as a tightening of the *general* (no model-based) *principle of controllability*. In my opinion, this principle is the most important paradigm of a "normative control theory" in companies. It is a requirement that must be followed if individuals are held responsible for a setpoint-actual-variance.

At least in the English language literature this general principle of controllability has a firm place.¹⁰²⁷ But only it's tightening to the *model-based principle of controllability*,

¹⁰²⁷ "Today, the controllability principle appears throughout the management accounting literature". In: Fischer, F.M.. *The Application of the Controllability Principle and Managers' Responses: a role theory perspective*. Preface, Heidelberg, 2010.

which was formulated by me, enables a systematic and appropriate control in the form of setpoint-actual-comparisons with quantitative values.

In the following, the relationships between the *model-based principle of controllability* and its general (not model-based) form are discussed. It should be stated in advance that the demands to realize this *model-based principle of controllability* are formulated for the first time in a systematic and comprehensive manner within the control procedure connected with the Integrated Target Commitment Planning.

The general (no model-based) *principle of controllability* is based on the idea that someone can only be held responsible for what he can influence. There is widespread agreement in the literature that this principle should apply if one wants to introduce a control system in a company that has the goal of making certain persons responsible for "unfavorable" or even "favorable" quantitative variances.

Solomon's statement is typical of this: "*It is almost a self-evident proposition that, in appraising the performance of divisional management, no account should be taken of matters outside the division's control.*"¹⁰²⁸ While this general (no model-based) *principle of controllability* is discussed in almost every English-language publication on management accounting, it is not discussed so frequently in the German-language literature.¹⁰²⁹ But overall, it nevertheless receives considerable attention. Several journal articles are dedicated to this principle and there are two monographs that deal exclusively with this topic.¹⁰³⁰

These publications show that the principle of controllability is not specified by any author in such a way that certain quantitative parameters are defined which can be used to assess, within the framework of the control following an operational planning with cost-performance models, whether a manager (divisional head) can be held responsible for a setpoint-actual-variance of this quantitative parameters, whereby this responsibility is compatible with this principle. There are many requirements that certain quantitative variables should be used, whose variation should only be influenceable by one person who is solely responsible for it and thus satisfy the *principle of controllability*.

However such requirements alone are not sufficient. The quantitative parameters must be defined in such a way that they can be used as control parameters for as many companies as possible. But also the criterion that ensures that one can speak of a "controllability" by a responsible person must be clearly specified.

Antle and Demski, have investigated the question of what criteria can be used to assess certain figures of a company according to whether their use as control variables of a man-

¹⁰²⁸ Solomons, D. *Divisional Performance: Measurement and Control*, Homewood, 1965, p. 83

¹⁰²⁹ See Magee, R. P. *Advanced Managerial Accounting*. New York, 1986, p. 268-69, Merchant, K. A. *Control in Business Organizations*, Cambridge, 1985. p. 21-24, Maciariello, J. A. 1. *Management Control Systems*. Englewood 1984, p. 135-136. Choudhury, N., *Responsibility Accounting and Controllability*. In: *Accounting and Business Research* 16, 1986, p. 189-198.

¹⁰³⁰ Fischer, F.M., *The Application of the Controllability Principle ... op. cit.*, Pelster, C. *Das Controllability-Prinzip im Spannungsfeld von Theorie und Praxis*. Wiesbaden, 2007.

ager satisfies the *principle of controllability*. This study is based on the fact that "*the principal-agent paradigm is used to infer a formal definition of controllability*". They come to the conclusion "*If the manager can affect the statistical pattern of some particular variable, the manager controls that variable*".¹⁰³¹

However, such an almost tautological statement cannot be used to answer the question of how the *principle of controllability* is to be taken into account in the setpoint-actual control of area managers in the case of an (operational) planning with cost-performance models.

Merchant almost summarized the findings on the principle of controllability in a 1987 article as follows "... *further research is necessary before a much more definitive controllability principle, or perhaps set of principles, can be proposed.*"¹⁰³² But even the fourth edition of his standard work on "*Management Control Systems*" from 2017 does not show that anything has changed.¹⁰³³ Other recent publications on "*Management Control Systems*" also do not indicate that "*a much more definitive controllability principle*" has been developed."¹⁰³⁴

Therefore, I maintain that no closed system of quantitative variables has been proposed in literature so far, for which a certain value can be declared as a target variable in the context of an operational planning with a cost-performance model, the realization of which depends solely on the activities of an area manager and thus not on variables that are un-influenceable for him. Such variables, which can be defined in a general way and used in operational planning, are precisely the basic targets of an Integrated Target Commitment Planning.

Therefore, if one carries out a basic Target Commitment Planning in which only the basic targets are used in the following setpoint-actual control, then this is the first case described in the literature that the *principle of controllability* is realized in the context of a closed operative company planning.¹⁰³⁵ The basic targets can therefore be described as parameters that satisfy the *principle of controllability*, since during the negotiations between the company management and the area managers the required characteristic of controllability is assumed by a mutual agreement and the setpoint value to be achieved on the basis of this assumption of controllability is defined by agreement.

The pure basic Target Commitment Planning (with only basic targets as control variables) represents therefore the first operational concretization of the *principle of controllability*, which do not only lead to a "*more definitive controllability principle*" as Mer-

¹⁰³¹ Antle, R., Demski, J. S., *The Controllability Principle in Responsibility Accounting*. In: The Accounting Review 1988, p.700-718.

¹⁰³² Merchant, K. A. *How and why firms disregard the controllability principle*. In: Accounting and Management: Field study perspectives, 1987, p. 337.

¹⁰³³ Merchant K. A., *Control Systems*, New Jersey, 2017.

¹⁰³⁴ See Zanin, F., Comizzi, E. *Management Control Systems in Complex Settings: Emerging Research and Opportunities*, Hershey, 2018.

¹⁰³⁵ For the difference between a basic target and an area target commitment planning, see page 47.

chant demands, but also to a complete quantitative and consistent specification of the principle, which has been discussed for decades, in the context of an operational company planning and control.

However, this statement was based on the assumption of realizing a pure basic Target Commitment Planning. It has the consequence that the figures which are used to determine the setpoint-actual variances, for which an area manager is held responsible in accordance with the controllability principle, are only basic targets. In the context of a basic Target Commitment Planning, however, it is common practice that certain control variables are also used for the setpoint-actual comparison which are aggregations of the basic targets. Their structurally identical definition equations of the setpoint and actual values contain basic targets, but also variables for which an area manager is not responsible (s.p.79). In such a case, as described in detail elsewhere (s.p.80), the variables contained in the definition equations of the target and actual values, which are no basic targets, must be assigned the same planned or actual values. This ensures that the variance for which an area manager is held responsible depends solely on the variances between the basic targets specified in the definition equations.

The "removing" of these variables that cannot be influenced by an area manager from the definition equations of the setpoint and actual values thus always proves necessary when an Integrated Target Commitment Planning in the form of an Area Target Commitment Planning is carried out. In this case, the structurally identical definition equations of a setpoint and actual area target in question often contain variables such as production coefficients, procurement prices, order quantities or exchange rates, which an area manager cannot influence and which therefore have to be "removed" from the setpoint-actual variance as described.

If there is a multi-level production (over several subordinate production center), the reduced area target equation for the head of total production contains (s.p.88) cost chains (CO) of the form

$$CO = PP \cdot M_1 \cdot M_2 \cdot \dots \cdot M_v \cdot SQ \quad (43)$$

(PP - procurement price, M_i - quantity multiplier i , SQ - sales quantity, CO - cost component of the area cost center "total production")

In such a case, the definition equations for the costs of the setpoint and actual values, i.e. CO^{SP} and CO^{ACT} , are structurally identical to (43). All values which do not represent basic targets of the production cost centers subordinate to the head of total production and which are therefore not influenceable by them, must be assigned in (43) the same values. These are always the procurement price (PP) and the sales quantity (SQ). The same applies, however, to the quantity multipliers (M_i) in (43), if they are considered to be uninfluenceable by agreement, such as certain production coefficients as well as consumption rates or scrap rates.

The use of basic targets and the "removing" of uninfluenceable variables in the structurally identical setpoint and actual definition equations of the setpoint-actual comparison leads to the *principle of controllability* being applied for the first time in a comprehensive and systematic manner within the framework of a control system for an operational company planning.

The paradigm of the (general) *principle of controllability*, which has been described purely verbally throughout the literature, thus receives, as perhaps now can be recognized more clearly, a complete specification and systematic classification in the context of the Integrated Target Commitment Planning and Control. One could describe this step as a "paradigm tightening". But I think it is also appropriate to speak of a paradigm shift.

Burkert, Fischer and Schäffer point out in their 2010 article "*Application of the Controllability Principle and managerial Performance...*" that there is still a "*great interest of academics and practitioners in the controllability principle*".¹⁰³⁶ This should actually lead to these "*academics and practitioners*" developing a "*great interest*" in this control procedure.

5.3 Model-based planning and control paradigms in the literature

After the description of the planning and control paradigm of the Integrated Target Commitment Planning and Control, the question arises whether and which model-based planning and control paradigms can be found in the literature on operational planning and control of companies.

Planning Paradigm. With regard to existing planning paradigms, one can only refer to the optimizing planning of the deterministic decision theory. Apart from the production program planning, however, only a few examples of the application of such optimizing planning in the context of a cost-performance model are described in the relevant literature.¹⁰³⁷ This is why I found it so difficult to find examples in the literature describing such (model-based) optimizing planning.¹⁰³⁸

However, it is questionable whether there are other planning paradigms in the context of planning with a cost-performance model besides the paradigm of an optimizing planning. The remarks found in many texts, such as Küpper (s.p.315), that top-down planning should be carried out in the case of business planning, is not a model-based paradigm if everything that is said about it is exhausted in such verbal comments.

Control Paradigm. The control paradigm of the Integrated Target Commitment Planning and Control has been named as the *model-based principle of controllability*. The question arises whether descriptions of a "control" that take this principle into account can be found in the literature.

¹⁰³⁶ Burkert, M., Fischer, F.M., Schäffer, U., *Application of the Controllability Principle and managerial Performance: The of Role Perceptions*. In: Management Accounting Research 22.3 (2011): 143-159.

¹⁰³⁷ As mentioned above, in the light of the Integrated Target Commitment Planning, production program planning is not a planning based on the decision theory (s.p.58).

¹⁰³⁸ See also: Zwicker, E., *Integrated Target Commitment Planning and Optimizing Planning*, Berlin 2000, www.Inzpla.de/IN08-2000c.pdf. (Text in German, title translated).

If Kilger, for example, demands that in the case of a setpoint-actual comparison of costs in the identical setpoint and actual definition equation of these cost, i.e. "*costs = procurement price • consumption quantity*" for the procurement price in the setpoint and actual equation its planned value should be chosen, then the *model-based principle of controllability* is realized in this procedure.

Surprisingly, the top representatives of operational planning and control have not included this so obvious idea of "removing" uninfluenceable parameters in the definition equations of the setpoint and actual values in their considerations when they deal with the topic of "control". This is somewhat astonishing and therefore in the following, separately for all four top representatives, the question will be investigated as to what they even have to say only in passing about the paradigm of control that I consider so important, i.e. the general or even *model-based principle of controllability*.

• Küpper and the principle of controllability

The general (no model-based) *principle of controllability* is neither mentioned by Küpper in the index of his work "*Controlling, Konzeption, Aufgaben, Instrumente*" nor is it dealt with in his text.¹⁰³⁹ This is astonishing, given the importance attached to this principle by many authors. Therefore, there is no other choice than to search Küpper's entire text of 579 pages to see if any clues can be found that have something to do with the *principle of controllability*.

Such a search shows that Küpper did not deal with this principle even without explicitly naming it. Thus he remarks "*setpoint variables can only be specified for those variables that can be influenced by the actors* (p. 217)". However, no further explanations are given for this correct assertion. Küpper further points out that a control is to be carried out in the form of a "*comparison*" and then continues: "*the execution of the comparison consists of the determination of the standard size and the size to be evaluated and the calculation of the variance between the two. The standard size can be specified directly in the design. In many cases, however, it can only be derived from planned values or - if they are not available - from other values. For example, for the setpoint-actual comparison of a cost center, you must convert the planned costs determined at the beginning of the planning period into the setpoint costs, that is, the planned costs of actual employment*" (p.220).

This procedure consists precisely in the fact that in the structurally identical setpoint and actual definition equation of costs (CO), i.e. "*CO = PCR • EP*", in which the *proportional cost rate* (PCR) should be the basic target of the head of a cost center, the *employment* (EP), which is uncontrollable for the head of the cost center, is equated in the setpoint and actual equations of the *costs* (CO). This is done by choosing its actual value (EP^{ACT}). This results in

$$CO^{SP} = PCR^{SP} \cdot EP^{ACT}$$

and

¹⁰³⁹ Küpper, H.U. *Controlling, Konzeption, Aufgaben, Instrumente*, Stuttgart, 5th edition, 2008.

$$CO^{ACT} = PCR^{ACT} \cdot EP^{ACT}$$

The difference between the *setpoint* and *actual costs* CO^{SP} and CO^{ACT} , which leads to the "removing" of the employment (EP) that cannot be influenced by the head of the area, is nothing other than compliance with the "removing requirement" of the *model-based principle of controllability* (s.p.78), which is necessary in this special case. Since Küpper leaves it at the quotations given here, the question is not unreasonable whether he is even aware of the *principle of controllability* and if so, he probably does not consider it to be very relevant.

However, it could be that Küpper does not deal with the principle of controllability, but within the framework of a "control calculation" occurring in his text, he perhaps may propagate a procedure that corresponds to the principle of controllability. However, Küpper does not have a special text about "control calculation". What one could assign to such a calculation is discussed in the chapter "Determination and Analysis of Variances". If you look there for what is said about a control procedure that could correspond to the requirement of the principle of controllability, you will find the following sentences:

"The variance analysis determines how much the value to be tested differs from the standard value and what causes this difference. It is a central element of the link between control and the information system. The variance calculations and analyses performed in the information system must be tailored to the control purposes" (p.227).

This is general talk that will lead nowhere if it is not further specified. However, one could argue that there would be further concretization after all. For Küpper's text quoted above is followed by a description of the relevant procedures of variance analysis such as the description of alternative or cumulative variance analysis. It is therefore reasonable to assume that Küpper understands "control" to be the performance of a variance analysis that takes the *principle of controllability* into account. But all the methods of variance analysis that he describes do not comply with the principle of controllability.

In this "History..." it has been tried in relative detail to make clear by means of examples that it is absolutely necessary to distinguish between a "control" (a normative variance analysis), which takes into account the *principle of controllability*, and an explorative variance analysis (s.p.103).¹⁰⁴⁰ If this distinction is not made, this leads in my opinion to a fundamental error, namely the disregard of the *model-based principle of controllability* in the case of the setpoint-actual control of a person who is to be held "responsible" for the variance. This mistake also applies to Ewert and Wagenhofer, whose contribution will be examined next.

• Ewert-Wagenhofer and the principle of controllability

In contrast to Küpper, the *principle of controllability* is mentioned by Ewert and Wagenhofer. In their opinion, this principle requires that *"an employee or manager should only*

¹⁰⁴⁰ Zwicker, E., *Control and Variance Analysis in the System of an operational Planning*, Berlin 2007, (301 pages). www.Inzpla.de/IN34-2007.pdf. (Text in German, title translated)

be judged on the basis of the factors he can control."¹⁰⁴¹ Although Ewert and Wagenhofer quote this principle, they do not use it, and precisely where its use as a maxim for designing a control procedure in the context of the operational planning and control with cost-performance models would be appropriate. The "control calculation" described by Ewert and Wagenhofer for this purpose has already been discussed (s.p.436) in detail elsewhere.

In my opinion, it is an extremely confused representation, which is one of the lows of this work. In order to justify this drastic formulation, I have attempted to analyse Ewert and Wagenhofer's "control calculation" in an online text of more than a hundred pages, in order to draw attention to the errors and ambiguities that occur there.¹⁰⁴² However, a sentence from the discussion of their "control calculation" on page 435 of this text shall be repeated here. It reads: *"Their (Ewert and Wagenhofer's) definition of the setpoint-actual variances of a control variable, ignoring the principle of controllability, is already a knock-out criterion for rejecting the entire text"*.

• Malmi-Brown and the principle of controllability

Malmi and Brown's aim was to examine and systematize the various definitions of the term *"management control system"* in the literature. In none of the control systems they examined do they indicate that these systems require compliance with the *principle of controllability*. The concept of a "setpoint-actual control" is not mentioned in their systematization, although the term "control" is used 317 times in their text (s.p.201). As a result, they do not mention the *principle of controllability*, which requires a setpoint-actual comparison to be carried out in accordance with this principle.

• Kaplan and the principle of controllability

It is not possible to examine Kaplan's numerous contributions with regard to the question of whether and how he addresses the *principle of controllability* there in the context of the topic "control". Only the two works that the scientific community considers to be his most significant contributions to the further development of management accounting are considered here, i.e. his book on the *Balanced Scorecard* written with Norton and his further work *"Relevance Lost - The Rise and Fall of Management Accounting"* published with Johnson.

In his book *on Balanced Scorecard*, the word "control" is used 68 times, but it is neither defined nor is there any indication of how this control should be carried out. Obviously not at all, since Kaplan and Norton, (s.p.200), even point out by underlining "not" that the Balanced Scorecard is "not" a control system.

¹⁰⁴¹ Ewert, R., Wagenhofer, A., *Interne Unternehmensrechnung*, 8.Ed., Heidelberg, 2014, p. 327

¹⁰⁴² Zwicker, E., *Control Calculations* in the Light of the Integrated Target Commitment Planning - Critical analysis of chapter 7 "Kontrollrechnungen" from the work "Interne Unternehmensrechnung" by Ewert and Wagenhofer, Berlin 2016, (121 pages), www.Inzpla.de/IN45-EW-Kap-7.pdf. (Text in German, title translated)

In the book "*Relevance Lost ...*" one quotation can be found where the principle of controllability is mentioned. It reads: "*only those costs that are both traceable to actions taken in the cost center and can be measured at the cost center level should be assigned to the cost center.*"¹⁰⁴³ However, from this requirement to the realization of the model-based principle of controllability in the system of the Integrated Target Commitment Planning and Control is still a rather big step.

6. How can the paradigms of the Integrated Target Commitment Planning and Control be brought down?

Therefore, the question arises as to how, analogous to the search for the circumstances of a falsification of a hypothesis as demanded by Popper, circumstances can also be cited here under which the two paradigms of the Integrated Target Commitment Planning and Control are no longer valid and can thus be brought down.

The planning paradigm of the Integrated Target Commitment Planning, i.e., the target commitment paradigm, is based on the fact that the parameters of a corporate's planning model can be divided into four categories, namely decision parameters, uncontrollable parameter, basic targets and decision variable. Furthermore, it is assumed that each basic target can be assigned to exactly one area manager who ultimately commits (or "is committed") to meet a certain setpoint value of this basic target.

Classifications can only be brought down by showing that reality cannot be adequately "captured" by them. The classification of the parameters of a plan cost-performance model according to the target commitment paradigm can therefore only be brought down if it can be shown that it is not possible to develop plan cost-performance models (or comprehensive planning models) of companies whose model parameters can be classified accordingly.

Above all, it is necessary that the class of the basic targets, for each of whose elements one area must be solely responsible, is not an empty set.¹⁰⁴⁴ Otherwise, target commitment planning with basic targets would not be possible. If it were to become apparent that no basic targets could be found as model parameters for the majority or all of the plan cost-performance models examined to date, then the target commitment paradigm would be brought down for lack of applicability.¹⁰⁴⁵

In which way can the control paradigm of the Integrated Target Commitment Planning, i.e. the paradigm of a model-based principle of controllability, be brought down? This paradigm is a requirement. This raises the question of how to bring down the validity of a requirement. A requirement (R1) is no longer valid if another requirement (R2) is accepted as valid and one accepts that its compliance will force one to abandon the compliance with requirement (R1). Therefore, the question arises which requirement, considered as

¹⁰⁴³ Johnson, H. T., Kaplan, R. S., *Relevance Lost - The Rise and Fall of Management Accounting*, Boston 1987, p. 232.

¹⁰⁴⁴ See on this case and the consequences p. 365.

¹⁰⁴⁵ However, as has been shown, the opposite is the case s. page 213, 468.

dominant could force to abandon the requirement to comply with the *model-based principle of controllability*. One can arrive at this requirement, which overrides the *model-based principle of controllability*, if one asks oneself the question, "for what" someone can actually be made "responsible".

In the working group "Integrated Corporate Planning" of the Schmalenbach Society, of which I was a member (s.p.524), there was a heated discussion between the planning heads of large German companies whether or not the variance of the exchange rates should be "removed" when determining the bonus of a profit center manager based on the actual profit.

In the case that the actual-plan variances of the exchange rate would not be "removed", than a profit center manager would have to be held "responsible" not only for the (favorable or unfavorable) change of the plan-actual-variance of the exchange rate on the plan-actual-variance of the profit. He would also be responsible for the plan-actual-variance of the other uncontrollable basic parameters such as plan-actual-variance of the oil price on the plan-actual-variance on the profit. However these are plan-actual-variance he cannot be held responsible according to the *principle of controllability*.

If a profit center manager were to be assessed on the basis of the setpoint-actual variance of his profit (area profit) within the framework of a hierarchical area target commitment planning and control, the influences of these uncontrollable basic parameters would be "removed".

If, on the other hand, the principle applies that the profit center manager should be held responsible for all plan-actual variances in the parameters of his area model that occur during planning, then the control procedure that follows the hierarchical area Target Commitment Planning (as a variant of the Integrated Target Commitment Planning) is no longer applicable. Without this "removing" of the uncontrollable plan-actual variances, the "control" to be carried out on the profit center manager (area manager) proves to be extremely simple, since in this case he is "responsible" for the entire plan-actual variance of his profit (area profit). In this case, the *principle of controllability* is no longer taken into account.

7. Should the Prohibition of circular Definitions be kept as a Paradigm?

In the context of my courses "*Rational Reasoning in the Economic and Social Sciences*" (s.p.518) the question was dealt with, which requirements have to be considered when formulation and applying definitions.¹⁰⁴⁶ For this purpose I formulated six demands, the first of which was: "*Definitions must not be circular*."¹⁰⁴⁷ When I later turned to the development of cost-performance models (s.p.22), I also looked at the structural relationships that occur when cost centers allocate certain activities to each other. These alloca-

¹⁰⁴⁶ The script for this part of the lecture is available at: Zwicker, E., *Defining and Classifying in Business Administration*, TU Berlin, no year, (62 pages), www.Inzpla.de/Definitionen.pdf. (Text in German, title translated).

¹⁰⁴⁷ See page 6 in: Zwicker, E., *Defining* ..., op. cit., www.Inzpla.de/Definitionen.pdf.

tions are described in a cost-performance model by a system of simultaneous equations. Within the framework of the model configuration system of the Integrated Target Commitment Planning, they are generated on the basis of so-called order quantity-price relationships (s.p.24).

On the occasion of the development of the hyperstructure model for the description of these relationships, it became clear to me that the equations describing the transfer prices in the order-quantity-price relationships are definition equations. This in itself is not a special insight, but it became additionally clear to me that the transfer prices in case of the existence of a system of interdependent settling cost centers, lead to a complex system of *circular definitions*.

If there is only a mutual allocation between two cost centers (s.p.534), then both definition equations of the transfer prices have the form of a classical circular definition, in which the transfer price to be defined also appears as a definition component of its definition equation.

The use of these circular definition equations cannot be rejected because they are solvable and their solution corresponds exactly to the desired values that a user considers necessary for further use in the model. Thus they prove to be useful circular definitions. In view of this statement, my claim is that if this type of circular definitions is useful, then they should be allowed, contrary to the prohibition "*definitions must not be circular*". This conclusion I reached at the time, but did not attach much importance to it.

When I met Carl Hempel at the Institute for Advanced Studies in Berlin in 1983 and had a series of discussions with him on methodological questions I showed him, as already reported (s.p.533), how to arrive at the circular definition equation of the transfer price of a cost center in a company, using the example of two cost centers which mutually charge each other for their services. As reported, he was very surprised, because he was not aware of such an example to invalidate the general prohibition of circular definitions.

This all happened in 1983. Thirty-six years later, however, when I remembered the conversation with Carl Hempel while writing this text, it only became clear to me that this was an example by which this paradigm of prohibiting circular definitions, which had been in force for centuries, could be brought down. For the definition equation of the electricity transfer price (TP_{EG}) in equation (160) on page 535 presented to Carl Hempel is undoubtedly a circular definition, which is characterized by exactly what Rivello demands of an acceptable circular definition, namely that it "*make logical and semantic sense*".¹⁰⁴⁸

The reasoning behind the prohibition of circular definitions is very simple and plausible, because it makes no sense to trace a term (or a variable in a model) to be defined back to itself. Accordingly, it is also not permissible to use so-called definition loops in which a

¹⁰⁴⁸ Rivello, E., *Revision without revision sequences: Circular definitions*. In: Journal of Philosophical Logic 48.1 2019, p.58.

term (or a variable in a model) to be defined is traced back to itself via several definitions.

Now that I have come to the conclusion that with this example a fundamental paradigm of the theory of definition has been "brought down", it was immediately clear to me that such an assertion must be carefully examined.

First of all, it seemed necessary to review the literature that has appeared so far to see whether someone else had already preceded me in 1983, or at least in the years that followed. Furthermore, the question arose whether the example of two interdependent accounting cost centers that I cited was sufficient to bring down the paradigm of the prohibition of circular definition.

Therefore I started to search the literature on the topic of "circular definition". It turned out that, with regard to this topic, one has to distinguish between the contributions of the classical definition theory and the contributions of a small group of logicians. The representatives of this group, in contrast to the representatives of classical definition theory, claim that circular definition can certainly lead to a *"logical and semantic sense"*.

Bruni, who has developed such a theory of circular definitions, points to the *"view of definitions from classical philosophy that simply prevented the circular case to be even considered as a theoretical possibility, up to recent times"*¹⁰⁴⁹. But he also points to the *"lack of actual cases of circular definitions that might motivate a shift from that view"*.

The contributions to the development of a theory of circular definitions found in the literature work on an extremely high level of symbolic logic. Their authors do not provide examples of circular definitions, so that the *"lack of actual cases of circular definitions"* makes it impossible for an unbiased reader to decide whether an example provided by these theories makes sense or not. The basis for these theories of "reasonable" circular definitions is provided by the so-called *"revision theory of definitions"*. *"In this theory, a circular definition imparts to the defined term a meaning that is hypothetical in character; the semantic value of the defined term is a rule of revision, not as with non-circular definitions, a rule of application"*.¹⁰⁵⁰

These approaches to justify a meaningful circular definition will therefore not be pursued further in the following. Despite an extensive search, I have not been able to find an example in the literature of an "acceptable" circular definition that has been or can be used to bring down the paradigm of prohibition circular definitions.

Therefore, the following text examines the question of whether the paradigm of the classical theory of definitions, *"that simply prevented the circular case to be even considered as a theoretical possibility, up to recent times"*, which has been in force since antiquity (since Aristotle), can be brought down by the example of two interdependent cost centers presented by Carl Hempel a long time ago.¹⁰⁵¹

¹⁰⁴⁹ Bruni, R. *Addressing circular definitions via systems of proofs*. In: *Mathesis Universalis, Computability and Proof*, Springer, Cham, 2019, p.99. The following quote can be found on the same page.

¹⁰⁵⁰ Gupta, A., *Definitions*, Stanford Encyclopedia of Philosophy, April 2015, <https://plato.stanford.edu/entries/definitions> from 18.12.2019

¹⁰⁵¹ The so-called *"petitio principii"* was already described by Aristotle as a false conclusion.

In connection with the "prohibition" of the use of circular definitions, which has been dealt with in the literature, there are no standards that further specify this prohibition.

However, it is obvious that a potential opponent to refute my claim will point out that one must distinguish between a transformable and non-transformable circular definition. A transformable circular definition is a circular definition that can be transformed into its normal form by certain transformations. This is not possible with a non-transformable circular definition.

According to the demand of the opponent one must always start from the example of a non-transformable circular definition if trying to bring down the general prohibition of the use of circular definitions by means of an example.

However, if one accepts this condition of "non-transformability", then the example with the two cost centers settling simultaneously against each other would no longer be able to bring down the general prohibition of circular definitions. For it is possible, by a simple algebraic transformation, to bring the transfer price (TP_{EG}) of the occurring on both sides of the definition equation (160) to the left.

In order to bring down the paradigm the general prohibition of circular definitions after all, the only remaining possibility is therefore to find an example in which a transformation to the normal form is not possible. As described, companies sometimes have hundreds of cost centers that settle interdependently with each other. For example, the simultaneous equation system used in the planning model of ThyssenKrupp Steel (s.p.627) describes a system of more than 1,000 interdependent settlement units as subunits of certain (multiple reference values) cost centers.

The transfer prices of these reference units occurring in the cost-performance model form a complex system of circular definition equations, which are represented by a simultaneous system of equations. The question is whether the transfer prices of the reference units occurring in this system can be converted to their normal form by algebraic transformations.

If it is a linear system of equations, then it is in principal possible to achieve such a solution by means of algebraic methods. However, the "normal form" of the definition equations determined in symbolic form would be extremely long and even such powerful computer algebra systems as Mathematica would not be able to generate them.¹⁰⁵²

But even that is no conclusive counter-argument. My opponent will argue that it is not even necessary to determine the normal form of transfer prices using algebraic equations in symbolic form. In a singular case, i.e. a planning model with numerically specified parameters, the normal form could also be described in the form of matrix equations. This

¹⁰⁵² See on the use of such computer-algebraic procedures in the framework of the system of the Integrated Target Commitment Planning: and La, B., *Strukturanalyse gleichungsorientierter Planungsmo-delle*, (Structural Analysis of equation-oriented Planning Models). Diss. TU Berlin 1998.

is correct. In this case, the inhomogeneous linear system of equations generated by the configuration system

$$\begin{aligned} Y_{11} &= a_{11} \cdot Y_{11} + \dots + a_{1n} \cdot Y_{nz} + b_{11} + \dots + b_{1v} \\ &\vdots \\ Y_{nz} &= a_{n1} \cdot Y_{n1} + \dots + a_{nn} \cdot Y_{nz} + b_{n1} + \dots + b_{nv} \end{aligned}$$

can be presented by the matrix equation

$$\mathbf{M} \cdot \mathbf{Y} = \mathbf{b}$$

$\mathbf{Y}$ is the solution vector $\mathbf{Y} = \{Y_{11}, \dots, Y_{nz}\}$ which contains the transfer prices in question here as a subset.¹⁰⁵³ $\mathbf{b}$ is a column vector whose elements describe the row sums of the coefficients b_{ij} . If you assume a planning alternative such as bottom-up planning, all parameters a_{ij} and b_{ij} have numerical values. The solution of this matrix equation then leads to the desired normal form of the transfer price definition

$$\mathbf{Y} = \mathbf{M}^{-1} \cdot \mathbf{b}$$

Here $\mathbf{M}^{-1}$ is the inverse matrix of the coefficient matrix $\mathbf{M}$ of the system of equations. To enable this representation, the inverse matrix $\mathbf{M}^{-1}$ must be calculated. But this is no problem.

If, according to the Integrated Target Commitment Planning terminology, there are only real quantity-price relationships between the cost centers with an interdependent settlement, the result is always a linear system of equations. Such simultaneous linear systems of transfer price equations are never converted to their normal form in all computerized applications such as the SAP-CO system. Instead, their circular form is used to determine a solution using the Gauss-Seidel method.¹⁰⁵⁴ Therefore, you must not have to determine the normal form to solve the simultaneous system of equations.

Here the opponent could reply, but you can and that is the reason for the rejection. This seems to me to be rather far-fetched, but this objection should also be accepted, so that I now start the last attempt to bring down the paradigm of the general prohibition of circular definitions.

Cost-performance models of full cost accounting also include so-called fictitious order quantity-price relationships (s.p.25).¹⁰⁵⁵ They always occur when the allocation of costs between cost centers is based on certain allocation keys. Such allocations are quite problematic because they are not cause-related. However, they are still used since full costing requires that all costs be allocated to the products. The allocation keys used also include

¹⁰⁵³ The other quantities in $\mathbf{Y}$ are also described by cyclic definitions, but these are not of interest here.

¹⁰⁵⁴ It can be proven that due to the special structure of the linear system of equations, the Gauss-Seidel method always converges in the case of interdependently settled cost centers.

¹⁰⁵⁵ For a detailed description of the order quantity-price relationships, which also covers fictitious order quantity-price relationships, see: Zwicker, E., *The Model Tableau System of Cost-Performance Models in the System of the Integrated Target Commitment Planning*, op. cit., p. 34f., www.Inzpla.de/INO-6-2000a.pdf. (Text in German, title translated).

so-called value-based allocation keys. If they are used, non-linear simultaneous definition equations may occur, which can almost never be transformed to the required normal form. Therefore, if such an example can be found, it can serve to bring down the paradigm of the general prohibition of cyclic definition in the end.

Such an example will be described in the following. It is based on an extension of the example already presented to Carl Hempel (s.p.534), in which an interdependent cost settlement takes place between the cost centers of water and electricity supply.

In addition, it is assumed that both cost centers are superordinate to a management center. There are two opposing order quantity-price relationships between this management center and the electricity and water supply. The first relationship is that the management center purchases water and electricity from the two cost centers and must pay a transfer price for this. Within the framework of the second relationship, the total costs incurred in the management center are allocated to the water and electricity supply cost center according to a specific allocation key. The allocation key will be the total costs incurred in the cost center for water and electricity supply.

The allocation of the costs of the management center to the water and electricity supply cost centers represents (according to the order quantity-price interpretation of the Integrated Target Commitment Planning) a fictitious order quantity-price relationship. In this case, the allocated costs are calculated by multiplying the fictitious quantity ordered by the water or electricity supply cost center by the fictitious purchase price (fictitious transfer price) of the management center (FTP_MC).

This results in certain interdependent settlement relationships between the real purchase order prices of the water supply (TP_WA) and electricity supply (TP_ES) and the fictitious purchase order price of the management center (FTP_MC).

The formulation of this relationship using an equation model is described in a text that can be called up online.¹⁰⁵⁶ The originally formulated equation model, as described in the callable text, is reduced by eliminating the endogenous variables of no interest in such a way that only the three transfer prices remain. They result in the following non-linear simultaneous definition equation system (or circular definition system):

$$\mathbf{TP\_WA} = (\mathbf{NW2} + \mathbf{NW3} \cdot \mathbf{TP\_ES}) / (\mathbf{NW1} - \mathbf{FTP\_MC} \cdot \mathbf{NW1})$$

$$\mathbf{TP\_EL} = (\mathbf{NW5} + \mathbf{NW6} \cdot \mathbf{TP\_WA}) / (\mathbf{NW4} - \mathbf{FTP\_MC} \cdot \mathbf{NW4})$$

$$\mathbf{FTP\_MC} = [(\mathbf{NW7} + \mathbf{NW8} \cdot \mathbf{TP\_WA} + \mathbf{NW9} \cdot \mathbf{TP\_ES}) \cdot (1 - \mathbf{FTP\_MC})] / (\mathbf{NW5} + \dots + \mathbf{NW6} \cdot \mathbf{TP\_WA} + \mathbf{NW2} + \mathbf{NW3} \cdot \mathbf{TP\_ES})$$

The symbols NW1 to NW9 describe certain numerical values of individual parameters or certain combinations of several parameters, which were specified numerically in the originally formulated equation model and are predetermined in the attempt to solve the non-linear simultaneous equation system in question.

¹⁰⁵⁶ See www.Inzpla.de/Interdependenz-Beispiel.pdf

It is a system of circular definitions of three transfer prices, which cannot (as in the linear case) be transformed into a normal form. Rather, the numerical values of the transfer prices can only be determined directly using this form of a system of circular definitions by using an iterative procedure.

The assertion "*directly using this form*" should be concretized so far that it becomes recognizable how such a system of equations or circular system of definitions can be solved by means of an iteration procedure. And this "solution" delivers, on the basis of the system of equations or circular definitions, which is unchanged in its form, a meaningful numerical result desired by the model developer, namely the numerical values of the three circularly defined transfer prices.

The iteration method used here, in the form of the Gauss-Seidel method, is easy to explain. For the three non-linear simultaneous equations arranged in any order, a value of zero is chosen (in the simplest case) for the three transfer prices, which are on the right side of the equations. Afterwards, this system of equations is calculated again and again with the values of the transfer prices, i.e. TP_WA, TP_ES and FTP_MC, on the right side of the equations, which are determined anew for each previous calculation. After several iterations, this calculation ensures that the values of the three transfer prices on the left and right side of the equations match each other (according to a convergence criterion that can be selected with any degree of precision). Thus the system of equations is "solved".¹⁰⁵⁷

As a further counter-argument, the objection could now be raised that the circular system of definition equations, for which a numerical solution was found using the Gauss-Seidel method, is no longer a circular system of definition equations at all, with the solution of which the prohibition can be brought down. For in determining the numerical values, one would move from the logical level of definition to a numerical level to which the prohibition would not apply.

This objection depends on which criterion is used to "to bring down" the paradigm of the general prohibition. If one accepts the criterion I have formulated, that a "bringing down" occurs when one can do something practical with a circular definition equation, although it cannot be transferred to its normal form, then this is not a counter-argument.

Moreover, the circular definition equation system remains a circular definition equation system even after the numerical solution. One does not leave the level of the definition logic when determining a numerical solution. It is only no longer a generic definition, but a singular definition.

The definition equation of the operating result of a company, in which the bonus of the management is determined as a cost variable depending on the operating result, can take the following form:¹⁰⁵⁸

$$OR = TS - TCB - a \cdot OR$$

¹⁰⁵⁷ See in detail about the Gauss-Seidel method: Zwicker, E., *Simultaneous and recursive Planning Models: Structure, Semantics and Application*, Berlin 2003, p. 19f., www.Inzpla.de/IN25-2003c.pdf. (Text in German, title translated).

¹⁰⁵⁸ OR - operating result, TS - total sales, TCB - total costs without profit-related bonus of the corporate management, a - share of the corporate management on operating result

It is a generic definition that applies to all companies that have introduced such a bonus scheme. For example in the case of Peter Miller Ltd it is assumed that the following singular definition equation has arisen for the year 2019:

$$OR = 20,000,000 - 18,000,000 - 0.05 \cdot OR$$

It would be analytically transferable to its normal form. If, however, it is solved with the Gauss-Seidel method instead, the result is

$$1.905 = 20,000.000 - 18,000,000 - 0.05 \cdot 1,905$$

This is also a (albeit fully numerized) singular definition equation which can be used for practical purposes, i.e. the determination of the operating result, and yet is a circular definition.

My claim is that the way of using these non-transformable circular definitions "*make logical and semantic sense*". And if one agrees with this claim, the paradigm of prohibiting circular definitions is thus brought down.

My opponent, however, can now move on to the final and from his view devastating counter-attack, which consists in tightening up his demand for the conditions that must be met in order to claim to have broken the prohibition on circular definitions.

He could claim that any method of solving a system of cyclic (or simultaneous) definition equations with an iterative procedure and thus determining the value of the circular defined variables can be considered as a transformation of the cyclic definition equations into a non-cyclic definition.

The simultaneous equations together with the iteration method used to solve them form together the non- circular definition that leads to the numerical values of the transfer prices. It is therefore not necessary to realize the normal form at all.

With this definition of a non-circular definition, the paradigm of prohibiting circular definition is immunized against any attempt to bring it down. For if one finds a solution of circular definitions (a simultaneous system of definition equations) which is not able being transformed to its normal form (a reduced recursive form) but yet "*make logical and semantic sense*", you can no longer speak of a circular definition, since now a transformation into a non- circular definition has succeeded.¹⁰⁵⁹

This would mean, however, that this circular definition is not prohibited, although it clearly has the form of a (prohibited) circular definition. A somewhat paradoxical result.

My claim, formulated somewhat differently, is as follows: If there is a circular definition equation of a quantity X and this equation cannot be transformed into a (non-circular) normal form of an definition equation by algebraic transformations, but with which a numerical value for X can however still be determined (i.e. only with this circular form) using the Gauss-Seidel method and this numerical value then also serves a practical application, then this circular definition is not to be forbidden

¹⁰⁵⁹ There is nothing said in the literature on this subject and Aristotle's opinion on this question can no longer be obtained.

One special feature should however be pointed out. Not every simultaneous system of equations contained in a model with which reality is to be explained is a system of definition equations. I assume that simultaneous systems of equations consisting of two or more definition equations will not occur in equation models with numerically specified parameters that are intended to explain singular events (in the form of numbers) and are not cost-performance models.

Definition equations in an explanatory model are always characterized by the fact that the quantities defined by them are not observable variables. In the other case, the equation used to determine the numerical value of this observable variable would be a hypothesis equation.

It must therefore be a simultaneous system of equations in which two or more definition equations are interdependently linked by the decision of the model developer. This is the case in the example given, because the costs of one cost center are charged to another cost center due to certain (not falsifiable) assignment rules or definitions practiced by the model developer. And this happens mutually.

It seems very unlikely to me that in other areas equation models have been developed which are supposed to predict numerically describable quantities and in addition have such a self-contained simultaneous system of assigning unobservable quantities to certain units (such as cost centers) which are observable in reality. Therefore, I do not consider it very likely that someone in another field has already discovered a corresponding example and, as a consequence, has come up with the idea of bringing down the prohibition of circular definition equations.

My opponent, however, cannot care about that. Because for him there exists no counter-example. From his point of view, it is simply a mistake to believe that one could bring down the general prohibition of circular definitions with a counter-example, that "*make logical and semantic sense*". But what is the status of this categorical imperative he has formulated? Even for Kant's categorical imperative, examples can be cited that call its general validity into question. In any case, such a general prohibition of circular definition, which does not allow any exceptions, would not be a paradigm, because paradigms are characterized by the fact that they can lose their validity under certain circumstances.

40. *I did it my way*

If someone reads some pages in this "History... ", then he will recognize soon that some what is to be read there deviates from the usual. So, as you can quickly see, I didn't keep myself in check when it comes to criticizing or praising. And there are some other unusual things to read as well.

Therefore the numerous poems and the telling of jokes (p.272) may seem quite strange.¹⁰⁶⁰ To pretend being the "*illegitimate son*" of the "*red baron*" (p.512), to stage himself as a fool in front of his colleagues (s.p.507), and to reproduce the confused conversations with his wife (p.215) that is indeed a bit unusual. But to make a mocking poem about a colleague (p.626) that is really the top. Where else has there been such a thing?

This is not a behavior which intended to appear as a serious professional representative who, for example, is deemed worthy of being awarded the Federal Cross of Merit. Well, if anyone would like to have it, I wish it to him.

The behavior to be observed here, to allow oneself to be influenced as little as possible by collective ideas of behavior, became apparent to me quite early on. And this will be described in the following.

My mother, to put it this way, attached a lot of importance to the acceptance by her environment. And if she thought that this acceptance was endangered by my behavior, then she used to say "*What are people going to say?*" Even the tone of her question is still ringing in my ears today. Pretty early, not even in the voice breaking, but also again and again afterwards, I more than definitely replied to her, "*I don't care what people say, I do what I want*". After reading Tom Sawyer, Huckleberry Finn, who wasn't restricted by anyone and didn't let anyone restrict him, was my hero.¹⁰⁶¹

I did it my way at the school

During my **school days**, growing up without a father, I experienced for the first time how others wanted to impose their will on me. I would like to tell you about my experience with two of these specimens.

The first one was Siegfried **M-G.** called "**Schweres (= Heavy) M.G.**" our Latin teacher. As a major in the Second World War he had obviously not yet got used to the fact that the war was over and treated us like his subordinated soldiers. He was a strong but at the same time extremely massive man, who already looked a bit frightening. When he entered the class, we had to stand up straight before he ordered "sit down" in a harsh voice. But I often kept just standing and when he asked me the first time "*Why don't you sit down?*" I replied: "*With me everything goes a little slower*". So, depending on my mood, I sat down slower or faster.

¹⁰⁶⁰ But there are also others who did not force themselves in their biographies. One such example is the biography of one of the most important theoretical physicists in the 20th century, namely Paul Feynman. His book, which I will go into in more detail (s.p.511), is extremely funny and entertaining. For physicists it is a "cult book".

¹⁰⁶¹ My mother was a single parent. I have never consciously experienced my father. During the Second World War he was stationed as a radiologist in a military hospital in France and did not return from the war. One cannot say that I grew up in feudal circumstances.

During the class tests in Latin he stood on a chair to get a better overview of the pupils and if he believed that someone was using a cheat sheet when translating the Latin texts or was copying from his neighbor, then he jumped off his chair in a "*panther jump*" (so he called it himself) to snatch the delinquents work and then rate it 5. While he was standing on the chair, he made such threats as: "*I'll even pull your "Klatschen" out of your a...*".¹⁰⁶² We also had to listen to his war stories like the hunt for partisans in Crete.

When he shouted at one of the students in such a way that he froze with fear and therefore didn't answer his question anymore, he asked: "*What's wrong with him? I took the liberty of remarking, "Your screaming has put him in state of shock."* Some who opposed him finally gave it up, but some did not.

Today one has no idea how authoritarian some teachers at that time were in school and above all that the pupils accepted this. These were the last effects of this attitude, which accepts everything that comes from above without contradiction. Today, thanks to heaven, there is nothing left of this "subservient spirit", which Heinrich Mann so aptly described in his novel "Der Untertan" ("The subject").

The second specimen of this subjugation demanding types was our German teacher A. H. I didn't like his eulogies about "*our*" great past at all. And I found the glorification of the military repulsive and inappropriate.

When he reported what a feeling of happiness flowed through him as he marched "*in goose step with clenched butt cheeks*" passing some saluting Nazi-bigwig, I made a remark that referred to the "*clenched butt cheeks*" and cannot be quoted here. It did not cause a benevolent reaction.

With enthusiasm he reported that even before the beginning of the war pupils of our school had built together with their teachers a large wooden model of the city of Lübeck in which every house could be seen. The whole thing was stored on a large wooden plate. And the pupils would have carried it together with the model on their shoulders from Lübeck to Berlin (according to Google Maps 264 km footpath) to hand it over to "*the Führer*" as a gift. Shortly before the completion and the beginning of the procession a pupil had destroyed something by mistake (I don't know exactly what it was anymore) at the ensemble and he had become "*unconscious*" because of fear of endangering the project.¹⁰⁶³

There would have been a community spirit among the pupils, which today has completely disappeared etc. etc. etc. (We know to what this "*community spirit*" has led.) When I replied: "*These pupils don't impress me at all. They must have been completely crazy to do such a monkey show for this crazy postcard painter. This procession to Berlin can't be called anything else.*" That didn't go down well too.

¹⁰⁶² At that time, the term "Klatschen" was used to describe special cheat sheets in palm size which could be bought and which contained German translations of the Latin classic, arranged according to sections.

¹⁰⁶³ Whether this story is true at all, I don't know, but that could be checked even today.

On his list of students with recalcitrant behavior I had, as with S.M.G., a safe first place. But I only became his arch-enemy through the following story. When we began to read Faust I, I was so fascinated by Goethe's language that I immediately bought a commentary for this work in order to penetrate even deeper into the world of this poetry.¹⁰⁶⁴ It was the book by Reinhard Buchwald *"Führer durch Goethe's Faustdichtung"*, (Guide to Goethe's Faust poem) 5th edition 1955.

When A.H. then dealt with the Faust text in the following lessons, what he said about it seemed so familiar to me. And I quickly noticed that he repeated Buchwald's remarks almost identically, and especially quoted the concise formulations cited there word for word, while pretending to have just created them himself. In school, always sitting in the last row, I then had the commentary on my lap, read along and quietly announced in advance what was to come. This was then very quickly spread in the class.

And then he stood in front, commenting on some text passage, with a template in his hand and said, looking deeply into the class, one could best describe this as "XX".... Bingo! It was exactly the formulation I had already announced. And that happened all the time. The class then began to grin or laugh and he was quite irritated why one could react to his contribution in such a way. It were funny German lessons. That went over a number of dates. But of course something like that will be discovered one day, and from then on I had a special position on his enemies list.

My German essays, which were written under examination conditions in the school, were rated from now on only with 4. (He probably didn't dare to give me a 5). And I can still remember his vicious comments, which he wrote under the essays that justified the grade. But that didn't matter to me at all. I only wanted to go through the final examination (Abitur), the notes didn't interest me.

Everything is history. But from none of these authoritarian guys, who glorified the past did I allow to be restricted in my freedom of expression only for the sake of peace.

By the way, I couldn't make a name for myself with good grades. I had quite good grades in mathematics and physics, but only because these subjects opened up to me without learning. I hardly ever did any homework, which of course led to bad grades.

Other activities were in the foreground. I was a member of the student parliament and one of the co-founders of the Lübeck School Speakers' Working Group.

But most of all I led together with my friend Jürgen Zschiesche the Lübecker section of the *"Young European Federalists"* a rather active troop with a (already during the school time) by donations financed own office in the Sandstrasse. We organized exchange programs with French groups, invited politicians to lectures and promoted a united Europe

¹⁰⁶⁴ My enthusiasm for Goethe's Faust and also for other works of Goethe, which was triggered at that time by reading the "Faust", has survived to this day. See pages 222, 318, 511, 522, 538, 543, 545, 547, 554, 554 and, as described on p. 547, my collection of 33 translations of a selected series of rhymes from Faust into English. www.Inzpla.de/Faust.pdf

with events among the pupils.¹⁰⁶⁵ In addition, I had another focus of activity which could not develop in a pure boys' school and took quite a lot of time.

I did it my way at the university

When you **study**, you are not restricted at all if you study what you are really interested in. During my time as a *research assistant*, my academic supervisor fortunately shone most of the time by being absent and every employee could do what he wanted (s.p.532). As an *assistant professor*, I could do whatever I wanted anyway. And after I had received a call for a *professorship* in 1973 at the age of thirty-four, I was able to conduct research in the areas that interested me without any external constraint. I enjoyed the lectures and found them not a restriction but an enrichment (s.p.520 and last page).¹⁰⁶⁶

The cooperation with committed students like my correspondence on questions of the courses (s.p.446) but also beyond the pure courses like the working group I founded on "Forms of Rational Reasoning", the inter-university debating club (s.p.518) or my thirty years of work as a trusted lecturer at the TU of the German National Academic Foundation was not work for me but a pleasure.

I did it my model-based way.

These stories should make it clear that I tried not to let myself be influenced too much by others, and tried to go "my way" also against established conventions. But that's actually nothing special. Each of us has his own "way" with which he differs from these of the others. And each of us can also tell stories where he chose his "way" and didn't adapt.

A behavior that also falls under the category "*I-did-it-my-way*" should, however be emphasized because it was not only of great, but also of decisive importance for the development of the Integrated Target Commitment Planning. However, this behavior is more aptly described by a narrower version of the "*I-did-it-my-way*", namely "*I did it my model-based way*".

In this text the term "*model-based*" is used many times, with "*model-based*" as the preceding adjective in "*representation*", "*view*", "*consideration*", "*criticism*", "*precision*", "*approach*", "*procedure*", "*forecast*", "*analysis*", "*reconstruction*", "*operational control*", "*operational company planning and control*", "*planning and control systems*". This adjective is so important because all my activities in the field of operational planning and control in companies have always been "model-based". Most importantly, the entire system of the Integrated Target Commitment Planning and Control is a model-based approach that cannot be found even in rudimentary form in the literature on this subject.

¹⁰⁶⁵ Jürgen Zschiesche remained my friend until his death. As head of French studies at the "Studienseminar für Gymnasien" in Lübeck, he continued exactly what we started. For many years, he was chairman of the "*Deutsche Auslandsgesellschaft*" (German Association for Abroad Relations), which is committed to "*fostering German relations abroad and promoting international understanding*". On 28.2.1984 he was appointed to the *Chevalier dans l'Ordre des Palmes Académiques* by the French Prime Minister for his merits in Franco-German cultural relations. A picture from us from 1958, www.Inzpla.de/JueZis.pdf. One of them, who is still alive 80 years old with his son on the Elbe cycle path 61 years later (2019), www.Inzpla.de/Elberadtour.pdf. See also page 530.

¹⁰⁶⁶ See the readable correspondence with the students of my courses in: www.Inzpla.de/Lehraktivitaeten.pdf.

However, the claim *"I-did-it-my-model-based-way"* should be formulated in more detail and read as follows: *"I did it my model-based way in opposite to the whole scientific community in the field of operational planning and control"*. The completely different approach of the entire scientific community in this field has not been able to dissuade me from my purely *model-based* way. And that was a good thing. Otherwise there would be no Integrated Target Commitment Planning and Control.

As described, my attempts to publish something about this in English-language journals or to present my theses at conferences proved to be completely unsuccessful (s.p.216).¹⁰⁶⁷ The same applies to my attempt to bring about an exchange of ideas with German-speaking colleagues (s.p.216).¹⁰⁶⁸ I never received an answer to my initial large-scale mailing of texts on the Integrated Target Commitment Planning and Control that would have led to a factual discussion (s.p.503).

I lived for more than forty years in a model world (and computer world) that nobody (except the members of my team) shared with me and fortunately I did not adapt to the scientific community, whose representatives thought my work to be a rather out-of-the-ordinary spinning mill and considered it superfluous to deal with my approaches.

The meeting with a colleague who asked me at a conference with a pitiful look is typical: *"Are you still occupied with your simulation models?"* (s.p.554). Even more significant is the reaction of another colleague who abruptly broke off the conversation with me after he rather snobbishly replied: *"You may have problems"* (s.p.626). I had asked him at a conference in Cologne in 1988 and my question related to whether, as an expert and well-known book author on cost-performance accounting, he had ever dealt with the difficulties that arise with the occurrence of non-linear equations for the description of cost allocations in cost-performance models that can very often be observed with such allocations. In the last forty years, to the best of my knowledge, the Integrated Target Commitment Planning has not been mentioned in any monograph or essay published by a specialist colleague in the field of controlling (management accounting).¹⁰⁶⁹

My insistence not to be influenced by the evaluation and recognition of the social environment, here the scientific community of management accounting, in the choice of the field of work and the enthusiasm for the job, alone has led to the fact that I have developed a unique "model-based" (and also computer-based) consistent and also applicable operational planning and control system for companies. For its development, this autistic persistence and non-adaptation was crucial.

To make it clear once again. *With the Integrated Target Commitment Planning and Control a normative theory was developed, which transforms the classical decision theory, the normatively applied Simonian theory of satisficing decision making, the "planning by objectives" and the normative agency theory into a comprehensive normative theory of*

¹⁰⁶⁷ The only exception was my conversation with Michael Scott Morton and Arnoldo Hax at MIT in Cambridge, see page 528.

¹⁰⁶⁸ The only exception was Josef Kloock s.p.515.

¹⁰⁶⁹ Three times it was mentioned in a bibliography but not mentioned in the text.

*the operational planning and control of companies. And this theory has proven itself in practice. For me, this is a quantum leap compared to the past.*¹⁰⁷⁰

My unshakable credo "**I do it my model-based way**" has made a significant contribution to achieving this. The already early reaction to the reproaches of my mother namely "*I don't care what the people say, I do what I want*" is described somewhat more refined by the following maxim

Wer sich an andere hält,
dem schwankt die Welt.
Wer auf sich selber ruht,
der steht gut.

This maxim was translated by me, like my other maxim that, in order to achieve something, one should limit oneself first (s.p.554), also into English.

Sticking to others
you always will sway.
Rely on yourself,
you stable will stay.

Like all maxims, this one has its limitations. But it let me moving around in my model world (and also my computer world) for decades without external confirmation.

Frank Sinatra put it more succinctly when he sang "**I did it my way**". But he also chose this final confession as the conclusion of his probably most famous song. And now I don't want to let you miss the poetic climax of the whole chapter. In view of the fact that it is time to take stock of one's own actions, I have tried something similar. My "I-did-it-my-way-song" is, what is the case with such "songs", somewhat naively simplifying, but it does contain a little bit of truth.¹⁰⁷¹

Now, as the end is coming near,
it will quite strange to you appear,
but nearly nothing seems me clear.
There's only one point I don't stray,
it shows my role during the play,
"I did it my way."

¹⁰⁷⁰ For a more detailed assessment of the system as a whole, see page 505.

¹⁰⁷¹ The rhythm corresponds to the verses of Frank Sinatra's "My way".

41. Looking back at the development of the Integrated Target Commitment Planning

Over the course of many years, I have developed a theory on model-based operational planning and control of companies and have tried with a lot of effort to develop a program system to show that this theory is successfully applicable in practice. The planning procedure of the Integrated Target Commitment Planning would not have been developed for several reasons

- if I hadn't been able to refer to other people's investigations and findings.
- if I hadn't tried to implement the developed model variants as well as the procedures of their planning, control and model exploration with the help of a computer system, and
- if the "equation-calculation system" hadn't been so powerful.

• Standing on the shoulders of others

No train of thought arises from nothing, and no theory begins at zero. Every consideration and also every "new development" ties in with the existing. What others have started is being developed further. Most of them are only marginal developments, but there are also small and big jumps.

With regard to the Integrated Target Commitment Planning, the question arises in retrospect as to which thoughts, considerations, and concepts of others form the basis of this approach. Of course, it is not possible to make a clear decision, but significant influences can already be shown.

My joy in equations describing the real world was as mentioned (s.p.532) undoubtedly triggered by my physics teacher Gerhard Woldt, who enjoyed "working with equations" and who succeeded to transfer this enjoyment to some of his students. When he presented us with the first physical formula, namely the law of falling bodies $d=gt^2/2$, I regarded it as a miracle and could not believe that reality could be successfully described with such an equation.

As a student at the university, I searched for equation applications in the field of economics, and it turned out that there were only macro-economic models that could be used for an (prognostic) application. The first authors whose knowledge I have acquired are the developers of macro-economic dynamic models. Studying the dynamic models of Jan Tinbergen and Klein-Goldberger on the economic development of the USA was my entry into the world of modeling and model analysis. However, they weren't the only ones.

How I then decided to search for models that could be applied in companies and in doing so analysed the company planning models of Welsch and other authors, has already been described. (s.p.8).

An important milestone in the study of these models was the book of **Wolfgang Kilger**. It taught me to understand the cost and performance accounting, and above all, his example of plan cost and performance accounting which he described by a system of tableaux was a profitable source of information for me. This tableau system was used to develop

the "Kilger model", which was quite voluminous with more than 19,000 equations. However, the so-called "Kilger model" differed greatly from the tableau example in Kilger's work. A "sales quantity-driven" quantity structure was introduced, which only made it possible to carry out a sales quantity-driven planning. Furthermore, the so allocation of costs using the so-called "*coverage reference sizes*" (DM-Deckungsbezugsgrößen) used by Kilger were deleted (s.p.22). The allocations between the reference objects used were formulated in accordance with the order quantity-price interpretation of such allocation relationships as real and fictitious quantity-price relationships.

A lot of other changes were done too. It is possible for every reader to study the fundamental differences between Kilger's tableau representation and the resulting "Kilger model".¹⁰⁷² Nevertheless, the name "Kilger model" was retained, because without Wolfgang Kilger this model would not have been possible.

The Kilger model served as a permanent "guinea pig" for all the processes and analyses we carried out. Everything was first tested with the Kilger model. Over many years, there was probably no name among the changing development teams that was needed more.

For example, when we developed the INZPLA-Connect system, with which SAP-CO applications could be transformed into an INZPLA-model, we first configured the Kilger model as an SAP-CO application. (SAP terminology "customized"). This SAP model was then transformed with INZPLA-Connect back into the Kilger model in the form of the INZPLA representation. We were then able to compare this model, including the generated model tableaus system, with the original Kilger model in INZPLA representation with its model tableau system.

The two INZPLA tableau systems had to coincide, and this was the case. As I have described in detail, the system of the Integrated Target Commitment Planning differs on a large scale from Kilger's approach.¹⁰⁷³ With regard to planning procedures, Kilger's example can only be compared with the pure Integrated Target Commitment Planning using a standard cost-performance model.

This corresponds to the case described in Fig. 39 on page 145 with the name "*Models and planning procedures*" in column 11 and line 1 of a pure Integrated Target Commitment Planning with a standard cost-performance model.

Kilger also does not deal with all other procedures, such as a mixed optimization basic Target Commitment Planning, an area Target Commitment Planning, a one- or two-step comprehensive company planning and a profit center planning. Kilger would have had to develop the corresponding models first. Only then would the questions arise which planning and control procedures should to be carried out with them.

Kilger does not deal with the pure Integrated Target Commitment Planning as a planning

¹⁰⁷² See: Zwicker, E., *The Kilger Model - Structure and Configuration and its Connection with a CRFI Model in the Context of a two-step comprehensive Company Planning*, Berlin 2003, (137 pages) www.Inzpla.de/IN30-2003h.pdf. (Text in German, title translated) and Zwicker, E., *Classic Cost and Performance Accounting in the Light of the Integrated Target Commitment Planning*. Berlin 2002, p. 6-17, www.Inzpla.de/IN15-2002a.pdf. (Text in German, title translated).

¹⁰⁷³ See pages 56 and 516.

method. He only "plans" with the cost-performance model by calculating the variables of his tableau system once and these are the values of his example. A planning in the sense of a "target-oriented direction" of the model parameters for planning a top target is not recognizable.

This is not possible because, as already mentioned (s.p.57) in Kilger's model the operating result is not defined as the top target, and the model parameters to be selected for a influencing a target are in part only implicitly defined in the model, making it very difficult to specify their values in a target-oriented manner.¹⁰⁷⁴

Kilger's example in the form of a tableau system and his considerations are, therefore, "procedural-free". Kilger's tableau system could also be implemented in Excel. If one were then asked to carry out an Excel-based planning with the resulting equation model, this model would not provide any semantic information on how the planning process should proceed, but there is nothing to be learned about it in Kilger's text either. The model can only be used "for planning", but how this planning should work remains open. And the Kilger tableau system reconstructed in Excel could not be used for a sales quantity-driven planning.

From my point of view, this makes a practical application almost difficult. A planner wants to know how a change in a certain sales quantity affects the quantity structure of the company, from the employments of the cost centers up to the purchasing quantities.¹⁰⁷⁵ And he also wants to determine the change of the operating result which is caused by the change of certain parameters.

Kilger did not develop a systematic control calculation or a further comprehensive variance analysis. He describes only how to use the two setpoint-actual control methods of the flexible plan cost accounting to check the quantity consumption and the variance between the setpoint-actual costs for an actual employment (s.p.76).

I have emphasized these differences here again, because at the end of my "History..." it should become obvious that the Integrated Target Commitment Planning and Control is not, as some may think, be seen a marginal development of the flexible plan cost accounting. Rather, it proves to be a new type of a model-based planning and control system for the corporate management that is based on target commitments, which raises the comprehensive operational planning and control in companies to a level that is clearly different from this one practiced so far.

However, Wolfgang Kilger's performance should not be diminished by these differentiations between the Integrated Target Commitment Planning and his flexible plan cost accounting. He has played a greater role in shaping the flexible plan cost accounting than anyone else. It is no exaggeration to say that I know almost all the relevant German and English texts on the flexible plan cost accounting. Kilger's work reaches far beyond eve-

¹⁰⁷⁴ See page 57 for the treatment of the operating result and for the non-implicit definition of the model parameters page 23.

¹⁰⁷⁵ Apparently, the developers of the SAP-CO system also saw this and included such a sales quantity-driven planning in their system. The implementation of such planning in the SAP system, which I have discussed in detail, is, however, a technical disaster, as was explained there. See page 330

rything else. His theoretical insights and the experience he gained during his work at the management consultancy Plaut on the concrete application of the flexible plan cost accounting are reflected in his tableau example, which runs through the entire book. The know-how manifested in this tableau example was taken over by me. And the Kilger tableau example served as a starting point for the development of a structurally and semantically fundamentally changed model. However, it should be made clear once again: Without Kilger's book there would be no Integrated Target Commitment Planning.

So far, it has only been described how my knowledge of equation models deepened through contributions by certain authors, and that the Kilger model served as a reference model for a wealth of developments. As described above, I introduced the responsibility-related classification of the model parameters and the concept of the target commitment function of a planning model with which the described planning procedures could be implemented.

I was always aware of the fact that it is not an optimization, but rather a normative planning that is to be designed in the sense of Herbert Simon's theory of satisficing behavior, in which the pressure on the person responsible for the execution plays an important role. Simon's model of adaptive behavior in organizations developed together with March was the deciding factor for the decision to realize a normative transformation of Simon's satisficing behavior as a planning procedure (s.p.474).

But it was Charles Bonini's model (s.p.474) that showed me how to combine Simon's theory as a „normatively turned“ planning method with a cost-performance model.¹⁰⁷⁶ And the impressive investigations by Gunnar Eliasson provided so much concrete information and theoretical reflections about the operational planning in companies that it became clearer and clearer to me how the often mentioned planning triad of an operational company planning can be designed in a normative way up to the last detail (s.p.477).

Herbert Simon, Gunnar Eliasson and **Charles Bonini** are, therefore, the ones who have contributed to placing the Integrated Target Commitment Planning and Control on a solid theoretical basis. Their contribution to the development of this normative theory has been extensively acknowledged in several places in this text.¹⁰⁷⁷

As already mentioned, I believe to have shown that the Integrated Target Commitment Planning can be interpreted as a variant of the normative agency theory. The idea of developing this variant, i.e. the *hidden-effort agency theory*, came to me after many detours. But I stood "on the shoulders" of the developers of the present normative agency theory despite the rigorous abandonment of important paradigms of this theory (s.p.403). After the reaction of Alfred Wagenhofer at my meeting with him in Graz (s.p.419), however, it is to be expected that the representatives of the previous normative agency theory do not see it that way.

For me the hidden-effort agency theory has an extraordinary importance because it is a

¹⁰⁷⁶ See on the normative turn of Simon's theory of a satisficing decision maker p. 482

¹⁰⁷⁷ See especially the pages on Simon 470-474, 548-552, on Eliasson 27-28, 159, 477-479, 491-494 and on Bonini 27, 474-476, 481, 485, 493.

normative theory that contributes in an essential way to the theoretical foundation of the Integrated Target Commitment Planning. Only with its relatively late development was it possible to show that the Integrated Target Commitment Planning unifies all normative approaches to the operational planning of companies, which had been discussed separately until then, in a normative theory without contradiction

- **No Integrated Target Commitment Planning without IT support**

The bibliography of this publication on the development of the Integrated Target Commitment Planning contains all the publications I have produced so far for this planning procedure in the amount of about 1,800 pages.¹⁰⁷⁸ None of these documents contains a reference to the technical problems encountered during the development of the Integrated Target Commitment Planning System. I avoided that as much as possible. Because my objective was to develop a normative operational planning and control theory for companies. Any reference to the software used, the database system, etc. could have given the impression that I am a computer scientist and not someone who, as a specialist in the field of accounting and controlling, deals with the methods of accounting-based planning and control of companies.

A reader could believe that it would have been sufficient to develop and describe the Integrated Target Commitment Planning and Control. He could argue that the implementation is not the task of a method developer. An architect only develops the plans, and a builder then implements them. If one agrees with this argumentation, then the implementation of the planning and control concepts developed by me could have been taken over by a software house afterward, if there is any interest on the part of the practice. So why such an effort?

I can only disagree with the idea of separating conception and implementation. The procedures I have developed for establishing a model of the Integrated Target Commitment Planning and the rules for designing the planning and control procedures to be carried out with this model could not have been formulated without a constant feedback occurring by the implementation problems. The whole development would have come to a halt in its normative sharpness at an unsatisfactory level. This unsatisfactory level can already be found in the literature if, for example, the concept of a top-down planning is only explained by the notion that there is a planning “going downwards” from the company's top targets.

These explanations are correct, but not very helpful if you want to implement such planning with a cost-performance model. If I had not been constantly involved in the program development and had not received constant feedback on difficulties and opportunities for improvement, this system would not have emerged as a self-contained, consistent planning and control system.

¹⁰⁷⁸ All contributions can be accessed via the Internet. See the information in the bibliography and in the footnotes.

- **Struggling with the detail is essential**

The realization that it is necessary to fight with the detail is only briefly demonstrated by the example of the treatment of simultaneous equations in cost-performance models.

At the conference of the Association of University Teachers of Business Administration in Cologne in 1988, I asked a colleague during a break from the conference who had written a widely distributed work on cost accounting whether I could talk to him about a topic related to cost accounting. After he accepted, I asked him whether he was aware of the problem that, in a cost allocation between allocations of charges and allocations of quantities and prices, simultaneous equations may occur which are not (or only with difficulty) solvable. He looked at me in a very irritated way and then said to me: "*You may have problems*". He turned away, and the conversation ended.¹⁰⁷⁹

That is when I realized that such a problem could only be encountered if one tries to implement the specifications for designing the structure of cost-performance models. For me, it was essential that this "concrete implementation" be tested with the help of a program system, which I developed together with my team members. Because I was able to permanently adapt this system to the changes in the structural design and procedural regulations that I found necessary, which resulted from testing and new considerations. The problem that arises when assessments and direct activity allocations occur in a simultaneous equation model has not yet been solved in the SAP-CO system, as described above (s.p.327).

The literature hardly ever points out that simultaneous equations can also occur in product cost accounting. This is the case if a partial quantity of a generated product in a production chain is used as a preliminary product to produce the same product.¹⁰⁸⁰ Such quantity loops in multi-level product cost accounting actually occur in the chemical industry. This problem has to be recognized and considered in the conception of the structural equations of a configuration system. Although it is quite plausible, I only recognized the existence of such a relation when it had to be modeled in practice. In the SAP-CO system, this quantity loop problem is not taken into account either, i.e., the simultaneous equation system is not recognized as such and is, therefore, not solved at all (a questionable error).

When modeling the planned cost and performance accounting of the Berlin-based electricity utility BEWAG (with INZPLA-Connect), we came across the case that another simultaneous supply relationship occurred because the electricity generation cost center supplied itself with electricity and charges himself a transfer price for it. We hadn't considered that. This is actually a case that could have anticipated by a simple reflection, but it was only through the application that we came across this error, which was then corrected.

¹⁰⁷⁹ That I had problems is true. I still have them today. However, simply to turn away from me, I felt at that time as highly insulting. (Today I wouldn't care). However, after I had written a satirical poem that same evening in the hotel for this unpleasant contemporary, who's theoretically inferior and also completely practice-unrelated contributions were well known to me, my anger was gone. That's a way to deal with your aggressions. See www.Inzpla.de/Spottgedicht.pdf.

¹⁰⁸⁰ A trivial example is the production of baker's yeast.

Some readers may find it inappropriate to use the problem of simultaneous equations as an example because this does not seem to be a particularly relevant area of cost and performance accounting. Simultaneous transfer pricing systems are often described in the textbooks of cost accounting using two cost centers. The Kilger model describes interdependent activity allocation between (seven) service cost centers, i.e., it contains simultaneous equations.¹⁰⁸¹ Kilger's example does not allow to conclude that cost centers with an interdependent settlement play a major role in practice. However, it turned out that all models used in practice, which we analyzed with the INZPLA-Connect system, had simultaneous equations.

In the ThyssenKrupp Steel model, for example, the largest simultaneous system of equations included the supply relationships between 1,316 reference variable units in 745 cost centers. The entire simultaneous system of equations consisted of 100,058 equations. If this system of equations were not resolved, ThyssenKrupp Steel would have been unable to carry out its operational planning as it was designed.

Even theoretical concepts that were to be implemented in the system proved to be in require a revision in view of a model-based reconstruction. As already mentioned (s.p.124), it became apparent that the often quoted Agthe-Mellerowicz scheme of multi-stage contribution margin calculation, as described by the authors, is not feasible because it contains an inconsistent classification rule.¹⁰⁸²

• No Integrated Target Commitment Planning without equation-calculation system

However, one module of the INZPLA-System is of outstanding importance, and without its development, I would never have been able to test my theory "at the base". This is the so-called "equation-calculation system" or, from the point of view of the applied procedure, the INZPLA equation compiler. This program works on the basis of a compiler.

Already during the preparation of my dissertation on the use of equation models in business administration, i.e., around 1967 (I was 28 years old), it was clear to me that an application of these models would only be possible if a computer-supported system were available with which the equation systems of the company models to be developed could be calculated as quickly as possible. In order to achieve this goal, I already developed an equation precompiler (in FORTRAN) at that time, with which these calculations could be carried out very quickly.

From then on, I have always been concerned with the question of which methods can be used to calculate large systems of equations quickly. In the process, I developed a number of approaches that are my trade secret, so to speak. This is because the developed equa-

¹⁰⁸¹ See in detail: Zwicker, E., *Classic Cost and Performance Accounting in the Light of the Integrated Target Commitment Planning*, op. cit., p. 46f., www.Inzpla.de/IN15-2002a.pdf. (Text in German, title translated).

¹⁰⁸² See in detail: Zwicker, E., *Explorative and normative Analysis of multidimensional hierarchical Profit Segment Systems*, op. cit., p. 66f., www.Inzpla.de/IN11-2001a.pdf. (Text in German, title translated).

tion compiler is unsurpassed in the speed of a calculation of equation systems.¹⁰⁸³

In the report on the SAP-CO system, I mentioned that ThyssenKrupp Steel needs one day to calculate its SAP-CO model, i.e., the calculation of the operating result, including all necessary manual transactions. The time in which the system calculates "on the database" is approximately four hours, i.e., about 14,400 seconds. However, if the INZPLA-Equation Compiler needs 15 seconds for the (monthly) calculation of 2.6 million equations also altogether $12 \cdot 2.6$ million equations, then this is extremely fast compared to the SAP-CO system. As reported, in the case of the ThyssenKrupp Steel model a system of 100,058 simultaneous equations had to be solved with a calculation of a planning alternative for each of the twelve months, which required a higher calculation time. In the case of Volkswagen AG's cost center model, which comprises 562,266 equations, the system required only 0.283 seconds for a calculation.¹⁰⁸⁴

This fast equation compiler was the prerequisite for implementing the concept of the Integrated Target Commitment Planning and Control. Without his development, I would not have been able to develop the pure theory that was so dear to my heart.

- **Many were involved**

Many were involved in the development of the programming system, which lasted for more than twenty years. I have always had excellent co-workers who were convinced that this was a project for which it was worth working. I have had stimulating and constructive discussions with them. All work in my area of expertise focused on the overall project of model-based operational company planning and control system.

Many programs have been developed, but they always refer to the application of operational models for company planning and control and other model analyses, i.e., they always start from concrete business-relevant questions. Only a small part of this has been reflected in the current software system. The modules of this software system have been constantly reprogrammed, modified and extended in other languages over the years.

The current software system comprises 876,853 lines of program code.¹⁰⁸⁵ These would result in 25,790 A4 pages being printed with a line spacing of one and a half lines. The program code of the modules required for use at ThyssenKrupp Steel comprises 614,912 lines. The described INZPLA equation compiler consists of 22,383 lines.

I want to thank all those who have contributed to this development. Some such as Eike Golas and Rene-Reiner Starke had completed a double degree (Dipl. Kaufmann and Dipl. Informatician). Sebastian Lehnert, a computer scientist by nature, has developed into a real business economist. After all, anyone who has mastered accounting is a real business economist. Others, such as Arne Flemming or Jan Hummen, for example, have worked their way into the depths of system programming as business economists and industrial

¹⁰⁸³ A leading developer of the SAP-CO module described him as sensational.

¹⁰⁸⁴ See Fig. 40 on page 150 for details.

¹⁰⁸⁵ According to Hasso Plattner, the SAP system contains about 400 million lines of code. See www.youtube.com/watch?v=b1AL1BCaPAw.

engineers in an admirable way in order to develop systems that have been ultimately always relevant to the practical problems of companies. I want to thank Dirk Braun for the in-depth discussions I have had with him.

The Integrated Target Commitment Planning program system has been used by several companies (such as CBW in Bitterfeld, Germany), but our activities are mainly focused on the application at ThyssenKrupp Steel. We have made a targeted effort to work together with ThyssenKrupp Steel. As already mentioned, ThyssenKrupp Steel has developed according to our information one of the world's largest and most sophisticated (SAP) cost-performance models. The impetus for the further development of the INZPLA-System comes mainly from this company. The decision to deploy the system was made by Peter Urban, CFO and Vice Chairman of the Executive Board of ThyssenKrupp Steel. The preparatory talks were conducted with Oliver Smeets and Alfred Beth. Oliver Smeets was the Head of Controlling at ThyssenKrupp Steel. Alfred Beth was responsible for coordinating the mission, which was then taken over by Michael Huypen.

The whole project has always been a research project, and the program system is still a prototype. ThyssenKrupp Steel provided third-party funds for the further development of the planning system as a compensation. The cooperation with the employees of ThyssenKrupp Steel was excellent.

What's next?

All texts I produce on the Integrated Target Commitment Planning and Control can be accessed on the Internet and are constantly updated. Anyone who would like to can, therefore, obtain information without any significant procurement effort. The courses on the Integrated Target Commitment Planning were recorded in a video teaching format and should be available to anyone interested on the Internet.¹⁰⁸⁶ Distribution via the Internet does not generate any income compared to distribution, through a publisher. However, it is much more important to me that anyone interested can have free access to this system. As far as the software is concerned, it is in a state that will allow you to continue working with it. Whether it will ever leave the phase of a prototype is quite unlikely.¹⁰⁸⁷

The Integrated Target Commitment Planning and Control is a self-contained normative theory. The development of the INZPLA-System was intended to demonstrate the applicability of this theory. The use of the INZPLA-System to date has shown that this theory is not only applicable but is also considered a significant step forward in practice. The successful application was not only evident in relatively unknown small and medium-sized companies but also in the context of an annual operational planning in a large company that has already been practiced for four years, using an extremely large plan cost-performance model.¹⁰⁸⁸ It would, of course, have been desirable if the system had become more widespread. However, not everything is attainable.

¹⁰⁸⁶ See for the offered courses and the used video-education software. www.Inzpla.de/Lehraktivitaeten.pdf and p. 520.

¹⁰⁸⁷ See on the question of their further development p. 359.

¹⁰⁸⁸ These are the planning periods 07/08, 08/09, 09/10 and 10/11 for one-year operational planning. On the same time a medium-term planning was carried out in parallel using as mentioned the same structural equations of the one-year-planning-model Inzpla(see page 336).

More than fifty years ago, I had already quite clearly defined my research objective: I wanted to develop a new model-based and comprehensive method of an operational planning and control for companies. It should be methodologically clear and all the planning and control procedures, which can be transferred to a computer, should be carried out by a computer. The model-based planning and control procedure should be used in companies and judged by them to be a significant improvement. It has passed its acid test in practice, and the theory "stands". In any case, it was exciting the whole time, and I was always committed.¹⁰⁸⁹ What more could you ask for?

When I review the developed planning and control procedure, i.e., its normative design, its theoretical justification and also its technical implementation, then I find the work done quite simple and plausible. It is obvious to proceed like this if you have a certain mathematical background, are interested in methodical questions and also know how to work with computers.

Looking back at the decades of development of this operational planning and control system, it makes sense to draw a conclusion. How can my long-standing activities be put into a simple formula? The following verses express it best:¹⁰⁹⁰

**You want to find new ways
and every way seems barred
find something very easy
and push it very hard**

Can we now say that the history of the Integrated Target Commitment Planning is over? Maybe yes, maybe no. It will be seen.

If, after more than forty years of university activities, one is "relieved of all duties (but not all rights)," as they say, this is an incisive event. Such incisions suggest the question of how to proceed. Max Frisch described a similar situation with the following words: *"Three months ago I would have said that I had arrived. On the other hand, I will always want to do something, want to change, also myself. When you arrive, you are at the end"*. That sounds rather elegiac. The Integrated Target Commitment Planning is a consistent system in itself, but there is still something to deepen and develop. Therefore, I will never ask myself whether I have "arrived". Employment is ensured. And that's a good thing.

¹⁰⁸⁹ However, sometimes too committed. I was in the Steglitz Clinic for a while with a severe tinnitus and hearing loss due to overwork. My co-workers wrote me (through Christian Campagna) a letter on 8.4.1996, I should stop the program development; otherwise, I would ruin my health, because apart from the theoretical topic treatment this could not to be carried out by me.

¹⁰⁹⁰ It is a variation of the verses of Pit Hein *"To make a name for learning"*.

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The German-language version is available at www.Inzpla.de/INZPLA-Geschichte.pdf

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Subject index

“So essential did I consider an Index to be to every book that I proposed to bring a bill into Parliament to deprive an author who publishes a book without an index of the privilege of copyright; and, moreover, to subject him for his offence to a pecuniary penalty.” (Lord Campbell, Lord Chancellor of the United Kingdom). What else can I do with such a threat than to create this index as soon as possible?

Note

This text is currently only available online as a pdf file. A print version is so far not planned.. The original German text was translated by me without proofreading by a native English speaker. I hope that a reader does not come across incomprehensible passages or formulations. In this case, only the German version can provide a clarification. It is available at www.Inzpla.de/INZPLA-Geschichte.pdf.

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Last Lecture or not.

In the USA, it is common practice for a professor to hold a "last lecture" when he retires. This "last lecture" is not an event in which the professor (how it occurs in this "History...") draws a conclusion of his research. The claim to a "last lecture" goes much further, the professor should deliver an "important guidance for successive generations" on the basis of his life experience.¹ A high claim.

After an American colleague asked me if I had already kept my "last lecture", I asked myself what useful things I had to communicate to the following generation. And I couldn't think of anything right about it. What should I recommend to the "following generations"? Read more books, or watch less television.

Even a report on the development of one's own research activity (as it is presented here) carries the risk that the whole thing will only result in a great self-representation, while the research findings and the description of their development history will fall behind. But to give advice to the next generation, what importance is attached to such a person who feels called upon to do so?

However, the curiosity was aroused, and I asked myself, what valuable insights and advice the already published „last lectures“ conveyed to the following generations. Therefore, I studied some speeches dedicated to this purpose. The result was very heterogeneous.

The recommendations range from practical advice to emphatic calls. For example, a "last lecturer" recommends that when you receive a telephone call, and you don't want to speak to the caller at all, then you should hang up the handset while you are talking. Then the caller gets the impression that the call has been interrupted by a technical malfunction and the call has ended..... well... well.

Another recommendation; if you want to have a critical conversation with someone, you should go to his office. Then you could set the end of the conversation by saying goodbye. That's already better, but is that so important for the next generation?

Most of the "last lecturers", however, report how hard work has been put in and how lucky one has been and to whom one is indebted for everything, i.e., autobiographical things (as in this "History..."), and thus everything that might not be of particular interest to the next generation.

Nevertheless, I couldn't let go of the question whether I could recommend something to the "next generation", those who have nothing to do with my field of expertise. After all, I have already made a proposal for reform of the law of marriage, which may not have been very serious, but it is intended to be implemented by the present and not by the next generation.²

However, perhaps one could recommend to the next generation the observance of my "eleventh commandment". But is this commandment really so important that the "next generation" must learn about it right away? I don't think so. But I would tell a small circle of students if they asked me what I could advise them based on my "life experience".

Because that's the way it has happened before. I have already presented my eleventh com-

¹ <http://www.iupui.edu/lastlecture> called on 7.10.2012.

² www.Inzpla.de/Marriage-Reform.pdf (in English).

mandment to a group of "Studienstiftler" (from all fields of study at the TU Berlin), whom I supervised as a trust teacher.³ They had probably asked me about it more in jest and were quite amused when they heard my answer. That's all we can ask of the next generation.

But now to the eleventh commandment. I never mastered the Ten Commandments without errors, but I added another eleventh commandment for myself. And this commandment is very often present to me. It reads

You shouldn't be bored, but you shouldn't bore others either.

The first demand not to get bored is harder to meet than the second is. Because you can't always follow it without getting in not too much trouble. Sometimes you have to endure borer; unfortunately, this is unavoidable, but even in such situations, there are ways to react. Thus a professor was urgently "reminded" by his dean to attend the inaugural lecture of a newly appointed colleague. Last time he didn't show up either. So he appeared.

After the talk, the new appointee addressed him with the words: "*Mr. colleague, I had the impression that you slept during my entire talk*". Thereupon the "*colleague*" replies: "*I would have wished I had*". A little satisfaction for the forced violation of the eleventh commandment.

Mark Twain was even more consequent. He reported that after an extremely boring and uninspired sermon, he took a dollar from the bell bag passed through the rows, in the end, to make up for the wasted time.

If someone reads my eleventh commandment, then it is obvious to say, "This must have just come from him". Didn't Voltaire already say, "*the art of boring is to say 'everything'*".

If one learns from this text that it offers only a first overview, which is deepened on the basis of more than 1,800 pages, then one can probably assume that "everything" was said in such a bundle. But the argument is not entirely true, because nobody is forced to read. These pages, in which "everything" is said, are only an offer. The methods of the Integrated Target Commitment Planning and their computer-based implementation are described and discussed in various depths and under various questions. If you're bored, you should not deal with it. My courses on the Integrated Target Commitment Planning have also always been elective courses only. No one was forced to participate. However, maybe there's someone who's not bored with some of the stuff. And I was certainly not bored in creating this "bundle".

The best way to dispel boredom is to deal with a subject intensively. Whether collecting stamps, programming or studying Roman history does not really matter. The more one sets one's mind in motion, and the deeper one devotes oneself to a thing, the more one is gripped by it, and the opposite of boredom occurs.

Not to bore others is not so easy either. Most of what you do yourself doesn't interest others at all. Once you realize that, you've already come a long way. When it comes to a common cause, you have to know or find out what level of knowledge the others have. Otherwise,

³ For more than thirty years I was trust lecturer of the "*Studienstiftung des deutschen Volkes*" at the TU Berlin and supervised an (albeit changing) group of "Studienstiftlern" at regular meetings and in individual discussions. The "*Studienstiftung des deutschen Volkes*" is a foundation of the Federal Republic of Germany to support highly gifted students..

they'll get bored because you serve something they knew already. In a general conversation, you should never present your special knowledge. That doesn't interest anyone and seems only pompous. A conversation should be cheerful, and everyone should contribute something to it.

My eleventh commandment is by no means an urgent recommendation; it is a maxim without a missionary claim. If the "next generation" never hears the eleventh commandment, there is no reason for unrest. The eleventh commandment is neither pompously accompanied nor does it claim comprehensive validity as, for example, Kant's categorical imperative. It's limited by many other demands (such as the simple principle of not making jokes at the expense of others), but for everyday life, it was useful to me at least and didn't make me walk around the world too pessimistically.



The following poem does not need to know the next generation either. I like it a lot, and maybe it appeals to others. It's been hanging at my home for many years right next to the left edge of my computer screen. And when I let the view from my screen wander a little to the side, I see it. It was made by Hans Dieter Gelfert. So far, it is nowhere published, and that is very pity. It describes in living verses the relationship between mind and feeling.

Mind and feeling are two powerful forces that influence our actions. And this influence but also its influencing has always been an issue for me.

As mentioned above, I held a course for interested students called "Rational Reasoning..... It served solely to promote rational behavior. The mentioned founding of the inter-university debating club "The Debate" with some students and the also mentioned (compulsory) lecture I performed during several decades for students in business administration, in industrial engi-

neering and in economics about basic questions of scientific theory, in which several thousand students may have taken part, was only realized by me in order to raise the "rational argumentation level" of the participants. The reason for getting involved here was that I was always concerned about the question that Korf formulated in the following verses; *How do jerks succeed in fascinating so many people and what can be done against it?* Korf's statement and also his conclusion in the last three lines correspond exactly to my opinion.⁴

*Korf is still not able to believe
what jerks are able to achieve,
while what sharp brains announce
in public eyes quite seldom counts.*

*The mill moves restless in your head
how lovely feelings are instead
And after switching off your brain
you are freed from thinking's pain*

*Artists, from insanity infected,
are high regarded and respected
and politicians who need fixation,
can easily win a complete nation.*

*Thinking clearly calls for notions;
There's no space for large emotions
But if the brain is not involved,
how a problem can be solved?*

*Cool heads, and clear thinkers,
are, however, held for stinkers,
and the worst of these blind shells
are the intellectuals.*

*Yet feelings blindly swamp the land,
And quickly they get out of hand,
one single spark in this excitement
leads to a firestorm of frightment.*

*Rationality has no attraction,
brings the feelings not in action,
while the brain saponifies,
when a piper pipes.*

*Korf, now getting on a light,
sees what is the point behind.
Once enjoy fullness of live,
isn't that for what we strive?*

*For Korf it is an earnest quiz,
what the reasons are for this.
And the reasons could be these;
Thinking does not give us peace.*

*To him it now gets clearly plain,
it's always good to use your brain.
But is it not a pretty notion,
at times to flush it with emotion?*

One last point: one should not engage in "existential philosophy" and deal with questions to which there are no answers anyway. Richard Feynman, one of the most ingenious theoretical physicists of the 20th century, who discussed such questions with his sharp mind, does not go beyond the general.⁵ Here the sentence "the curtain closed and all questions open" actually applies. It is better to do something productive, and since it is not quite clear what is "productive", it should at least be a fulfilling activity.

However, you can't shut yourself off completely, and an open question that comes to my mind occasionally (but only occasionally) can be found on the next page...

⁴ Hans Dieter Gelfert is Professor Emeritus of English Literature at the FU Berlin. Korf is a well-known figure in Germany, who appears in poems by Christian Morgenstern. In these poems, he develops certain thoughts and draws at the end a conclusion from them. Gelfert's poem has an excellent rhythm and strength of wording in German, but unfortunately, I could not translate it adequately. The German version is available on www.Inzpla.de/INZPLA-Geschichte.pdf, p. 596

⁵ Feynman, Richard P., *The Meaning of it all: Thoughts of a Citizen-Scientist*, Basic Books 2005. For Richard Feynman, see also p.511



I don't know, where I come from,
I don't know, where I am going,
I'm surprised I am so happy



Participants of the Advanced Seminar Summer Semester 2005