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## THE THEORETICAL SUBSTANTIATION OF COST ACCOUNTING IN THE LIGHT OF CONFLICTING APPROACHES

Marcell Schweitzer

### RESUMEN

Desde hace algunos años se viene sosteniendo en Alemania una discusión acerca de la fundamentación teórica de la contabilidad de costes, así como de la necesidad de mantener un sistema de costes independiente. El abanico de planteamientos posibles abarca desde la total integración de la contabilidad de costes en la contabilidad externa hasta el de una separación lo más completa posible de ambos sistemas contables. Esta aportación pretende presentar, desde el punto de vista alemán, cómo se ha desarrollado la discusión y cuál es la situación actual. Como conclusión del trabajo se aboga por una separación, sustentada teóricamente, entre ambos sistemas de contabilidad.

El trabajo persigue varios objetivos:

- (a) identificación de las raíces históricas de las bases teóricas de la contabilidad de costes,
- (b) presentación de la problemática de la empresa y de su estructuración,
- (c) definición de los planteamientos de separación y de sus teoremas,
- (d) análisis de las perspectivas de investigación y de su fundamentación teórica,
- (e) orientación metodológica de la contabilidad de costes dentro del sistema de planificación y dirección,
- (f) presentación y evaluación de las recientes contribuciones acerca de los fundamentos teóricos,
- (g) fundamento teórico de un sistema independiente de contabilidad de costes.

### ABSTRACT

In Germany, a discussion has been in progress for a number of years on the theoretical substantiation and the necessity of an independent cost accounting system. The spectrum of views involved ranges from a complete integration of cost accounting (internal income statement) into the profit and loss statement (external income statement) to as complete a separation as possible of the two income accounting systems. This contribution will represent, from a German standpoint, how the discussion has developed, and what its present state is. The conclusion of this contribution is a recommendation of a theoretically substantiated separation of the two types of income statements.

The contribution pursues several different purposes:

- (a) an identification of the historical roots of the theoretical basis of cost accounting,
- (b) an account of the problem field of the firm and its structures,
- (c) a definition of the position of separations and separation theorems,
- (d) an analysis of perspectives of investigation of a theoretical substantiation,
- (e) a methodical orientation of cost accounting by the planning and steering system,
- (f) an account and appreciation of recent contributions on the theoretical substantiation,
- (g) a theoretical substantiation of an independent cost accounting system.

#### PALABRAS CLAVE:

*Contabilidad de costes, fundamentación teórica, independencia de la contabilidad externa, Alemania.*

#### KEY WORDS:

*Cost accounting, theoretical substantiation, independent cost accounting system, Germany.*

## 1. Introduction

In the literature, contributions on the theoretical substantiation of cost accounting are distinguished by differences of method. These result particularly from the orientation to differing superordinate contexts of statement, the stressing of differing accounting objectives or decision goals<sup>1</sup>, and the choice of differing general hypotheses as basic elements of accounting. It is therefore not surprising that the contributions arrive at different and to some extent contrary conclusions or statements on the theoretical substantiation and independence of cost accounting.

The discussion of the theoretical substantiation of cost accounting is mainly carried on in Germany. For this reason, the present contribution from a German perspective will begin with a brief outline of historical roots of the theoretical foundation of cost accounting. This will be followed by an account of structures of the problem field of the firm, and separation problems of accounting. Special attention will be paid to the separation theorems of Lücke (1955) and Kloock (1981).

As cost accounting traditionally serves, in addition to the determining and documentation of data, to support operational planning and steering decisions, the planning and steering system of the firm is selected as a frame of reference for all the information generated in cost accounting. Within the frame of reference, the operational level of planning is expanded by the tactical and strategic levels. Finally, calculus, decision and real theory modules of a theoretical foundation of cost accounting are elaborated.

These modules are adduced in order to analyse and appreciate recent contributions to the theoretical substantiation of cost accounting. As examples, one contribution from agency theory, one from capital market theory, and one based on decision theory are included in this analysis and appreciation.

## 2. A brief historical outline of cost accounting

For the theoretical substantiation of cost accounting, older roots of cost accounting, which go back to the 14th century, are not very fruitful, because they are predominantly to do with calculation technique and price policy (Dorn, 1993: 722). The first theoretical component of cost accounting is to be found in Ballewski (1877), who recognised the dependence of cost on alterations in employment (volume), that is, a cost-theoretical relation, as the basis of cost accounting. Tolkmitt (1894) went somewhat further in seeing in cost accounting beside the technical task a decision- and planning-related one. Finally, Schmalenbach (1899) achieved a theoretical quantum leap in introducing marginal cost into cost accounting.

In the 20th century, cost accounting had quite a stormy development, marked by progressive industrialisation, numerous efforts at standardisation and systematisations, and by the events of war. In the forefront of this development, without doubt, are standard cost accounting and marginal cost accounting, the theoretical components of which rest on the meritorious ideas of Schmalenbach.

After the 2nd World War, there were additionally new impetuses from the USA. These led to the further development of standard cost accounting, direct costing, planned direct costing, contribution margin accounting and forecast cost accounting systems. Partially parallel

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<sup>1</sup> In this article the term “goal” is used in a decision context and the term “objective” in an accounting context.

to these, life-cycle costing, behavioural accounting, activity based costing, target costing and others were developed. The penultimate step was the basing of cost accounting on superordinate systems of investment accounting in the firm and on the macroeconomic capital market. Essential features of more recent approaches to cost accounting are: taking into account elements of production theory and of cost theory, as well as of decision and agency theory, differentiation according to accounting objectives, orientation to the future, and orientation to superordinate systems. These are the more recent roots of the theoretical substantiation of cost accounting, which will be dealt with in detail in this contribution.

### 3. Methodical links for the theoretical substantiation of cost accounting

#### 3.1. The problem field as the empirical basis

In the following, the problem field in the firm, its modelling by the planning and steering system, various kinds of determination as perspectives for analysis, and accounting objectives as criteria of differentiation of cost accounting are seen as the basic elements of the theoretical substantiation of cost accounting.

One central task of cost accounting is to provide managers with decision-relevant accounting information for the solution of operational planning and steering problems. In particular on the middle and lower management levels of a firm, operational decision problems constantly arise, which must be solved by decision processes marked by a division of labour. The structured totality of decision problems and problem solutions is termed here a *problem field*, which is subdivided into problems and partial problems. Since each problem comprises an unsolved factual question (or task) and one or more goal functions, a division of the problem field means both dividing the question field and dividing the goal function(s). Each division of the problem field into problems and partial problems is termed a *separation*.

For the solution of a problem, this must be separated off from the problem field as an unsolved factual question. This leads to a factual separation. Factual separations can be made both on the level of real goods (area of production) and that of nominal goods (financial area). If, on the one hand, internally oriented problems of investment, supply and production (internal problems), and on the other externally oriented problems of dividends, financing or liquidity (external problems) are to be separated, as a first step on the object level, a factual separation into internally oriented and externally oriented problems must be made.

In the case of a factual separation of the problem field into internal and external problems, the goal function with its accounting measure for the two problem areas must be separated, which brings about two accounting areas. Various paths can lead to this formal separation:

- (a) The structure of the superior goal functions can imply that their separation according to their variables is possible, given the same accounting measure. That is to say, the superior goal function is formally separated according to the variables of the two problem areas into two partial goal functions in such a way that the two accounting areas retain the same, uniform accounting measure (e.g. payments) despite differing variables.
- (b) The structure of the superior goal function may imply that its separation is possible both according to its variables and its accounting measure. That is to say, the superior goal function is formally separated into two goal functions in such a way that each accounting

area uses its own accounting measure despite differing variables (e.g. the internal income statement revenue and cost, the external income statement earnings and expense). Here the question arises as to the formal relation existing between these accounting measures. The accounting measures (here: monetary ones) used for both accounting areas should satisfy the requirement of reciprocal transformability. The conditions under which this is possible must be explained by a theorem.

- (c) If attention is moved from the accounting areas to an individual problem for the solution of which the theoretical bases permit several partial goal functions, differing accounting measures can be applied. For examples, this is the case with the evaluation of investment alternatives. Calculation of the preference of an alternative can be done either by means of cost/revenue, contribution margin or outpay/inpay. Here too, the question arises as to the relation between these accounting measures. In order to arrive, independently of the accounting measure, at the same unambiguous preference, it needs to be explained by means of a theorem what formal relations exist between the accounting measures selected, and in particular under what conditions there exists equivalence (correspondence) between the accounting measures. Only under these formal conditions do the different accounting measures yield the same preference.

### **3.2. The planning and steering system as the frame of reference**

For the modelling of the problem field, both simple and more complex planning approaches may be adduced. The planning approach selected determines the basis structure of the resulting planning system. For instance, as a simple planning approach, the net present value model of investment accounting may be selected. If this planning approach is decided on, the overall problem field of the firm is considered as a (simplified) investment problem. With the decision in favour of this simple planning approach, all the abstractions and implications are accepted that characterise this approach.

If, on the other hand, it is seen that the problem field represents a complex dynamic structure with interdependences between a number of investment, financing, and production problems that must be mapped as precisely as possible, the necessary choice is of a dynamic simultaneous investment, financing, and production model that builds on markedly fewer abstractions, and thus maps the complex problem field more realistically than the net present value model. This planning approach, however, makes considerably higher demands on the quantity of data required, the formulation of the model, and the solution algorithms than a net present value model.

If, finally, it proves that the problem field is so complex that it cannot be represented in terms of similar structure by any of the planning approaches mentioned, a (stochastic) simulation model needs to be considered, which in case of doubt has to be formulated anew. For all three planning approaches, however, the supposition applies that an accounting system based on a planning approach is unable to generate information more precise than this planning approach, or planning system, includes or permits.

Modelling the problem field on the basis of one of the planning approaches mentioned leads to the planning and steering system of the firm, which covers all the problems and problem solutions. The planning and steering system is the map of the problem field of the firm, to which the information produced in cost accounting must be oriented. Conversely, the requirement of decision-relevant information is derived from the planning and steering system. Be-

cause of this relation, the planning and steering system becomes the *frame of reference* of the cost accounting system. In this sense, all information generated must be decision-relevant (planning- and steering-relevant).

From the perspective of decision theory, the formal basis of all planning and steering processes is the decision field with the components "multi-period, influenceable action area" (e.g. all feasible programmes of supply and sales), "multi-period, non-influenceable state area" (e.g. the supply structure, the rate of inflation, or interest rates) and "multi-period goal function(s)" (e.g. payment, cost, or income function). The goal function evaluates all alternative action-state- combinations with a result (effect). The decision field, meanwhile, gives information only about formal components of a decision logic which explains how a rational choice is arrived at. Studies based on this formal perspective are decision-theoretical analyses (Ewert et al, 2005: 30 ff). The planning and steering system, by contrast, is based on real planning and steering decisions for the solution of real problems or to close real problem gaps, which formally speaking are of the nature of a rational choice.

The connection between the planning and steering system and the cost accounting system consists in the fact that the planning and steering system defines the operating demand of information that is to be covered by the cost accounting system. Consequently, the context dealt with here involves the supplying of information concerning cost and revenue to support planning and steering decisions, differentiated according to levels of planning (strategic, tactical, operational), phases of value added (supply, production, sales), planning periods (quarters, years) and phases of steering (carrying through, inspection, protection). Cost and revenue information is required both for the problem description, the evaluation of alternative problem solutions in the process of drawing up plans, and the capturing of problem solutions in plans. Apart from supporting planning, cost and revenue information is also required to support current steering decisions of the realisation of planning. The cost and revenue information generated is oriented to the planning and steering system, and thus implicitly to the planning approach used. This monetary information is, however, not required at the lowest executive level in the firm, as at this level steering mainly takes place using factors of quantity, time, and quality (Schweitzer et al, 1999: 116 ff).

### 3.3. Types of determination as the perspectives of analysis

For the analysis of cost accounting, three perspectives of analysis suggest themselves: the perspective of the accounting system, the perspective of decision orientation, and the perspective of the empirical basis. Each of these perspectives, in turn, raises descriptive, theoretical and instrumental questions.

The theoretical questions of these three perspectives are dealt with under the present central topic of theoretical substantiation. In an analysis of the theoretical questions, the circumstance is particularly to be taken account of that cost accounting is an information generator very closely connected with the superior planning and steering system. From a theoretical point of view, the three perspectives named can be more precisely characterised as the perspectives of calculus theory, decision theory, and real theory (empirical theory). If one succeeds in formulating hypotheses from these three perspectives, and in linking these appropriately, it is possible to speak of a comprehensive theoretical substantiation of cost accounting and the accounting information derived. In this context, singular and general statements with an empirical truth claim are termed hypotheses. The hypotheses of calculus theory include all

formal (mathematical) statements of the accounting system (e.g. axioms and rules of matrix calculus). These hypotheses determine the formal structure of the accounting system. They have the property that their truth can be tested only according to logical criteria. Therefore they can only be logically true or false. The cost system is determined logically by them. To result in a feasible accounting system from the perspective of management science, these hypotheses are complemented by rules of structuring, delimitation, aggregation, etc. (Schweitzer, 2002: 2017 f).

Together with the logical determination of the accounting system, an empirical determination is also required for the information generated by the accounting system. This is achieved by hypotheses based on real theory for which an empirical confirmation must be striven for (Schweitzer, 2001: 185 ff). If, for instance, for the profit planning in the planning and steering system monthly forecasts of cost and revenue are required, for their prediction general hypotheses are required to be provided in the form of operational (short-term) cost and revenue hypotheses (functions). The corresponding conclusions have to be made for the providing of tactical (medium-term) cost hypotheses (for instance to predict the cost of a project) and strategic (long-term) cost hypotheses (e.g. for life-cycle costing). These functions have to be formulated in the area of cost accounting, tested, and applied as forecasting instruments (Müller, 1996: 127 ff, 217 ff; Kilger, 2002: 101 ff). The degree of empirical confirmation of these functions determines the quality (reliability) of the cost forecasts. The higher the degree of empirical confirmation of these functions, the more reliable is the information from the cost accounting and the better the substantiation of the cost accounting according to real theory. Thus the cost accounting is empirically determined.

To derive decision-relevant information on cost and revenue that are required in the planning and steering system, the hypotheses based on real theory must be integrated into the decision context of statements or a planning model. This step provides the determination of the cost accounting in terms of decision theory; that is, the derived information acquires a relation to the goal function(s) and the constraints of the planning model selected (Küpper, 1985: 26 ff; Kloock, 1997: 64 ff; Schiller, 1998: 528 ff; Schweitzer, 2001: 186 f). If goal- and constraint-dependent opportunity cost is required in the planning and steering system for an alternative evaluation, these are to be calculated in a separate decision model of the cost accounting system or in the planning and steering system itself. The more precisely the decision model maps the specific decision situation, the more reliable are the derived opportunity cost, and the better substantiated is the cost accounting in terms of decision theory.

A cost accounting system is considered theoretically substantiated, in accordance with these considerations,

- (a) when the accounting system is logically determined from the perspective of calculus theory (is free of contradictions),
- (b) when the information generated is determined in terms of decision theory from the perspective of decision theory (is related to the goal functions and constraints of the decision situation of a planning and steering system), and
- (c) when the accounting information generated is determined in terms of real theory from a perspective of real theory (on the basis of empirically confirmed hypotheses relating to input, cost, revenue or net present value hypotheses).

### **3.4. Accounting objectives as the criteria of differentiation**

The cost accounting system should be able to pursue various accounting objectives. For the steering of plan realisation, it should provide factual information on realised facts as a statement of actual cost (e.g. the actual sum of manufacturing wages of the past month). For profit planning, it should, as a budget accounting system, provide forecast information on (empirically) expected facts (e.g. the actually expected material cost of the coming month). For monitoring the efficiency of the cost centres and departments or the steering of the behaviour of employees, it should, as a standard cost accounting system, provide prescriptive information on special objectives (e.g. minimal centre cost). Whereas for the determining of singular cost information (observation statements) in actual cost accounting, general cost hypotheses are only indirectly recognisable, such hypotheses appear directly as forecasting instruments of cost in both of the planned cost accounting systems mentioned. This statement is also valid for all other forms of planned cost accounting.

In order to be able to pursue several accounting objectives, the cost accounting must be differentiated and flexibly structured in its components or modules. Whether the requirement of orientation to several objectives can at all be satisfied by a single accounting system depends on the properties of the accounting data used, what accounting objectives are to be pursued, and the relations between the individual accounting objectives. For the designing of accounting systems, accounting objectives are the most important determinants and differentiation criteria. The accounting objectives themselves are in turn determined by the decision goals (goal functions) of the addressees of the information. Traditionally, the following accounting objectives are attributed to an internal income statement (cost accounting) (Schweitzer, 2003: 26 ff): mapping and documentation of the firm process, forecasting future cost and revenue, planning and steering of processes, steering of employee behaviour, other objectives.

## **4. The interpretation of separation theorems**

### **4.1 The central idea of the separation theorem according to Wolfgang Lücke (1955)**

In some contributions on the analysis of cost accounting, the view is put forward that separation theorems represent the essence of a theoretical substantiation. This view is not accurate, and will therefore be relativised in the following. However, to facilitate understanding of the problem, first of all a survey of the separation theorems according to Lücke and Kloock will be given.

The best-known formal contribution to the problem of separation in accounting is the separation theorem of W. Lücke, which has a predecessor in the theorem of G.A.D. Preinreich (1937: 209 ff). The term "Lücke theorem" is applied to a statement (proposition) which Lücke formulated in connection with the evaluation of investment alternatives (e.g. assets) by net present values according to the net present value model of investment accounting (Lücke, 1955: 310 ff). This theorem is to be regarded as a statement arrived at by a logical deduction from the basic statements of the net present value model. As to the question whether this evaluation is to be payment-based (pagatorial) or income-based (calculational), Lücke demonstrates formally (mathematically) that under certain conditions (assumptions) the net present value of the calculational partial income (revenue less cost) of a planning period is equivalent to the net present value of the pagatorial payment surplus (inpay less outpay). Inasfar as the-

se conditions apply, it is, according to this theorem, equivalent whether the investment alternatives are evaluated pagatorically or calculatorically. Under these conditions, the preference of the alternatives is not affected by the valuation measure. The conditions under which this statement is correct are:

- (a) To all internal partial income, interest must be added on the basis of the book value at the beginning of the partial period concerned and of the relevant rate of capital cost (interest rate).
- (b) The sum of the cost included in the partial income must be as high as the sum of the outpays and the sum of the revenue included in the partial income must correspond to the sum of the inpays.
- (c) The difference between the acquisition value and the residual value of an asset must be the same as the sum of the depreciations made, whereas the depreciation method can be individually selected. The depreciation plan can therefore be different in the two approaches.

On closer inspection, it becomes apparent that the Lücke theorem, which was formulated for the valuation of investments on the basis of the net present value model, only gives formal conditions for when there is value equivalence between the accounting measures (profits and payments). This means that only under the conditions of the net present value model are the two accounting measures equivalent. Thus the Lücke theorem, as a formal separation theorem, makes no statement about how the investment problem is to be factually separated from the problem field, or what factual interdependences in modelling are to be abstracted from. Instead, it proceeds from the assumption that the investment problem under consideration has already been factually separated and is appropriately mapped by the net present value model selected. Equally, it provides no information on the preference of an alternative project (Ewert, 2005: 69 ff). The Lücke theorem also fails to state whether cost accounting should be set up as well as the external profit and loss accounting. It presupposes, however, that for all the investment alternatives to be evaluated decision-relevant income and payments can be calculated (forecast, estimated) with appropriate precision. To answer the question as to an independent cost accounting system, however, it must be clarified whether factual requirements of the decision process need a corresponding separation of the problem field. If this question is answered positively considering the organisational division of labour, the department capacity, the nature of the decision problems and the complexity of the problem field, the factual foundation for the setting up of an (internal) cost accounting system beside an (external) income statement is laid. This argumentation proceeds from the assumption that the external income statement, with its legal determination, cannot meet these factual requirements, or that it cannot be restructured in accordance with the requirements. To stress it once more: the Lücke theorem makes no statements about the fruitfulness or necessity of setting up two income statements; it merely points out, as a formal implication of the net present value model, under what conditions there is an equivalence between the accounting measures "cost/revenue" and "outpay/inpay".



#### 4.2. Expansion of the Lücke theorem according to Josef Kloock (1981)

J. Kloock places the Lücke theorem at the centre of his investigation of the measures in cost accounting. Kloock demonstrates, from the perspective of investment theory (Kloock, 1997: 68 ff),

- (a) what formal requirements are to be made, according to the Lücke theorem, of the delimitation of the internal and external income statement,
- (b) what insights this theorem provides for the accrual of earnings and expenses in the valuation of an enterprise,
- (c) how, according to this theorem, uncertainties or risks in the payments are linked to uncertainties or risks in the profits, and
- (d) what problems in the disaggregation (separation) of the values from the tactical to the operational planning level are revealed by this theorem.

For further interpretations of the Lücke theorem, reference may be made to Kloock (1981: 878 ff; 1997: 68, particularly the formal demonstration that the external income statement according to commercial law (profit and loss accounting) (with the inclusion of an internal interest calculation) can also provide relevant information on earnings and expenses for investment accounting (Kloock, 1981: 883 ff).

From the perspective of investment theory, Kloock represents the delimitation between cost accounting and profit and loss accounting as follows (Kloock, 1997: 68 ff):

- ? First, Kloock disposes of the error in thinking that the *Lücke* theorem pursues the purpose "of carrying out the investment accounting, instead of a payment accounting, with another monetary basis accounting system" (Kloock, 1997: 70). Instead, according to Kloock, the main purpose of this theorem is to explain under what conditions the internal accounting measures (cost, revenue) are in a consistent relation to external accounting measures (outpay, inpay), with the concept of income used being based on net present value and thus the net present value model of investment accounting is used as the basis of both accounting systems (Kloock, 1981: 873 ff).
- ? For cost accounting, by means of the Lücke theorem the value measure is derived which formally permits, by decisions on the operational level, the attainment of a positive net present value planned in (tactical) investment accounting.
- ? The Lücke theorem provides a purely formal support for the calculation of internal interest cost in cost accounting (taking withholding capital into account). Also, for particular models of various individual decisions, this theorem leads to the calculation of further (calculational) cost, taking residual values into account (Kloock, 1997: 68/69).
- ? Conversely, a planned income statement on the basis of the Lücke theorem provides decision-relevant information for investment decisions already made in advance.
- ? For the controlling of investments that were carried out before the planning point in time  $t=0$ , the Lücke theorem also formally provides the theoretical basis, insofar as the target income and the actual income of the investment used are oriented to the net present value of the investment accounting.

It must be noted that Kloock in his investigation argues purely formally on the value level of the problem field. According to this, the Lücke theorem reveals in the investment-theoretical approach an implication for the formal transformation of external outpay/inpay into internal cost/revenue. In a generalisation, Kloock and Feltham/Ohlsen show that this theorem is valid not only for the accounting measures of internal income, but also for the accounting measures of other monetary basis accounting systems and their variants (e.g. for valuations of whole enterprises, investment controls, strategic decisions, relations between market value and accounting data etc.) (Kloock, 1997: 69 f, 90, 104, 108; Feltham, 1995: 693 ff, 701 ff, 709 ff. For the criticism of the Lücke-theorem s. Kloock, 1997: 69 ff). The common feature of these accounting systems is, however, their relation to the net present value model of investment accounting. It becomes clear from Kloock's argument that each of his applications (investment decisions) first of all demands a factual separation of the decision problem (investment problem) involved. Equally, every factual separation of the problem field demands a formal separation of the goal function or its accounting measure, for which the Lücke theorem can be adduced for numerous decisions in the nature of investments which are represented by a net present value model.

## **5. An account and appreciation of selected contributions to the theoretical substantiation of cost accounting**

### **5.1. Theoretical substantiation in a capital-market-oriented contribution**

#### **5.1.1. An account of the approach of Küpper (1985)**

The first contribution to the theoretical substantiation of cost accounting is the capital-market-oriented approach of H.-U. Küpper (1985: 26 ff; 1990: 253 ff; 1995: 19 ff). The central idea of this approach is the orientation of accounting systems to the planning of the firm. For this purpose, a distinction is made between the two planning levels (1) "strategic/tactical planning" and (2) "operational planning". Income potential accounting and project planning and control accounting are assigned to "strategic/tactical planning", and planning and decision accounting to "operational planning". Each accounting system involves the provision of information for the planning level assigned to it, with a close vertical tying link of the operational planning and accounting to the strategic/tactical planning and accounting.

For the orientation of strategic/tactical planning, the capital market is selected from which, as the highest goal (goal function), an increase in the market value of the firm is derived. This goal is, accordingly, also binding for the strategic/tactical accounting systems. The capital-theoretical market value orientation means an orientation to shareholder value (market value of the equity capital = market value of the firm – market value of outside capital = shareholder value). From this perspective, the accounting system becomes an instrument of a capital-market-dependent assessment of the managers. Problems of designing then involve the adjustment of the operational accounting to the current and future interests and goals of the managers and shareholders, and to design the (one-period) operational cost accounting in such a way that it provides relevant information for multi-period decisions. Procedures that perform this task formally are dynamic investment accounting systems. These accounting systems have the advantage that they use the market value as goal. Küpper sees in the linking of cost accounting with dynamic investment accounting the solution of the overall problem

(Küpper, 1990: 253 ff). Furthermore, this link permits a substantiation of cost accounting based on investment theory.

The consequence of the linking of cost and investment accounting systems is "*investment-theory-based costing*", for the setting up of which several principles are to be followed (Schweitzer et al, 2003: 237 f):

- (a) Combination of short-term and long-term planning in a standardised plan,
- (b) direction of all partial plans to the same long-term goal,
- (c) combination of cost accounting with investment accounting on the basis of investment theory,
- (d) the choice of payments as a common basic accounting measure including the formulation of rules for the transformation of external inpay and outpay into internal revenue and cost,
- (e) theoretical substantiation of accounting by statements of investment theory,
- (f) setting up the cost accounting system as a partial system of the objective-oriented accounting of the firm,
- (g) the generation of relevant information for short-term decisions.

Strictly speaking, according to the principles mentioned, the operational cost accounting system is regarded as an investment accounting system simplified under the conditions of operational single-period planning (Schweitzer et al, 2003: 236). It is not a practically oriented accounting system, but rather a theoretical framework of designing or experiment within which practicable procedures and techniques of cost accounting can be developed, worked out in detail, and analysed. This accounting system should, in its final stage of development, provide relevant information for all operating planning decisions. The predominant accounting objective of cost accounting according to investment theory lies in providing information for short-term planning. Documentation und behaviour steering as accounting objectives are excluded.

In order to arrive at a strategic orientation of the accounting system by the market value, procedures are needed according to which this value can be forecast. One possible point of connection is cash flow accounting. For the calculation of the market value, which is supposed to be the measure of the total income potential of the firm, for instance, in a preliminary approach to a divisionalised enterprise a central control office, a financial area, and various divisions are separated (Breid, 1994: 26). The net cash flows of these three areas determine the market value of the firm. A central steering factor for the information and steering behaviour of these areas is a risk-free calculation interest, which is modified by an area-specific surcharge or discount. A further differentiation of these surcharges can, depending on strategy, be undertaken, which is supposed to achieve strategically an optimum allocation of cash and cash equivalents to the various areas.

As support for the choice of his cost accounting approach, Küpper states that it proceeds explicitly from payments, and permits a simple subordination of cost accounting to a multi-period goal. In particular, this approach, he states, avoids in operational accounting complicated period accruals of inputs, whose potential is tied up within the firm in the long term (e.g. depreciation). In this manner, the manager is to be provided with a continuous orientation of his decisions to the shareholder value.

### 5.1.2. Analysis and appreciation of this approach

In Küpper's view, the problem field of the firm represents a complex investment problem. As a frame of reference, he selects standardised planning within the firm. From the market value orientation of the approach based on capital theory, there follows as the prime goal of planning a maximisation of the market value of company capital. As planning approach, the net present value model of dynamic investment accounting is chosen, which as preference measure shows a net present value. The predominant accounting objective of "investment-theory-based costing" is short-term planning (Schweitzer et al, 2003: 252 ff). In detail, an appreciation of Küpper's approach leads to the following conclusions:

- ? The net present value accounting system used is based on streams of payments in and out with an effect on income over different time periods. They contain payments that must be subjectively estimated for potentials, programmes and processes planned in advance.
- ? The selection of a standardised planning as a frame of reference excludes problems of process steering (steering of plan realisation) and of behaviour steering. Equally, fixation on the single goal of market value excludes the choice of a multicriterial goal system.
- ? A relation between the Lücke theorem and "investment-theory-based costing" consists solely in the fact that they are both oriented to net present value. Otherwise, the Lücke theorem aims at purely formal accounting measure transformations, which occur in "investment-theory-based costing" (in a practicable version) at most on the operational level with the transition from payment to profit.
- ? Because of its constant orientation to shareholder value, operational cost accounting is regarded as a short-term instrument for achieving the strategically/tactically defined maximisation of market value. Following this approach, it cannot be avoided that speculation motives of the capital market, and personal income goals and interests of the managers, have an effect on individual operational decisions.
- ? Strategic measures can result in various effects. Only some of the effects can be suitably mapped by payments. The remaining effects, particularly qualitative effects, are not covered by quantitative payments (e.g. learning effects, flexibility effects, or cultural effects of globalisation). Even if income potential accounting, because of its assumptions and separations, still needs development as an instrument to support strategic planning (Schweitzer, 2001: 165), its fruitfulness lies in creating a strategy consciousness on the part of managers and in the strategy orientation of the remaining accounting systems.
- ? The framework of designing of "investment-theory-based costing" takes account of sufficient flexibility, for the concrete execution of cost accounting, to set up this accounting system even in the case of incomplete strategic/tactical planning only for some areas, projects or processes. Also, it can be further developed on this basis to become a "dynamic theory of cost accounting" (Seicht, 1962: 703 ff; Kilger et al, 2002: 82 ff).
- ? As soon as the cost accounting system takes on concrete structures on the operational level, problems of value and evaluation are to be expected. In particular, there result for the formulation of period-related goals problems of derivation from the superior capital market goal.
- ? Through the definition of the overall problem field of the firm as a uniform investment problem, through the linking of the levels of planning into a standardised planning, through the selection of net present value accounting as the planning approach, and

through the fixation on a single profit goal based on the capital market with the accounting measure payments, all separations are considerably simplified: factual separations of individual problems always lead to partial investment problems; formal separations always lead to the accounting measure payments, with differing determinants (drivers). As a rule, following this approach the superior strategic goal can only be approximately reached.

- ? "Investment-theory-based costing" can be regarded as largely theoretically substantiated. Its foundation in decision theory results from the approach to planning according to the net present value model of investment theory, and from the optimising character of the decision models. The real theory substantiation follows from the problem-dependent net present value functions, which however require a differentiation and empirical confirmation. Accordingly, operational cost accounting is interpreted as a theoretically supported, reduced investment accounting system. At its present stage of development, it is not yet a practicable accounting system, but a heuristic designing framework with the main elements "capital-market-based goal ", "hierarchically standardised planning" and "planning approach according to investment theory".

## **5.2. Theoretical substantiation in an agency-oriented contribution**

### **5.2.1. An account of the approach of Pfaff (1994)**

As a second contribution on the theoretical substantiation of cost accounting, the agency-oriented approach of D. Pfaff will be discussed. According to this, it is to be assumed that cost accounting pursues the accounting objectives of

- (a) documentation of the firm process,
- (b) planning and steering of processes, and
- (c) behaviour steering of the employees (Pfaff, 1994: 1068 ff).

Among these accounting objectives, it is the behaviour steering of the employees that claims Pfaff's particular interest (1994: 1070 ff, 1076 ff). The reason for this is to be seen in the fact that conflicts of interests and goals, and asymmetrical information distribution (states of information) between individual addressees are possible (Beaver, 1998: 28 ff; Schweitzer, 2002: 2026). This also applies to the external addressees of the accounting system. Balance sheet accounting contributes to the solution of the goal conflicts between external addressees by means of information whose establishing follows legal prescriptions or particular contractual agreements. The question therefore suggests itself whether balance sheet or loss and profit statement, as legally defined accounting systems, are able to provide information suitable for the solution of internal goal conflicts as well.

Internally, according to Pfaff, managers have to make numerous individual decisions on potentials, programmes and processes which must be supported by problem-specific and decision-relevant information. Since external loss and profit accounting is not able to provide this accounting information, cost accounting is required. In particular, the derivation of opportunity cost for the evaluation of decision alternatives is, according to Pfaff, an important task of cost accounting (Pfaff, 1994: 1065 ff). Opportunity cost can (in a broad definition) be lost profits and differences between acquisition cost and other values, which are

assigned dependent on goals. In calculating opportunity cost, one may, however, be content with approximate values. At any rate, for this accounting a concept of cost in terms of value is used. Moreover, according to Pfaff, it is important for internal decisions to be able to map production processes precisely and in detail. Since an external income statement is neither able to provide a detailed modelling of the production processes, nor to calculate goal- and constraint-dependent opportunity cost, an internal income statement system, which is able to fulfil precisely these requirements, is necessary to support the planning and steering decisions of the managers. Pfaff puts forward comparable arguments for the accounting objective of behaviour steering, using the example of the accounting system of *Siemens AG* (Schweitzer et al, 1999: 11 f).

After considering all the arguments that speak for a separation of the two income statements (coupling of income, risk, or evaluation, couplings between areas and relations of interdependence), and arguments that speak against a separation (savings in cost, applicability of the concept of residual profit), Pfaff finally arrives at the recommendation to retain independent cost accounting as well as external profit and loss accounting. As a further reason for this recommendation, he carries out an investigation of possible consequences of coupling effects (Pfaff, 1994: 1079 f) which are related in detail to problems of calculating fixed and common cost. The allocation of such "coupling cost", he states, is a proven method to obtain a goal-oriented behaviour steering of employees. Flexible internal cost allocation too, he states, could only be provided by a developed form of cost accounting. A comparable argumentation is also put forward for the calculation of various transfer prices. Finally, as the minimum version of a cost accounting, Pfaff sees an accounting system with two segments. The first segment is a greatly simplified partial accounting system for the calculation of cost with an incentive function for economical behaviour (for the influencing of behaviour). The second segment comprises special decision accounting systems, yet to be researched, for the calculation of decision-relevant cost for decision purposes (Pfaff, 1994: 1081/82).

### 5.2.2. An analysis and appreciation of the approach

In his theoretical substantiation of cost accounting, Pfaff orients himself to a frame of reference consisting of hypotheses of the agency theory. His planning approach has the character of an operational planning and steering accounting system. As its prime goal, there predominates the maximising of a utility function, and its most important accounting objectives lie in the mapping of production processes, and in the behaviour steering of employees. The appreciation of Pfaff's approach leads to the following conclusions:

- ? The external income statement is not able to provide problem-specific and decision-relevant information for the behaviour steering of employees.
- ? Strategic and tactical differentiations of the separation idea are not the subject of the investigation. Nor is any complete planning and steering system introduced as a frame of reference between the problem field and internal income statement. Rather, various hypotheses of the agency theory are implicitly introduced.
- ? In the forefront of the investigation are questions as to the necessity of a separate cost accounting, and as to the significance of this accounting for the derivation of information for the operational behaviour steering of employees.

- ? Conditions of formal equivalence between various accounting measures are not analysed. On the other hand, it is worked out what fundamental significance precise mapping of production processes and goal- and constraint-dependent opportunity cost (or approximations thereto) based on factual separations have for the setting up of an independent cost accounting system.
- ? In all evaluation or decision accounting (special accounting) in which opportunity cost figure the standard concept of cost is necessarily applied.
- ? Special attention is paid to occurring coupling cost, because some weight is ascribed to them for behaviour steering. The same applies to the calculation of flexible internal cost allocation, and for the calculation of various transfer prices.
- ? Finally, the arguments for and against an independent internal income statement are weighed up. The conclusion is in favour of the separation of from external income statement, and thus in favour of an independent cost accounting system.
- ? Pfaff's approach is, by its reference to the utility maximisation function and by the optimising character of special decision accounting systems, based on decision theory. The basis in real theory, by contrast, suffers from the low empirical validity of the premises of agency theory (the hypothesis of work suffering, asymmetrical information assumptions, and a narrow view of rationality) (Schweitzer et al, 2003: 616 ff, 654 ff). Pfaff's recommendation of the setting up or retaining of cost accounting with the accounting objective of behaviour steering is therefore to be evaluated positively, with reservations regarding a raising of the empirical validity of the premises of agency theory.

### **5.3. The theoretical substantiation in a decision-oriented contribution**

#### **5.3.1. An account of the approach of Hax (2002)**

As a third contribution to the theoretical substantiation of cost accounting, the approach of Herbert Hax, based on decision theory, will be discussed. According to this approach, the theory of accounting raises the question whether an income measurement on the basis of the concept of cost and revenue in terms of value can be justified in terms of decision theory with the aid of a separation theorem (Hax, 2002: 758). Thus the question as to the justification of the existence of a cost accounting system in terms of value is put here from the perspective of decision theory.

Hax admits that, on the one hand, there are two arguments for separating internal and external income statement:

- (a) It may be operationally desirable to cover the narrow operating core business (supply, production, distribution) of a firm separately from the non-operating area (factual argument).
- (b) Equally, Hax states, it is understandable not to include in the cost accounting information distortions of external income statement, which, for instance, result from taxation or other manipulations of evaluation (balance sheet policy argument).

On the other hand, according to Hax, it is a serious disadvantage that a separation of cost accounting demands departure from the payments of external income statement and permits the use of the concept of cost in terms of value. This introduces into the accounting

system payment-neutral elements in the form of supplementary cost whereby the payment basis of external income statement is abandoned. The introduction of a "concept of pagatorial cost" following H. Koch is not, Hax states, the solution to the problem either. As long as it is not clear according to what rules the operating inputs and outputs are to be evaluated, the concept of cost in terms of value remains empty of content. Without deriving situation-conditioned values from a theoretical conception, the evaluation leads to complete indeterminacy (arbitrariness of evaluation) (Hax, 2002: 761).

According to Hax, the central theoretical question of cost accounting is under what conditions it is permissible to make decisions in the firm on the basis of cost and revenue (Hax, 2002: 761). To put the question otherwise, are there conditions under which problems and partial problems can be separated from the problem field of a firm in such a way that a manager in his sphere of competence can make decisions on the basis of decision-relevant cost and revenue in the sense of an optimum overall decision (Schweitzer et al, 1999: 80 ff). As an answer to this question, a correspondingly effective separation theorem must be formulated. To answer this question, Hax has recourse to the separation theorem of investment and financing theory, which states under what conditions (preconditions) "the optimisation of the stream of payment can be removed from the context of subjective preferences and be achieved via the maximisation of a monetary representation value, that of net present value understood as market value" (Hax, 2002: 762). This first separation theorem, however, is not sufficient. For a theoretical substantiation of an independent cost accounting system, a second separation theorem is required. This must state under what conditions the decision (evaluation, with cost and revenue) on a separated problem (e.g. for production programming) leads exactly to the attaining of the superior goal "maximisation of market value" and thus effectively at the same time to the optimisation of the superior stream of payment.

The second separation theorem that Hax introduces into his analysis was already analysed by Schmalenbach in formulating his "calculation values" and later in formulating his "optimale Geltungszahl" (Schmalenbach, 1947; 1948) (Hax, 2002: 762 f), and formulated as a "transfer price theorem". Schmalenbach even intended to transfer this theorem from internal company processes to macroeconomic processes, which however he did not achieve for reasons of age. At any rate, this theorem was subsequently fully confirmed and made more precise through the "duality theorem (price theorem)" of linear und non-linear programming. However, it is true that the calculation of the duals (transfer prices) can only be carried out simultaneously with the quantity solution of the decision problem. In planning, therefore, the central quantity solution for a decentral application of the transfer prices must be taken as known. Thus, according to Hax, a separation and decentralisation of decisions on a larger scale leads nowhere. Only for a few smaller special cases have there been successful attempts to approximate this decomposition problem to practical applications, with a considerable quantity of calculation required. To Hax, it is the more surprising that the concept of cost and revenue in terms of value, which rests on the same theoretical basis as the price theorem, has found its way with such success into practical application, although it has barely been theoretically investigated. If one additionally takes into account the demand, in practical application, to avoid complexity of accounting as far as possible, the tendency becomes understandable "...to approximate cost accounting again to the pagatorial basis, and thus integrate it more closely into an overall system of firm accounting..." (Hax, 2002: 764).



However, Hax sees one exception to his critique: as an instrument of income controlling in investment centres, he allows cost accounting some importance, because here, with the given interest rate, the requisite separation is possible without difficulty. Since in investment centres investments (capital allocation) play a special part economically, the decentral investment decisions of these partial areas of the firm can be steered by means of the transfer price (a given interest rate for the capital invested). Furthermore, it can be shown that the related income supervision can be effectively realised by cost-based income controlling, adducing the Lücke theorem. For cost accounting, there results from this the conclusion that, with the exception of the internal interest – to which however Hax attaches great importance – it "...must remain strictly pagatorically oriented. This applies above all also to depreciation" (Hax, 2002: 765). The factual argument and the balance sheet policy argument mentioned initially remain, however, grounds for the separation of the two income statements (Hax, 2002: 766).

### **5.3.2. An analysis and appreciation of the approach**

In his analysis of the theoretical substantiation of cost and revenue in terms of value, Hax does not proceed from the planning and steering system of the firm as a frame of reference but from fundamental statements of decision and investment theory. His planning approach is the net present value model of the dynamic investment accounting, and his prime goal the maximisation of market value. The accounting objective of his approach can be named as the representation and the planning and steering of the firm process.

In detail, the appreciation of Hax's approach leads to the following conclusions:

- ? Hax orients his approach tactically to the theory of investment and financing. A strategic orientation is not discussed.
- ? On the one hand, there results a justified expansion of the separation idea, by having recourse for the theoretical substantiation of a cost accounting system to three separation theorems (theorem of investment and financing theory, theorem of optimisation of the stream of payment, Lücke theorem). On the other hand, the Lücke theorem is narrowed down to the value transformation of income and payments in investment controlling for investment centres. This narrowing is permissible, but excludes possible applications of the theorem to comparable formal transformations of accounting measures, such as those described by Kloock (cf. section 3.2).
- ? Hax assigns to cost accounting primarily decision problems of "price steering" ("pretiale Lenkung"). In cases of scarcity of goods or capacity bottlenecks, these require the evaluation of alternatives with opportunity cost. In purely determining cost accounting there are no opportunity cost, whereas they exist in every decision accounting (model) with bottleneck conditions. If, then, decision models are included in the functions of cost accounting, in bottleneck situations opportunity cost necessarily occur (even if they can only be calculated approximately).
- ? Hax himself qualifies the requirement formulated by him of a maximum of integration (aligning) of cost accounting with the external income statement, in view of a number of exceptions (determining periodic operating income, avoidance of taxation distortions, steering of processes, profit controlling in investment centres, the importance of internal interest) in favour of separate cost accounting. If the requirement of average evaluation

(e.g. during the construction of assets, the valuation of work in process according to the "percentage of completion" method), and the demand of several period accrual requirements (e.g. the even allocation of spasmodically occurring risk cost over several periods) (Schweitzer, 2001: 188 f) are additionally taken into consideration, the use of calculational cost is hardly to be avoided. Opportunity cost and calculational or imputed cost, however, represent the factual content of cost in terms of value (value-based cost).

- ? If cost accounting is indeed to be strictly pagatorically based, the question arises which pagatorial value it is to be measured by: the acquisition or cost of production according to HGB (with legally permitted valuation options), or the fair value according to IFRS (with a quantity of undetermined legal concepts, a quantity of valuation options and scope for estimation, with subjective expectations and estimations in determining value). This question has also to be asked in a milder form in the case of evaluation according to IAS and US-GAAP. Furthermore, even the strictest pagatorial variant in payment forecasts involves the problem that the further in the future payments lie, the more they must be estimated as average figures. This detachment from later actually occurring payments is the first step to imputed value categories (Schweitzer, 2001: 188 f).
- ? The substantiation of cost in terms of decision theory results from the optimising character of the decision models and from the planning approach according to the net present value model of investment theory, whereas basing them on real theory follows from the hypotheses of cost accounting (which, however, are not discussed by Hax). Thus income measurement on the basis of cost and revenue in terms of value (in decision accountings) is shown to be justified, at least in terms of decision theory. Currently, the factual argument and that from balance sheet policy still stand against an integration of the two income statements going beyond what is possible according to IAS and US-GAAP.

## 6. Conclusions on the theoretical substantiation of cost accounting

From the above analyses and appreciations, several conclusions can be drawn as to a theoretical substantiation of cost accounting:

- ? The theoretical substantiation of a cost accounting system cannot be carried out unidimensionally, but requires because of its complexity three perspectives of analysis of the problem. *Conclusion:* in order to fulfil the methodological requirements of a theoretical substantiation of a cost accounting system sufficiently precisely, a back-up in terms of calculus theory, decision theory and real theory is required, of which the back-up in calculus theory is as a rule plausible.
- ? None of the three approaches analysed is able to claim substantiation in terms of real theory, but all three can do so in terms of decision theory (with varying precision). *Conclusion:* the substantiation of cost accounting in terms of real theory in the sense of a completion and empirical confirmation of the general hypotheses used needs to be further developed.
- ? The orientation to a complete frame of reference (planning and steering system) is given explicitly (with planning) only in Küpper's approach. *Conclusion:* the frame of reference should be a map of the real problem field. In it, no essential simplifications or standardisations must be made with the aim of justifying the use of a simple planning approach.

- ? The integration into the hierarchy of planning differs in the three approaches: whereas Hax integrates his approach operationally and tactically, Küpper does so strategically/tactically as well as operationally, and Pfaff operationally. *Conclusion:* the integration of cost accounting ought to cover all three levels of the planning hierarchy, with the requisite differentiation, in order finally to ensure as comprehensively as possible, with the support of operational, tactical and strategic decisions, the achievement of the strategically set superior goal (goal system).
- ? In Hax's study, separation theorems play a predominant part, in Küpper's at most a subsidiary part, and no part at all in Pfaff's. *Conclusion:* questions of the factual and formal separation of the problem field, including the formulation of separation theorems, must be systematically researched, in order to arrive at least at a transformation of different accounting measures in conformity with the system.
- ? Differences can also be observed in the accounting objectives. Whereas in Hax the accounting objectives mapping, planning and steering/controlling predominate, in Küpper this applies to planning and in Pfaff to behaviour steering. *Conclusion:* If particular objectives are defined and accepted for cost accounting, the accounting system must be able to provide relevant information for all accounting objectives. For the deriving of information relevant to planning, for instance, different models and hypotheses are required than for the deriving of information on the behaviour steering of employees. The differentiation of information according to accounting objectives can be achieved by various problem-related decision accounting systems. In general, as the heart of an accounting theory, it is necessary to research comprehensively how accounting objectives determine the structure and function of cost accounting.
- ? The recommendations regarding separation/integration of cost accounting also diverge: Hax recommends as great as possible an alignment (integration) of internal and external income statement on the basis of payments, and Küpper, by contrast, a separation on the basis of payments with rules for transitions to cost/revenue. Most consistent is Pfaff's recommendation of a (further developed) separate cost accounting system on the basis of cost and revenue. Additionally, Ewert/Wagenhofer assume that for decision functions a separation, and for behaviour steering functions an integration (alignment) of the two cost accounting systems will tend to be useful (Ewert et al, 2005: 64 f). *Conclusion:* a separate cost accounting system should be retained. The further development of this accounting system should, however, be performed with consideration of its orientation to the planning and steering system, the separation of basic statement and decision statement, and the use of recent data bank concepts. Then it is possible also to explain precisely whether and to what extent the two income statement systems should be separated or integrated, depending on their accounting objectives.
- ? It should not be overlooked that an integration of internal and external income statement would have to lead to a fundamental restructuring of the external income statement, as the requirement of operational information remains largely given, even in the case of integration, with all the differentiations involved. One obstacle to restructuring lies in the fact that the external income statement is legally settled and possesses only a limited scope for adaptation. *Conclusion:* if integration is to be solved in such a way that the external income statement is retained with its present structure and complemented by several auxiliary or special accounting systems, this would be a mere deceptive change of name. If, on the other hand, the proponents of integration succeeded in demonstrating that

no proven requirement of operational information (cost and revenue information) for the planning and steering system exists, the development of cost accounting over many years would have been a mere episode in the history of company accounting.

- ? The question as to integration/separation of income statement acquires a different stress if it is posed from the viewpoint of the controlling of international firms. Thus the changeover from HGB to US-GAAP or IAS means, on the one hand, improved payment orientation (less valuation options), but by no means an external income statement free of manipulation (more scope for interpretation in the case of valuation premises). Rather, arguments of practical controlling speak in favour of putting the integration question anew. These include an underdeveloped accounting system of foreign subsidiaries, lack of experience on the part of the foreign managers in cost accounting, lack of comparability of accounting data, aspects of domination, reduction of complexity of accounting, and lowering the cost of the accounting system. *Conclusion:* The controlling arguments certainly speak in favour of an alignment of income statements and thus for a simplification of international controlling. The theoretical substantiation of cost accounting, however, is only tangentially affected by these arguments. It is therefore important to research comprehensively the influence of alternative forms of alignment of income statements on the planning and steering/controlling relevance of the derived information, and finally the quality of the planning and steering/controlling decisions of managers. In this, the degree of internationalisation will probably be only one of various influencing factors.

## 7. Suggestions for the designing of cost accounting

In the following, some suggestions are formulated regarding the designing of the frame of reference (planning and steering system) and cost accounting:

- ? For the development of a comprehensive frame of reference for cost accounting, suggestions can be derived from empirical investigations on information requirements differentiated by management hierarchy and planning hierarchy (Schweitzer et al, 1999: 116 ff; Schweitzer, 2002:2028) and from problem separations in recent planning and controlling/steering systems, for instance in APS (Advanced Planning and Scheduling) models (Stadtler et al, 2005). APS models are modular planning and steering approaches which increasingly prove themselves in practice, and are able to have a heuristic function for the designing of accounting systems. This applies particularly to their use for the designing of international supply networks. Conversely, the approaches to cost accounting can provide ideas for a further development of the APS models, bearing in mind their theoretical substantiation and scope of application (Schweitzer, 2005: 133 f).
- ? The requirement of decision-relevant information that the cost accounting system is to satisfy must be derived from a frame of reference. When changes take place in the firm's strategy(ies) and the goal system, or in market structures or stages of globalisation, the frame of reference and the information demand may change. In order for the accounting system to be able to deal suitably with such changes or developments, it must be flexible (flexibly designed). On the other hand, it must also cater for the differences in size of firm and area of business.

In a market economy, firms are very largely free in their choice of strategies, planning procedures and goals. This has consequences for the designing of the frame of reference and the cost accounting. The practice of budgeting shows in particular that numerous firms

- ? pursue particular goals of their multicriterial goal system, simultaneously or sequentially, with changing priorities (e.g. economic, technological, ecological, or social goals), and for individual divisions of one and the same firm select quite different goals (e.g. in the R&D area innovation and quality goals, in the sales field goals relating to degree of service and share of the market, and for the firm as a whole a profit goal), whose accounting measures cannot be substantiated by any separation theorem,
- ? to a large extent are not participants in the capital market, and therefore do not select maximisation of the market value of their company capital as a goal function, but quite different goals (e.g. sales, contribution margins, value added or demand coverage). It is also questionable whether firms (are able to) maximise their income goal at all. The theoretical substantiation of the accounting system of a firm on the basis of a precise extremisation (maximisation, minimisation) of a goal function has no point unless this extreme form of the goal is in fact selected and is also actually achievable. It is, however, not possible to deny a heuristic function to model analyses on the basis of an extremisation criterion. With this, however, the step to empirical-theoretically substantiated and practically applicable accounting systems has by no means been taken.
- ? being non-profit-making bodies such as state-run hospitals, universities, forestry authorities, economic enterprises belonging to local authorities, etc. with multicriterial goal systems, pursue goals other than the maximisation of the market value of their capital (shareholder value). Their cost accounting systems require specific frames of reference (planning and budget systems) and a specific theoretical substantiation. For this reason, the cost accounting system of such firms has to be designed differently from that of a globally acting industrial group with shares quoted on the stock exchange. For such firms, the maximisation of market value can be neither a precise nor even an approximate solution to their goal problem.

## 8. Concluding remarks

In conclusion, after the above analyses and appreciations of conflicting approaches to the theoretical substantiation of cost accounting, we may state the following: to support decision processes for the solution of operational planning and steering problems, cost accounting (cost and revenue accounting) can be set up with adequate theoretical substantiation. The *theoretical substantiation* of cost accounting is constituted by the real-theoretical substantiation of the general hypotheses used, the decision-theoretical substantiation of the information derived, and the calculus-theoretical substantiation of the accounting system. The contribution of *formal separation theorems* to the theoretical substantiation consists solely in ensuring the transformability or equivalence of different accounting measures.

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