

FUSING ACCOUNTING AND LEARNING - THE MEASUREMENT AND ASSESSMENT OF KNOWLEDGE CAPITAL AS SUBJECT OF ORGANIZATIONAL REFLECTION

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ABSTRACT

According to many authors, the information produced by performance measurement systems (PMS) about knowledge capital of organizations widens operative processes of management towards strategic learning processes. In contrast, this paper objects that the relevance of PMS for strategic learning processes stands on shaky ground. The main argument is that a self-referential use of PMS by neglecting unintended or even dysfunctional effects leads to the development of ‘blind spots’ and may avoid, finally, strategic learning processes. The paper argues that learning provoked by PMS requires a reflexive use of them. In this case, organizations mobilize PMS by intervening, reinterpreting and negotiating their assumptions and effects. PMS become a subject of change itself and are seen as an independent as well as dependent variable in the organizational occurrence. However, it is not self-evident that PMS are considered a dependent variable both in theory and practice. Therefore, we strengthen and substantiate this fact by vitalizing the learning approach by Bateson (1972) and its organizational adaptations by Argyris and Schön (1978) within the accounting discussion. The paper develops an analytical concept of organizational reflection for empirical investigations. In particular, special attention is given to the ability of organizations to reflect the self-referential effects of PMS. A case study in the software development industry substantiates the concept.

Keywords: Organizational Learning, Performance Measurement, Strategy

Acknowledgement

The students Martin Bajer, Dominik Sachse, Peter Uhlig, and Falk Wargenau of the Department of Innovation Research and Sustainable Resource Management of the Chemnitz University of Technology were involved in the expert interviews and the survey feedback; I wish to thank them for their activities in the empirical investigations.

1 INTRODUCTION

The Balanced Scorecard, the Guidelines of the European Foundation of Quality Management, and the Intangible Assets Monitor are examples of performance measurement systems (PMS) that represent a new, second generation of accounting instruments (Fried

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and Orellana 2006). This generation of instruments is characterized by the search for suitable methods to measure intangible resources named knowledge capital. The information produced by PMS about knowledge capital should be a basis for strategic decisions, organizational change, and learning processes, *etc.* (e.g., Andriessen 2004; Khim Ong 2003; Mouritsen 2004; Neely 1999; Roos *et al.* 2001).

In contrast, some authors object that the strategic relevance of PMS stands on shaky ground (Ahrens and Chapman 2006; Andriessen 2004; Christiansen and Skærbæk 1997; Edvinsson and Brünig 2000; Ezzamel 1994; Granlund 2001; Lev 2001; Lohman *et al.* 2004; Luft and Shields 2003; Marginson and Ogden 2005; Mouritsen 2005; Quattrone and Hopper 2001; Townley *et al.* 2003). One of their arguments results from the observation that the study of PMS is “oriented towards the implementation... itself and therefore it typically stops when the system is in place (or not)” (Mouritsen 2005, 111; e.g. Kaplan and Norton 1996a; Mausolff 2004; Wilkie *et al.* 2005). This means, PMS are solely seen as an *independent* variable (Ahrens and Chapman 2006).

Moreover, they argue that the designed PMS are not the final result *per se*, but the stage at which they start to produce certain - intended or unintended - effects (Fried and Orellana 2006): “The design is not dead, it transforms organisations” (Mouritsen 2005, 99; cf. Christiansen and Skærbæk 1997; Ezzamel 1994; Granlund 2001). Organizations can be unaware of these effects. In the long-term, organizations run the risk of a significant reduction in complexity, of an untenable rigidity of the “theory of business” (Kaplan and Norton 1996a) and of a ‘rationality in pretence’ by using PMS. Thus, organizations ‘wear glasses’ with which they observe themselves, but blind out certain other perspectives relevant to their survival (Fried and Orellana 2006). Tolerating such a self-referential process may support the development of ‘blind spots’ (Argyris 1992; Chua 1986; Fried and Orellana 2006). Or, at best, the organization may reflect that outdated information gained from performance measurements are insufficient to describe future challenges adequately. In this case, organizations mobilize PMS by intervening, reinterpreting and negotiating their assumptions and effects (Marginson and Ogden 2005). Hence, PMS become a subject of change itself (Mouritsen 2005; Quattrone and Hopper 2001) and are seen as a *dependent* variable in the organizational occurrence.

It is not self-evident that PMS are considered a dependent and an independent variable both in theory and practice. Therefore, the paper strengthens and substantiates this fact by revitalizing the learning approach by Bateson (1972) and its organizational adaptations by Argyris and Schön (1978) within the accounting discussion. We draw upon three levels of analysis and show that all levels are decisive, if PMS are to become a relevant strategic instrument in the long run. Distinct from Argyris’ and Schön’s classification, we describe processes of measuring and assessing knowledge capital explicitly from an *observer-related* perspective on the first, second, and third order level of reflection in organizations. Observers can be researchers, consultants, or internal representatives and experts for measuring activities in organizations. The paper especially emphasizes its observer-related perspective, since this specification is important for the analysis of empirical results and its attribution to the different levels of reflection (Bateson 1972; Spencer-Brown 1994).

The paper is structured as follows: the next chapter reviews the existing literature on performance measurement in reference to strategy and organizational learning. The literature review is followed by the analytical framework ‘concept of organizational

reflection’. Thereafter, the concept of organizational reflection is illustrated through a case study in the software developing industry. The paper is finished by the discussion of the empirical results and the conclusion.

2 LITERATURE REVIEW

The way how researchers do study accounting respectively PMS determines the understanding of learning and strategy and *vice versa*. This chapter now clarifies the underlying relations between the three fields of study. Table 1 provides a first synopsis of the relations between strategy, learning and PMS.

Table 8: Relation between Strategy and Learning and the Role of Performance Measurement Systems.

		Extent of Strategic Change	
		<i>INCREMENTAL</i>	<i>RADICAL</i>
Strategy Approaches	<p><i>CONTENT APPROACH</i></p> <p>Strategy as Plan</p>	<p>DELIBERATE STRATEGY</p> <p><i>LEARNING</i> is anticipatory.</p> <p><i>PMS</i> have no role within strategy formulation; they only support strategy execution and value translation in terms of efficiency and speed. They deliver consistency and reliability to avoid costly mistakes. <i>PMS</i> are seen here as an independent variable.</p>	<p>INTENDED RENEWAL</p> <p><i>LEARNING</i>, in general, is anticipatory; in particular, it refers to the proactive development of new competencies at the top management level.</p> <p><i>PMS</i> monitor the environment concerning future business opportunities and/ or control the correctness of strategy implementation. Here, they are seen as an independent variable.</p>
	<p><i>PROCESS APPROACH</i></p> <p>Strategy as Emergent Practice</p>	<p>INDUCED STRATEGIC PRACTICES</p> <p><i>LEARNING</i> is experiential.</p> <p><i>PMS</i> are designed to encourage people’s actions to happen within the strategy. Here, <i>PMS</i> provide the framework for incremental changes that refine the current strategy throughout the organization. They are seen as a dependent as well as an independent variable.</p>	<p>AUTONOMOUS STRATEGIC PRACTICES</p> <p><i>LEARNING</i> is discovering, experimental and exploring.</p> <p><i>PMS</i> serve to evaluate and select fundamental actions outside the regular practices. They provide the context for the creation and establishment of practices that fundamentally redefine the strategy. Here, <i>PMS</i> are seen as a dependent as well as an independent variable.</p>

Up to the mid-1990s, relatively few papers were published about PMS and strategy. Until then, the research discussion focused on the contingency perspective. Here, the fit of PMS and strategy and other contextual variables was especially investigated in terms of organizational effectiveness. Most of the studies were based on the *content approach* (cf. table 1; e.g. Ansoff 1987; Barney 1991; Porter 1981; Prahalad and Hamel 1990). According to this approach, the definition of strategy describes a linear process of strategy

formulation, analysis and implementation by the top management. In the end, the content approach separates ‘doing strategy’ into distinct steps such as setting objectives; formulating strategic priorities; budgeting, monitoring, control and determining incentives. The planning procedure by the top management can incrementally modify (deliberate strategy; cf. table 1) or can radically redefine (intended renewal; cf. table 1) the current strategy.

In case of the *deliberate strategy*, PMS are only relevant in the implementation stage of a top management’s strategic plan. PMS are seen as supporting the translation of deliberate strategy into actions. Any impact of these systems on the emergent strategy is not intended, since the objective is to put the strategic plan into practice in an as accurate as possible manner. Here, PMS are perceived to deliver consistency and reliability, to function as instruments of control and to ideally avoid costly mistakes. Accordingly, learning is mechanic and “anticipatory and accrues from planning ahead of time, from examining the different alternatives before the organization dives into execution and from outlining the path” (Davila 2005, 39; cf. Tushman and O’Reilly 1997). In case of *intended renewal*, the current strategy is fundamentally redefined by the top management. Thereby, PMS monitor the external environment concerning potential business opportunities. PMS only support the learning process of the top management level by highlighting external developments and risks and by building new, relevant competencies.

In the content approach, strategies are associated with managerial control and aim to ensure the unmodified implementation of the executive’s intentions as far as possible. Reflecting on PMS within this approach, it is – consequently - intended to control the correctness of strategy implementation by using these systems: “they are purposefully designed to block innovation for the sake of efficiency and make sure that processes deliver the value they are intended to generate” (Davila 2005, 39). Consequently, the understanding of organizational learning likewise appears anticipatory; experiences with PMS and their effects during usage are not taken into consideration. For this reason, it is noticeable that in the content approach PMS are solely seen as an independent variable.

Despite their high level of practical acceptance, only a limited number of research studies have actually paid attention to the outcomes and processes of PMS (Langfield-Smith 2005; e.g. Ittner and Larcker 1998; Malina and Selto 2001; Bisbe and Otley 2004). This limited interest does not reflect the fact that the use of PMS as a diagnostic tool for control and monitor purposes has had negative performance effects for a lot of organizations (Langfield-Smith 2005). An alternative to the “command-and-control view” of the content approach can be found in the *process approach* (Braybrooke and Lindbloom 1970; March and Simon 1958; Quinn 1980; also named e.g. learning school by Mintzberg 1994). Here, throughout time, strategies emerge from complex processes in which the intended strategic plan is interpreted and - where appropriate - adapted to the changing internal or external circumstances. Therefore, emergent strategies in organizations are more likely to be a result of a mixture of reflexive and unreflexive as well as conscious and unconscious practices (Lowe and Jones 2004). The process approach thereby takes the potential for the emergence of unintended or even dysfunctional consequences of an earlier decision into consideration (Fried and Orellana 2006).

Within the process approach there also exists a distinction between radical change (autonomous strategic practices; cf. table 1) and incremental change (induced strategic

practices; cf. table 1) of the current strategy. *Autonomous strategic practices* radically change the current strategy and can be described as a process of variation, selection and retention of alternative future practices. Thereby, PMS are proactively used to observe and evaluate the current goals and practices and to encourage discovering and experimenting in highly uncertain settings. Internal and external collaborations can bring people together and enable discovering, experimental and exploring learning processes. In a radical perspective on strategic change where the current strategy is revised completely, the established PMS does not continue to represent the underlying “theory of business” any longer. PMS becomes unsuitable to the prospective challenges and aims of an organization and should be scrutinized. In this case, e.g. Kaplan and Norton (1996a) suggest to revise the Balanced Scorecard with the underlying assumptions and cause-and-effect relations and to restart the PMS creation process. Compared with this, *induced strategic practices* describe strategies as new ideas emerging over time; strategic plans are partly conceived and need considerable reflection to develop and become viable. Incremental change involves a gradual process of continuously adapting, improving, and learning (Chenhall 2005). Thereby, organizational learning can be encouraged among others through a reflexive, experiential use of PMS (Abernethy and Brownell 1999; Bisbe and Otley 2004).

A reflexive understanding of PMS use within the process approach realizes that strategy can be underrepresented in the established PMS or it is possible that the PMS produces none or dysfunctional effects in the organization. On this basis, studies of the process approach are able to demonstrate that PMS can assist or hinder the process of strategic change respectively organizational learning (e.g. Archer and Otley 1991; Chenhall 2005; Granlund 2001; Malmi 1997; Scapens and Roberts 1993; Vaivio 1999). In summary, the process approach reflects an essential precondition to understand PMS as independent as well as dependent variable: only if the potential failure of PMS due to their unintended or unconscious effects in the organizational occurrence is taken into consideration in theoretical approaches and by practitioners, does the chance exist to position PMS as a relevant strategic instrument in the long run.

However, this is not trivial. It raises the question how organizations take the potential malfunction of their once established PMS into account. Only if this is considered can the strategic potential of a PMS be ensured in the long-term. The theoretical framework of the paper is outlined in the next paragraph. Based on the process approach, it uses three different levels of organizational reflection to offer a possible answer to this question. Furthermore, the case study in the subsequent paragraph refers to an incremental change of the current strategy in the investigated organization. Initiated by the observation of non-effects of the previous PMS and its substitution with a new PMS, the strategy could be translated into organizational practices in a more elaborated way. In this way, PMS acquired an equally dependent and independent character.

3 THEORETICAL FRAMEWORK

This paragraph outlines the analytical concept of organizational reflection in order to investigate PMS as independent as well as dependent variable in organizations. The central idea is thereby that PMS, their business ratios and indicators of perceived knowledge capital are the materialized results of reality construction. This production of reality is based on specific distinctions (Andriessen 2004; von Glasersfeld 1992; Maturana and Varela 1987; Spencer-Brown 1994), like tangible/ intangible resources or human/ social/

symbolic capital. As such, they always generate a ‘remainder’ or an ‘other side’ – called the *unmarked state*. For observers, including users of PMS, the *unmarked state* of measurement and assessment of knowledge capital becomes a ‘blind spot’ (Fried and Orellana 2006). Consequently, even the most elaborated instrument can never illustrate organizational reality completely.

From an empirical point of view, the resulting effects of using performance measurement systems in organizations can be observed with regard to the established “theory of business” (Kaplan and Norton 1996a) and the organizational practices. The term “theory of business” is not explicitly defined by Kaplan and Norton. However, a “*theory of business*” can be seen as the cognitive result as well as a condition for organizational practices and its materializations, including PMS, which determine the everyday organizational occurrence. *Organizational practices* are streams of actions that refer to each other and that can be reproduced in different situations (Giddens 1984). This perspective focuses on the nature of everyday life and on the central role it plays in the social world. Daily life is associated with routine-driven behaviour (Denis *et al.* 2007); it also reveals contradictions of social life and shows the possibilities of change that lie hidden in it (Feldman and Pentland 2003). *Strategy* embraces all the conversations, routines and interactions which contribute to activate and transform the firm’s direction on a daily basis. Thereby, strategy is fabricated by organizational practices of strategizing (that is organizational learning respectively reflection) using strategic tools and models (Denis *et al.* 2007).

In general, we agree that the successful generation of a PMS yields a *strategic momentum*. Through reflections on knowledge capital, organizations broaden their understanding of the existing potential beyond tangible resources and are enabled to discuss, communicate, and assess their strategy in a more elaborated way. Hence, they may change their existing organizational practices by gaining an enhanced understanding of knowledge capital. Strategic change processes in organizations, where internal or external observers are often integrated as initiator or supporter of the processes, start with a process of reflexive monitoring of the existing organizational practices. This commonly happens in situations where organizational results have become dissatisfying. Unintended consequences cannot be ignored any longer and can also not be rated as a problem caused by a deficient realization of the established “theory of business” (Argyris and Schön 1978). This observation of the formerly unmarked state in comparison to the marked state by the organization is called a *second order reflection* (cf. table 2). During a second order reflection, organizations have a critical look at the ‘blind spots’ which arise by using PMS and by referring to the existing “theory of business”. In doing so, organizations accomplish double-loop learning processes (Argyris and Schön 1978; Bateson 1972). The materialized representation of a changed “theory of business” and organizational practices leads to a modification or revision of the existing instrument for measuring organizational performance. In our empirical investigations, we outline how the organization observes what is relevant to its survival and how it assesses the existing organizational practices. Against this background, we refer in the case study to the questions, how the organization discusses its basic assumptions, perspectives, and perceptions (constructions) of the “theory of business”, the resulting unintended and intended consequences for organizational practices, and their (un)suitable mapping in the existing PMS.

It has to be acknowledged that the points of reference for a second order reflection in organizations – the PMS, the “theory of business”, and the linked organizational practices –

vary throughout time since they are subject to change: the minimum aim of change processes is the establishment of a different kind of *first order reflection* with a new marked state (cf. table 2). It includes the development of a new “theory of business” and organizational practices that are finally materialized in a PMS. In doing so, organizations accomplish single-loop learning processes. Single-loop learning means that “the underlying program” (the PMS) is not questioned. The organization only identifies and corrects errors “so that the job gets done and the action remains within stated policy guidelines” (Argyris 1992, 116; Bateson 1972). In view of the accounting subject, Senge describes this situation as “single-loop accounting” (Senge 1994, 289). In organizations, this supports arguing about numbers, which have been created by following predetermined rules. As long as the organization continues in this marked state, unintended consequences of organizational practices will be solely assessed as inconsistent with the “theory of business”. Thus, the organization will subsume arising consequences into its “theory of business” until the organization deems a second order reflection necessary and reveals or scrutinizes its “theory of business”.

Finally, *third order reflections* take place in an organization independently of a specific situation of change. In doing so, organizations show that there exists a potential for change which is inherent in the once established “theory of business”, in organizational practices and in dealing with a certain PMS (Feldman and Pentland 2003). Reflections of the first and second order will not occur, if the organization is not aware that change must occur at a certain moment. The precondition is an organization’s ability to realise the necessity of change. For a new double-loop learning process deuterio-learning is needed: single-loop and double-loop learning will not happen, if the organization is unaware of the way in which these learning forms occur (Argyris 1992). Deuterio-learning is thereby defined as a process, in which the learning itself and its supporting instruments are examined and renewed. Only if an organization is able to carry out some level of deuterio-learning (Argyris and Schön 1978), can PMS become a dependent as well as an independent character due to the organization’s ability to reflect on the limited character of PMS.

In our case study, we observe the discussion about the organizational member’s constructions of reality and drawn distinctions. The member’s ability to lighten up “blind spots” - *i.e.*, the reflection of the enabling and constraining effects of PMS in general - will be a matter of specific interest. Table 2 summarizes the analytical *concept of organizational reflection* from an observer-related perspective to the different levels, contents, and exemplary questions of empirical investigations of performance measurement systems in organizations.

The following presentation of our empirical investigations is guided by the description of the three levels of reflection and their specification concerning relevant research questions about PMS in organizations. Using the case study in the software industry, we will show how the investigated business unit serves the three levels of reflection and how it changes their “theory of business” and the corresponding PMS. In other words, what does it mean if PMS are a dependent as well as independent variable in the organizational occurrence.

Table 9: Analytical Concept of Organizational Reflection.

Level of Organizational Reflection	Contents of the Empirical Investigation	Exemplary Research Questions
<p><i>First Order Reflection</i></p> <p>Observation of the marked state by the organization</p>	<p>Investigation of the “theory of business” of organizational members, in particular the perceived tangible and intangible resources and their related organizational challenges</p> <p>Investigation of PMS as its representation and materialized “theory of business” of organizational members</p>	<p>Which resources are object of measurement at present?</p> <p>What are the resources and conjoined dilemmas in resource decisions that the organization has to balance?</p>
<p><i>Second Order Reflection</i></p> <p>Observation of the unmarked state by the organization</p>	<p>Investigation of the discussion of the basic assumptions, perspectives, and perceptions (constructions) of the “theory of business” by the organizational members</p> <p>Investigation of PMS itself and its „blind spots“ as subject of evaluation by the organizational members</p>	<p>Does the organization still consider what is relevant for survival, and is this supported by the established PMS?</p>
<p><i>Third Order Reflection</i></p> <p>Observation of the marked & unmarked state observations by the organization</p>	<p>Investigation of the general ability of the evaluation of the marked & unmarked space of the “theory of business” by the organizational members</p> <p>Investigation of the ability of lighting up “blind spots” and general effects of PMS by the organizational members</p>	<p>How does an organization discuss its constructions of reality/ drawn distinctions? Are there established practices or a common “theory of reflexive usage of PMS”?</p> <p>Does an organization discuss their ability to discuss enabling and constraining effects of PMS – and how?</p>

4 THE CASE STUDY IN THE SOFTWARE DEVELOPMENT INDUSTRY

The present case study was realized in a worldwide operating company that is a supplier of a series of integrated products and systems for the implementation of customer-specific automation solutions in many sectors. The investigated business division produces mechatronic machine concepts, in which both software as well as hardware developing units are involved. The object of the action research-based project was the software unit that delivers programs to navigate the related machines. As the company is a newcomer in this business, the strategic aim of the business division with more than 100 employees in the software unit is to increase the market share in the next year and to become a serious competitor. The business division attempts to engage in specific projects with high-potential customers who can be regarded as convincing examples for further potential costumers on the market. A stable quality of the complex mechatronic solutions is essential for the company’s future engagement in this business and for its market success. In particular, the operative aim is to improve the quality and to enlarge the features of the offered solutions (similar Bukh *et al.* 2002; Adler 2003). It is obvious that we refer here to

induced strategic practices where the current strategy is interpreted and adapted. On the basis of these insights, we started our investigations in the business unit. One obvious limitation of the empirical research is its small sample size of only one case study. However, it serves as an explorative study that can exemplify the importance and the challenges of reflection processes while using PMS and shows the possibilities of their empirical investigation.

In the first phase, eleven semi-structured interviews were carried out focusing on the following topics: project planning, planning, process, product and expert knowledge, of documentation, quality management, the cooperation with the different worldwide locations, further education with marketing staff members, the development and the system tests. In this context, especially the employees’ perspective was examined; the executives were provided with an alternative, employee-oriented perspective on the current situation. On the one hand, the aim was to find explanations for the causes of errors in the software development. On the other hand, the existing knowledge capital and the underlying resources were examined. Moreover, we analysed the dilemmas, which the organization has to balance in order to be able to make sustainable resource decisions. The interviews were transcribed and analysed content-analytically according to a special coding scheme.

The interview results were presented in a one-day workshop and served as a basis to discuss the strengths and weaknesses of the current knowledge capital of the software unit. In this process, it emerged that the participants recognized strength particularly in the human capital, and weakness predominantly in the relational and structure capital. In agreement with the workshop participants, four project teams (planning, documentation, communication, and interfaces hardware/software) were formed and tasked with analysing the corresponding resources in detail. The researchers observed the work of the teams in order to be able to follow the process closely and to moderate the ongoing interpretations of the presented resources. At the end, the detailed results of the planning, documentation, communication, and interfaces hardware/software teams were summarized in a list of twenty resources. This list was more specific than the one resulting from the first interview phase. It represented the basis for a discussion of the connectedness of the resources, which had only been considered separately thus far. Here, it emerged to be fundamentally important that the description of meaning, designation, and connectedness of resources had been elaborated in several feedback loops. In support of this process, we utilized the ADVIAN method (Fried and Linss 2006). This method is based on an impact matrix and is used to assess the direct and indirect connectedness between the resources.

In addition to the observations by the project teams, four expert interviews were conducted to understand the situation of measuring and assessing activities of the software business unit at the time. Among others, the interviewed experts were the employees of the quality management and the project’s division managers, who are responsible for the evaluation and the processing of technical performance metrics. Again, the guideline-oriented interviews were transcribed and, based on a coding scheme, content-analytically evaluated.

The next paragraph outlines the results of the empirical investigation in accordance with the concept of organizational reflection (table 2). Before describing the first and second order reflection of the software business unit, the discussion starts with the third order reflection as the general precondition for the initiation of a change process.

4.1 Research Results

4.1.1 Reflections of the Third Order by the Software Business Unit

As mentioned above, the radical application of performance measurement systems can block necessary change processes in an organization. Therefore, we were interested in investigating the organization’s general ability to scrutinize their “theory of business”, and in particular in capturing general statements concerning “blind spots” triggered by PMS. In the expert interviews, it became obvious that a strong capability existed to handle the previous product metrics and financial indicators for the measurement and evaluation of internal processes in a critically-distanced manner. Concerning performance measurement and evaluation, the responsible executives assume that figures, numbers, ratios, and indicators *etc.* are ‘guidelines’, which have to be adjusted and can also be rejected. Reflective handling is enabled through the iterative questioning of the users with respect to the meaningfulness of the single metrics. In the statements, the following becomes apparent:

- Business ratios and indicators require interpretation; there is a difference between the measured value and usable information,
- Statements have to be made about potential users and interpreters of information (personal ascription of meaning),
- An understanding and the meaningfulness of business ratios, and indicators can only develop over time (experience-based),
- Business ratios and indicators are ‘rough points of reference’, which provide an ‘additional image’ and at best support decision-making,
- Not everything can be translated into business ratios and indicators, *etc.*; they cannot substitute a personal talk,
- Business ratios and indicators that do produce scanty or even false information or do not depict current strategic challenges must be replaced; this has to be checked periodically by the persons concerned.

In the further progress, the third order reflections enabled a reflection of the second order regarding the existing instruments for performance measurement in the software business unit. After some progress, it became obvious for the managers that the measurement activities could not give adequate information about the expected strategic challenges mentioned above. The existing technical and financial information could not provide any explanation about upcoming challenges and current problems.

4.1.2 Reflections of the Second Order by the Software Business Unit

In most cases, observers - as was our role in this project - are only then integrated into change processes, when the organization already started with second order reflections concerning its own “theory of business” and, moreover, its instruments of organizational performance measurement. Often, the management has already realised that the company is faced with developments in its organizational occurrence, which cannot be dealt with in the conventional way. This also applied to this study: “We wanted to get other insights and perspectives from external experts to overcome our everyday working perspectives and explanations”. The starting point of the discussion about knowledge capital in the analyzed

software unit was their need to raise the quality in the software development. However, the cause of the error rate was only partially comprehensible for the managers. Managers agreed on the fundamental observation that the error rate regularly increased after approximately two years since the original development and continuing improvements to the software program. This was especially prominent in large projects with more than one hundred employees. A ‘lack of time’ was identified as the source of software errors and as the omnipresent problem. Moreover, it was remarked that the lack of time results in reduced creative freedom and reduced chances for unscheduled discussions amongst the developers. It is noteworthy, that at the beginning of our investigations, software errors were always ascribed *individually*. The tenor of the managers was that, generally, software errors are the problem of the individual software developer and not of the marketing, or of the system test. The consistent individual ascription meant that increasing instabilities in the software development were not regarded as an organizational problem of the unit. Therefore, the organizational potentials for error avoidance and thus the activation of other resources as those of the expert knowledge remained unused. The pre-established “theory of business” concerning the influencing factors and constrains of the development work and their measurement revealed itself as unsuitable to explain and solve the current challenges.

Moreover, the expert interviews showed that apart from the financial indicators of accounting, there were also so-called technical and product metrics generated. At the end of each interim stage of the development (increment), selected decision-makers (the quality management or project managers) are provided with the technical metrics of the software status. Product metrics are measurement categories, which document the status of the developed software, e.g. memory capacity, download-time or error emergence. These metrics serve as a basis for internal agreements on objectives, but also as a sales argument for the customers. The product metrics for the user quality of the software and the technical metrics are condensed to eight technical ratios that underwent qualitative evaluations. Furthermore, the process of software development is evaluated according to internal standards that are aligned with the “CMMI-Levels”[†] of the Software Engineering Institute (SEI) of the Carnegie Mellon University, USA. Every two years, the internal certification process uses audits to evaluate the ‘degree of ripeness’ or maturity of the software development process in an enterprise. This evaluation is based on special process standards (Adler 2005; cf. Adler 2003; Bukh *et al.* 2002; Niazi *et al.* 2005; Ramanujan and Kesh 2004; Wilkie *et al.* 2005).

In the course of the reflection of the second order (initiated through interview survey feedbacks and the workshop), the employees and managers became aware that through a conceptual development of the PMS, resources other than the ones previously perceived can be taken into consideration. Thus, influences on the software quality were describable in a new way. It became evident that the focus of the previous instruments and metrics had to be broadened. New instruments had to be found for measurement and evaluation, since the present product metrics of the quality management and the CMMI certification did not offer sufficient answers about the origin of errors in the software development (cf. Niazi *et al.* 2005). Although the CMMI certification was designed for material as well as immaterial resources, it had comparatively little influence on internal actions and decision (cf. Bukh *et al.* 2002). Due to its sporadic application, managers regard this instrument rather as an ‘external credential of quality’ than a management instrument (cf. Adler 2003; Kemerer

[†] CMMI = Capability Maturity Model Integration.

1997; Ramanujan and Kesh 2004). In other words, the certification did not become a part of organizational practises. Product metrics do not contain any process-oriented statements of a qualitative kind, which could explain how and why errors develop on an organizational level. The unmarked state of these instruments became obvious.

4.1.3 Reflections of the First Order by the Software Business Unit

In this chapter, we outline the results of the critical discussion about the existing “theory of business” and the new insights of the software business unit into their knowledge capital, which ultimately were reflected in an enhanced PMS. We will present the fundamental dilemmas immanent in the actions within the software development. Amongst the involved employees, the analysis of these dilemmas evoked a process of debate about the knowledge capital. It hence furthered a reflection of the first order. Consequently, we investigated from an observer’s point of view the changing “theory of business”, organizational practices, and performance measurement of the business unit in the course of time. In our opinion, common lists of resources are not expressive enough to outline the underlying constrains of actions and decisions in organizations. Therefore, we followed two different approaches: apart from (1) analyzing the knowledge capital and the underlying resources, we also used (2) the ‘dilemma’ term as a concept to present details of the current and prospective challenges for the software business unit’s resource decisions.

4.1.3.1 Knowledge Capital of the Software Business Unit

During the development of an instrument for the assessment and measurement of knowledge capital, the resources were identified in the first instance. Everything that can be considered a condition and/ or a result of the action of the business unit and what has both a positive as well as a negative influence on the software development, was termed a resource. The knowledge capital is subdivided in different types of capital and furthermore in resources. Table 3 summarizes the software business unit’s knowledge capital, which was elaborated during the empirical analysis and workshop discussions.

Table 3: The Knowledge Capital of the Software Business Unit.

	Human Capital	Relational Capital	Structure Capital
Resources	... results from the generation of - planning knowledge - expert knowledge - process knowledge - product knowledge	... results <i>internally</i> from the communication - in reviews - in project leader meetings - between the locations - between hard and software development ... results <i>externally</i> from the communication between customer and - marketing - service centre	... results from the generation and use of - vision documents - feature specifications - design documentation - technical equipment

Relational capital results not only from the relations to the suppliers and other stakeholders of an enterprise (“bridging social capital”), but also from internal relationships (“bonding social capital”; Edelman *et al.* 2004; Sandefur and Lauman 1998). In the case study, the

internal relational capital comprises communication processes within the software unit as well as communication at the interfaces of the hardware development and with other worldwide locations. Communication in an institutionalised form takes place in project leader meetings and reviews. Reviews are meetings of a varying group of employees and executives in order to clarify particular questions specific to planning and development. They are held before and during the whole developmental process. Before the beginning of the actual software development, newly planned products are introduced in project leader meetings, to which all involved employees are invited. On the one hand, the external relational capital develops from communication about product requirements between the marketing people of the business unit and the costumers. On the other hand, the customer service unit offers the opportunity for feedback on the quality of the product in a ‘longitudinal test’.

Human capital refers to the competences and the know-how of persons, individually or organized in groups. This reading is broadly agreed on in the performance measurement discussion. The human capital of the business unit is subdivided into product, planning, process and expert knowledge of the employees. Here, product knowledge is the knowledge about the functions of the product, while process knowledge describes what employees know about the current status and the increments of the development. Planning knowledge is mainly experience-based. On the one hand, each individual employee can, based on their own capacities, develop planning knowledge through work experience. On the other hand, planning knowledge can be acquired by executives whilst planning software development projects. Expert knowledge is knowledge, which employees acquire in the form of education and further education. However, it is not limited to the knowledge; for instance, of programming languages, but can also comprise, amongst others, an understanding of typical processes of software development in the business unit.

Apart from these two kinds of capital, several authors make a third distinction, the *structure capital*. According to Leif Edvinson, knowledge capital can be subdivided into human capital and structure capital (Edvinson and Brünig 2000; Lev 2001; Edvinson and Malone 1997). Some components of structure capital contain special material resources like information and communication technology, infrastructure, *etc.* (Sullivan 1998). Material resources, such as the documents for the software development process, show their effect as capital less through their physical existence, but rather through their potential to enable and constrain the actions of organizational members. In the case study, the category structure capital comprises the vision document, the feature specification, technical equipment, and the documentation of development. Formulated by the marketing, the vision document contains the client’s essential product requirements. The feature specification, deduced from the vision document, implies the precise development plan. The development documentation describes the current status of the software design and has only a temporary influence on the development. Further components of the structure capital are the technical equipment, the amount of information in electronic form and finally the test automation. Using automated test cases, the functions of the developed software are checked through simulated applications. The structure capital of the business unit enables the actions of organizational members as follows: the vision document and the feature specification are the desideratum of an adjustment process between marketing and software development. This should provide an orientation and a guideline in the software development and set the standards for the success or failure of a specific project. The development documentation

records the stages of the software development and safeguards actions at the interfaces both for the hardware development as well as for interactions between the software developers. After the completion of the software development, documentation records simplify the search for causes and origins of development errors.

On this basis, the next chapter delineates how the single resources influence each other and which dilemmas of action occur.

4.1.3.2 Dilemmas of Action of the Software Business Unit

The survey feedback of the interview results, the workshop discussions of the resources and their interconnectedness supported the organizational members in achieving a different, highly detailed view on the organizational occurrence, which went *beyond* the individual attribution of software errors. Thereby, they were able to interpret the strategic objectives of quality improvement and feature enhancement and to assign sense to the resulting challenges in their everyday working-context. The revised picture of the organizational occurrence embodies three dilemmatic settings that we called innovation, planning, and documentation dilemma. By balancing these dilemmas, the software unit is able to deal with their strategic challenges and the interconnectedness of resources (table 3).

The *innovation dilemma* of the software unit can be described as follows: the business segment is a ‘newcomer’ on the market. Therefore, from the marketing perspective, the development of additional software features for new customers had to be further expanded. However, this exposed the software developers to the permanent pressure of the marketing segment asking for the development of new and innovative software features. The developers evaluated the marketing unit’s demands for innovation as ‘isolated’; from their perspective; the newly requested functions were often technically not compatible with each other. Thus, the complexity and therefore also the proneness to error in the developed software increased. Instabilities were only addressed cumulatively, when the stability of the developed software became that strongly affected that numerous customer complaints occurred and, thus, the need for action became unavoidable. As a consequence, functionality was pushed into the background, while demands on software stability became dominant. The analysis showed that actions and decisions in the software development were strongly influenced by customer’s requirements. Steady demands for new functions (functionality) impede the error reduction (stability) and vice versa. The following two described dilemmas are an expression of this innovation dilemma and show the importance of the analyzed resources.

The second dilemma is denoted as *planning dilemma*. One aspect that became apparent during the interviews, were the existing difficulties with planning and the use of planning knowledge. For instance, project planning was done in ‘fiscal year letters’ and was hence not carried out in parallel to the project period. This had a problematic impact especially on short-termed and smaller projects, where a relatively inflexible and premature assignment of budget and capacities took place without any empirically-based figures and project details. Moreover, the actual software development often started earlier than the feature specification was completed risking that the requirements on functionality had to be adjusted during the process. It implied that changes had to be incorporated into a running process.

Furthermore, the potential inherent in the current product and process knowledge of the involved personal was not satisfactorily used. There was at least one notable factor

hindering the acquisition or sharing of project-related knowledge: the interviewees complained about the discontinuation of the so-called ‘project leader meetings’ (relational capital). These meetings used to give project leaders the opportunity to introduce the status quo, the goals of development and sub-goals for the succeeding weeks, current problems, *etc.* They used to include all people involved in a project and allowed everybody to receive a general overview. However, they were not taking place any longer. Similarly, the so-called reviews (relational capital), which are meetings aimed at updating the employees’ process knowledge, were not held on a regular basis. While invitations and presentations of single reviews were the responsibility of the quality management, this unit however did not push for an adequate participation and preparation of individual participants. Thus, for instance, special developers needed for a detailed discussion of particular increments were often unavailable. Due to the cancellations of reviews, misunderstandings became predictable and finally resulted in development errors.

The above described effects observed by organizational members of the business unit are an expression of the planning dilemma of the software development in general. The success of the software unit depends on the extent to which the unit is able to handle the dilemma of the planning procedure (referring to the ‘feature specification’; belonging to the structure capital in table 2) without becoming a victim of the misconception. The aim is to make agreements and feedback loops during the development process superfluous. On the one hand, knowledge-intensive processes like these software projects are strongly based on the division of labour and therefore require a meticulous as possible planning. On the other hand, it is illusive to believe that every detail of a development process can be foreseen or every obstacle predicted. The human capital, including expert knowledge in the software development as well as the planning, product, and process knowledge of the employees and executives, can cushion this ‘gap of planning’ considerably.

The third dilemma is called the *documentation dilemma*. On the one hand, the interviews showed that a good and complete documentation is significant for the success of the knowledge-intensive and complex work of software development. On the other hand, there is the insight that oral explanations are nonetheless still necessary. The interviewees stated for example that after communicating with some colleagues about single steps in programming, these colleagues will limit their documentations to the very essentials. However, the same colleagues will make a more extensive documentation in other cases. It was regarded as fruitful that colleagues enquire about details, as one “has an own idea behind the documentation of ones programming and sometimes one misunderstands it.” Different interpretations of the documented knowledge in the development work reflect the classical problem of knowledge management and of the use of information and communication technology. In the examined software business unit, the status of documentation was rather low. Often, particular documents did not exist, were inconsistent or of inadequate quality. Frequently, the developers did not carry out a documentation of individual steps of their work. These documentation problems were mainly due to the lack of pre-defined development interfaces at the beginning of the project, and due to the resulting time constraints, since a belated correction of the design document required additional time.

Hence, the documentation dilemma of the software unit can be formulated in the following way: on the one hand, the recording of employees' expert, planning, product, and process knowledge (structure capital) offers, for instance, an efficient possibility to comprehend

discrepancies in the developed software even after a longer period of time and independently from the single developer. On the other hand, recorded knowledge has only limited explanatory power. Structure capital, for example the design documentation of the software development, can only to a limited degree be reproduced in a standardized way. Thus, it is never completely self-explanatory. The task of sensemaking via additional oral communication (relational capital) remains. Therefore, the software unit has to find the right balance between the extent to which they support oral communication between employees, and the extent to which the written design documentation is enhanced.

5 DISCUSSION

The generation of a PMS is a process that is never completely finished – as it was also not the case at the point of concluding our case study in the software business unit. This process needs to be understood in a normative as well as in a descriptive way: on the one hand, as mentioned in the introduction and in the performance measurement section, Argyris and Schön (1978) have already postulated the importance of organizational learning and continuous strategic change for the survival of organizations in the long term. In describing PMS as constructions of reality that are always linked to the creation of blind spots, we deliver a more profound understanding of PMS as independent as well as dependent variable. In the software business unit, the blind spots – that in this case encompass the unmarked state of the knowledge capital and its underlying resources – have led to a restricted view on the organizational occurrence and on the cause of problems with software quality. On the other hand, with the conceptualization of an analytical framework (cf. table 1), we illustrate how the sustainable usage and generation of PMS can enable far-reaching strategic learning effects, which lead to more than a *strategic momentum* in the organizational occurrence. Using the case study, we describe in particular the necessary empirical investigations for the three levels and underline the role of performance measurement systems as both object and enabler of continuous organizational change.

In the case study, we could reconstruct the third order reflections of the software business unit: in the interviews, a theory of business emerged that is based on a sensible, critical-distanced handling of business ratios and indicators in general. For this reason, project leaders were able to start a discussion of their “blind spots”, to reflect on the need for the creation of a new PMS, and to involve external observers to support reflections of the first and second order. Proven by this ability to notice the difficulties of a marked state and the appreciation of an unmarked state in general, it can be concluded: the potential of organizational change is inherent in the “theory of business” – not only this time for the creation of a new PMS, but also for a sustainable approach to dealing with performance measurements in the future.

Thereafter, the case study continued with a discussion of the software unit’s second order reflections. Here, the software business unit started scrutinizing the then marked state (technical and financial business ratios and indicators) and discovered the existence of the unmarked state (knowledge capital). They realized that the former underestimation of the importance of knowledge capital was partly the result of the exclusive concentration on financial and technical business ratios and *vice versa*: on the one hand, they did not realize the importance of knowledge capital for performing an incremental software development process. Therefore, an assessment and measurement of it was never discussed. On the other hand, the fact that knowledge capital was not mapped in the PMS, increased the software

business unit’s negligence in its creation. However, after conduction second order reflections of this unmarked state, the organizational members realized that the existing “theory of business” about software quality and its determinants (the software developing time available, the individual software developer) had to be replaced. The former PMS became a dependent variable.

On this basis, an enhanced PMS was developed containing 20 resources with 25 business ratios and related indicators. In creating a PMS that incorporates knowledge capital as an important influence on software quality, the business unit revised the “theory of business”. It changed their first order reflections regarding the available resources and the related dilemmas in resource decision making. With an enhanced perspective on resources and the related decision dilemmas, the software business unit succeeded in creating a premise for new organizational practices. In this process, the basic conditions for the generation of process and product knowledge as well as for internal communication were primarily tackled. At the end, the software business unit was able to explain and to talk about their working conditions and challenges in a different way. This can be equated with the development of a new “theory of business”.

In summary, the three levels of reflection, which we identified, played a specific role during the process of organizational change in the software business unit. Especially the third level of reflection, which represents the general ability for critical-distanced dealing with the theory of business and a once established PMS, enabled the generation of an enhanced PMS of knowledge capital. This underlines the importance of investigating the third level of reflection and fundamentally strengthens the organizational learning and strategic change discussion in the performance measurement field. Simultaneously, it is possible to understand PMS as independent and as dependent variable in the organizational occurrence.

6 CONCLUSIONS

The paper argues that a one-off procedure in the creation of PMS leads to a rigidity of organizational practices. Therefore, it demands for an understanding of PMS as independent as well as dependent variable. If a self-referential process in using PMS is tolerated, the danger of ‘blind spots’ in measuring and assessing knowledge capital increases over time. Building on the argumentation by Argyris and Schön (1978) and their deliberations on organizational learning, a new analytical framework is developed to escape the self-referential process of creating and implementing PMS. The *concept of organizational reflection* (table 2) aims to describe the conditions under which PMS can become relevant strategic instruments for the long term. Therefore, we refer to three levels of analysis: we describe processes of measuring and assessing knowledge capital explicitly from an observer-related perspective on the first, second and third order level of reflection. The pivotal terms of the analytical concept of organizational reflection, *theory of business* and *organizational practices*, emphasize the organizational embeddedness of PMS. It is emphasized that all three levels contribute to strategic learning processes. From an analytical point of view, we therefore suggest case studies describing all of these three levels.

The case study shows that by using an analytical framework based on the concept of organizational reflection, it is possible to outline whether and how organizations escape

self-referential processes of performance measurement activities. By dealing with PMS and business ratios in a critical-distanced way and by understanding the generation of PMS as an ongoing process (until its complete rejection), organizations can extend their chances to use PMS as strategic instruments and to obtain more than a short-lived strategic momentum.

REFERENCES:

- Abernethy, M.A. & Brownell, P. (1999) ‘The Role of Budgets in Organizations Facing Strategic Change: An Exploratory Study’. *Accounting, Organizations and Society*, 24(3), 189-204.
- Adler, P.S. (2005) ‘The Evolving Object of Software Development’. *Organization*, 12(3), 401 - 435.
- Ahrens, T. & Chapman, C.S. (2006) ‘Doing qualitative field research in management accounting: Positioning data to contribute to theory’. *Accounting, Organizations and Society*, 31, 819-841.
- Andriessen, D. (2004) ‘IC valuation and measurement. Classifying the state of the art’. *Journal of Intellectual Capital*, 5(2), 230-242.
- Archer, S. & Otley, D. (1991) ‘Strategy, Structure, Planning and Control Systems and Performance Evaluation - Rumenco Ltd’. *Management Accounting Research*, 2, 263-303.
- Argyris, C. (1992) *On Organizational Learning*. Cambridge, Mass.: Blackwell Business.
- Argyris, C. & Schön, D.A. (1978) *Organizational Learning: a Theory of Action Perspective*. Reading, Mass.: Addison Wesley.
- Barney, J.B. (1991) ‘Firm Resources and Sustained Competitive Advantage’. *Journal of Management*, 1, 99-129.
- Bateson, G. (1972) *Steps to an Ecology of Mind. A Revolutionary Approach to Learning Man's Understanding of Himself*. New York: Ballantine Books.
- Bisbe, J. & Otley, D. (2004) ‘The effects of the interactive use of management control systems on product innovation’. *Accounting, Organizations and Society*, 29(8), 709-737.
- Braybrook, D. & Lindbloom, C.E. (1970) *A strategy of decision: policy evaluation as a social process*. New York: Free Press.
- Bukh, P.N., Johansen, M.R., Mouritsen, J. (2002) ‘Multiple Integrated Performance Management Systems. IC and BSC in a Software Company’. *Singapore Management Review*, 24(3), 21-33.
- Chenhall, R.H. (2005) ‘Content and Process Approaches to Studying Strategy and Management Control Systems’. In C.S. Chapman (Ed), *Controlling Strategy. Management, Accounting and Performance Measurement*. Oxford: Oxford University Press, 10-36.
- Christiansen, J.K. & Skærbæk, P. (1997) ‘Implementing budgetary control in the performing arts: Games in the organizational theatre’. *Management Accounting Research*, 8, 405-438.
- Chua, W.F. (1986) ‘Radical Developments in Accounting Thought’. *The Accounting Review*, 61(4), 601-632.
- Davila, A. (2005) ‘The promise of management control systems for innovation and strategic change’. In C.S. Chapman (Ed), *Controlling Strategy. Management, Accounting and Performance Measurement*. Oxford: Oxford University Press, 37-61.

Proceedings of OLKC 2007 – “Learning Fusion”

- Denis, J.-L., Langley, A., Rouleau, L. (2007) ‘Strategizing in pluralistic contexts. Rethinking theoretical frames’. *Human Relations*, 60(1), 179-215.
- Edelman, L.F., Bresnen, M., Newell, S., Scarbrough, H., Swan, J. (2004) ‘The benefits and pitfalls of social capital. Empirical evidence from two organizations in the United Kingdom’. *British Journal of Management*, 15, 59-69.
- Edvinsson, L. & Brünig, G. (2000) *Aktivposten Wissenskapital. Unsichtbare Werte bilanzierbar machen*. Wiesbaden: Gabler Verlag.
- Edvinsson, L. & Malone, M.S. (1997) *Intellectual Capital. Realizing your companies true value by finding its hidden brainpower*. New York: Harper Collins.
- Ezzamel, M. (1994) ‘Organizational Change and accounting. Understanding the budgeting system its organizational context’. *Organization Studies*, 15, 213-240.
- Feldman, M.S. & Pentland, B.T. (2003) ‘Reconceptualizing organizational routines as a source of flexibility and change.’ *Administrative Science Quarterly*, 48, 94-118.
- Fried, A. & Orellana, F. (2006) ‘Lighting up ‘blind spots’ while measuring knowledge capital’. *The Electronic Journal of Knowledge Management*, 4(1), 31-38.
- Fried, A. and Linss, V. (2006) ‘“Sensemaking” in Strategic Processes. Measuring and Assessing Knowledge Capital in the Software Industry’. In A. Neely, M. Kennerley, A. Walters (Eds), *Papers from the Fifth International Conference on Performance Measurement and Management - PMA 2006*, New Connaught Rooms, 25-28 July 2006, London, UK. Cranfield: Cranfield University, 265-272.
- Giddens, A. (1984) *The Constitution of Society: Outline of the Theory of Structuration*. Cambridge: Polity Press.
- Glaserfeld, E.v. (1992) *Wissen, Sprache, Wirklichkeit: Arbeiten zum radikalen Konstruktivismus*. Wiesbaden: Vieweg.
- Granlund, M. (2001) ‘Towards explaining stability in and around management accounting systems’. *Management Accounting Research*, 12(2), 141-166.
- Ittner, C.D. & Larcker, D.F. (1998) ‘Are Nonfinancial Measures Leading Indicators of Financial Performance? An Analysis of Customer Satisfaction’. *Journal of Accounting Research*, 36, 1-35.
- Kaplan, R.S. & Norton, D.P. (1996a) *The Balanced Scorecard. Translating Strategy into Action*. Boston: McGraw-Hill.
- Kaplan, R.S. & Norton, D.P. (1996b) ‘Using the balanced scorecard as a strategic management system’. *Harvard Business Review*, 74(1), 75-85.
- Kemerer, C. (1997) *Software Project Management. Readings and Cases*. Chicago: Irwin.
- Khim Ong, L. (2003) *Does adding nonfinancial value drivers to a summary financial measure improve the learning and performance of managers?* [PhD Thesis]. Los Angeles: University of Southern California.
- Langfield-Smith, K. (2005) ‘What do we know about Management Control Systems and Strategy?’ In C.S. Chapman (Ed), *Controlling Strategy: Management, Accounting and Performance Measurement*. Oxford: Oxford University Press.
- Lev, B. (2001) *Intangibles. Management, Measurement, and Reporting*. Washington, D.C.: Brookings Institute.
- Lohman, C., Fortuin, L., Wouters, M. (2004) ‘Designing a performance measurement system: A case study’. *European Journal of Operational Research*, 156(2), 267-286.
- Lowe, A. & Jones, A. (2004) ‘Emergent strategy and the measurement of performance: The formulation of performance indicators at the microlevel’. *Organization Studies*, 25(8), 1313-1337.

- Luft, J. & Shields, M.D. (2003) ‘Mapping management accounting: graphics and guidelines for theory-consistent empirical research’. *Accounting, Organizations and Society*, 28(2/3), 169–249.
- Malina, M. & Selto, F. 2001 ‘Controlling and communicating strategy: An empirical test of the effectiveness of the balanced scorecard’. *Journal of Management Accounting Research*, 13, 47-90.
- Malmi, T. (1997) ‘Towards Explaining Activity-Based Costing Failure: Accounting and Control in a Decentralised Organisation’. *Management Accounting Research*, 8, 459-480.
- March, J.G. & Simon, H.A. (1958) *Organizations*. New York: Wiley.
- Marginson, D. & Ogden, S. (2005) ‘Managers, budgets and organisational change. Unbundling some of the paradoxes’. *Journal of Accounting & Organisational Change*, 1, 45-62.
- Maturana, H.R. & Varela, F.J. (1987) *Der Baum der Erkenntnis: Die biologischen Wurzeln menschlichen Erkennens*. Bern: Goldmann.
- Mausolff, C. (2004) ‘Learning from Feedback in Performance Measurement Systems’. *Public Performance & Management Review*, 28(1), 9-29.
- Mintzberg, H. (1994) ‘The Fall and Rise of Strategic Planning’. *Harvard Business Review*, 72(1), 107-114.
- Mouritsen, J. (2004) ‘Measuring and intervening: how do we theorise intellectual capital management?’ *Journal of Intellectual Capital*, 5(2), 257-267.
- Mouritsen, J. (2005) ‘Beyond accounting change. Design and mobilisation of management control systems’. *Journal of Accounting & Organisational Change*, 1, 97-113.
- Neely, A. (1999) ‘The Performance Measurement Revolution: Why now and what next’. *International Journal of Operations and Production Management*, 19(2), 205-228.
- Niazi, M., Wilson, D., Zowghi, D. (2005) ‘A maturity model for the implementation of software process improvement. An empirical study’. *The Journal of Systems and Software*, 74, 155–172.
- Porter, M. (1981) ‘The Contributions of Industrial Organization to Strategic Management’. *Academy of Management Review*, 6, 609-620.
- Prahalad, C.K. & Hamel, G. (1990) ‘The Core Competence of the Corporation’. *Harvard Business Review*, May/June, 79-91.
- Quattrone, P. & Hopper, T. (2001) ‘What does organizational change mean? Speculation on a taken for granted category’. *Management Accounting Research*, 12, 403-435.
- Quinn, J.B. (1980) *Strategies for Change. Logical Incrementalism*. Homewood, Ill.: Irwin.
- Ramanujan, S. & Kesh, S. (2004) ‘Comparison of Knowledge Management and CMM/CMMI Implementation’. *The Journal of American Academy of Business*, March, 271-277.
- Roos, G., Bainbridge, A., Jacobsen, K. (2001) ‘Intellectual capital analysis as a strategic tool’. *Strategy and Leadership Journal*, 29(4), 21-26.
- Sandefur, R.L. & Laumann, E. (1998) ‘A paradigm for social capital’. *Rationality and Society*, 10, 481 - 501.
- Scapens, R.W. & Roberts, J. (1993) ‘Accounting and control: a case study of resistance to accounting change’. *Accounting, Organizations and Society*, 4, 1-32.
- Senge, P., Kleiner, A., Roberts, C., Ross, R.B., Smith, B.J. (1994) *The Fifth Discipline Fieldbook. Strategies and Tools for Building a Learning Organization*. New York: Currency and Doubleday.
- Spencer-Brown, G. (1994) *Laws of Form*. Portland, OR: Cognizer Press.

Proceedings of OLKC 2007 – “Learning Fusion”

- Sullivan, P. H. (1998). Profiting from intellectual capital. Extracting value from innovation. New York: John Wiley.
- Townley, B., Cooper, D.J., Oakes, L. (2003) ‘Performances measures and the rationalization of organizations’. *Organization Studies*, 24(7), 1045-1071.
- Vaivio, J. (1999) ‘Exploring a ‘non-financial’ management accounting change’. *Management Accounting Research*, 10, 409-437.
- Wilkie, F.G., McFall, D., McCaffery, F. (2005) ‘An Evaluation of CMMI Process Areas for Small- to Medium-sized Software Development Organisations’. *Software Process Improvement and Practice*, 10, 189-201.