

Influence of Management Control Systems on Knowledge Processes - a microperspective¹

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Abstract

Knowledge management and management control have been discussed separately in business literature for many years without linking both, although their research objects intersect in some ways. Management control activities handle part of the firm relevant knowledge. Consequently, they have a mayor influence on the knowledge processes of individuals and, therefore, have an impact on the success of implementing knowledge management in firms. Moreover, for management control research has a longer tradition than knowledge management research, it may offer some new insights for theory and practice of knowledge management.

This paper looks at the relation between knowledge management and management control activities from a microperspective. It presents and uses a behavioral model for analyzing the impact of management control systems on knowledge processes that puts the transformation of knowledge at the center of the individual decision processes and that considers the influence of needs, expectancies and attitudes on these processes.

Keywords

Knowledge management, management control systems, planning, performance measurement

¹ Please note: This paper is still work in-process. We apologize for any mistakes with respect to writing, spelling, grammar etc. in the text as well as the exhibits.

1 Introduction

While knowledge management has been discussed in literature since the 1980s, it is still merely an umbrella term for a wide range of concepts (Alvesson & Kärreman 2001; Swan & Scarbrough 2001). These concepts differ with regard to their theoretical roots, the definition of basic terms (like knowledge, learning, etc.), and scope of analysis: Some concepts define knowledge management more or less as the implementation of adequate information technology (Hertz 1988; Damodaran & Olphert 2000; Duffy 2001); others place the focus on human resource management (Ryan 1995; Lank 1997; Gourlay 2001); and some authors concentrate on the strategic issues concerning knowledge and knowledge management (Grant 1996; Grant 1997; Spender 1996; Lubit 2001). But lately, the emphasis has been shifting towards a more fundamental view of knowledge management (Lissak 2000; Snowden 2000). It has become a management philosophy that is part of the overall management process. Following this philosophy, knowledge management has to accurately influence learning processes in and of organizations and, thereby, enable firms to survive in a modern, increasingly turbulent environment. In this sense, knowledge management comprises all activities in firms that help to actively manage and control knowledge transformation and learning processes of individual organizational members, of groups within an organization, and of the organization as a whole.

While there is a vivid discussion concerning the linkage between knowledge management and the concept of learning organizations (McElroy 2000; Rosenberg 2000; Becerra-Fernandez & Sabherwal 2001; King 2001; Rowley 2001), the relation between knowledge management and existing, fully established (“classical”) business functions and systems has largely been neglected. This is surprising, since these functions and systems also need to be integrated into and/or adapted to an organizational structure which fosters a learning organization.

The lack of linkage results partly from the fact that especially one type of knowledge, tacit knowledge, is in the focus of discussion. While explicit knowledge is transmittable in a formal, systematic language and has a more objective character, tacit “knowledge is personal, context-specific, and therefore hard to formalize and communicate” (Nonaka & Takeuchi 1995, p. 59). Although this knowledge is hard to articulate on a verbal basis, it can be transmitted via other means like e.g. the process of imitation.

On the one hand, this type of knowledge is certainly an important part of the knowledge base of a firm (Nonaka & Takeuchi 1995). Furthermore, it is often considered the main source of sustainable competitive advantage (Lubit 2001). On the other hand, this focus

on tacit knowledge overlooks important other knowledge systems and activities that already exist in most organizations and that influence the creation, storage, transfer, and use of mainly explicit knowledge. Explicit knowledge remains an important part of the organizational knowledge base: it is exactly this type of knowledge that is comprised in e.g. financial and non-financial performance indicators, performance measurement systems, technology portfolios, documented production and management processes, etc.

Consequently, taking explicit knowledge into account is also important. Furthermore, it seems rational from an economic point of view and with special emphasis on successfully implementing a knowledge management philosophy in today's firms, to first analyze how effective some already existing systems for knowledge management purposes are, before investing in new additional systems and activities.

In particular, management control systems (MCS) (such as e.g. planning and budgeting processes, performance measurement, and remuneration systems) traditionally aim at creating, distributing, and storing explicit knowledge (e.g. Merchant & Van der Stede 2003) and can foster the transformation of knowledge from an implicit to an explicit status. So, they are prone to strongly impact organizational knowledge processes. Therefore, they should be taken into account when analyzing and explaining knowledge processes. Thus, one would expect researchers from knowledge management and management control to aim at exploring the possible links between the two research fields. However, a review of both streams of literature reveals an almost complete lack of such an interdisciplinary approach.

This paper aims at initiating an exchange between both research streams. In order to do so, we will adopt a microperspective of knowledge management and present a model that puts knowledge processes and an individual's needs, expectancies and attitudes at the center of individual decision processes. This model will build the basis for analyzing the influence that management control activities may have on knowledge processes.

The remaining part of the paper is structured as follows: In chapter two we will briefly discuss the most important characteristics of knowledge and their consequences for our research perspective. In chapter three we will develop a model that allows for the analysis of the possible influence of management control systems on individual knowledge processes. Furthermore, we will discuss management control activities and systems as one major factor influencing these processes. In chapter four we will select two important management control systems and show their influence on the different aspects of the individual knowledge processes. The paper closes with a conclusion and implications for further research.

2 Knowledge and knowledge management

Although the analysis of the factor knowledge in the context of economic discussions has a long tradition (cf. Hayek 1945; Drucker 1968), there is not one general accepted definition of this phenomenon (Schreyögg & Geiger 2003; Guldenberg & Helting 2004). Instead, a variety of differing concepts that incorporate everything from “experience”, “values”, “information”, “beliefs” etc. can be found (e.g. Nonaka & Takeuchi 1995).

While we do not want to delve in depth into this question of defining knowledge, we, nevertheless, consider it important to highlight the two main characteristics of knowledge that are of importance to our research perspective.

Firstly, the origin of knowledge lies in human experience (e.g. McDermott 1999). It is gained through the interaction processes between the human being and its environment (George & Jones 2005). In this interaction process the individual is faced with the permanent requirement of acting and reacting towards changing environmental demands in order to satisfy his needs. This process of action and reaction is a cycle of building alternatives to act and expectations concerning these possible actions, performing one of the alternative actions, receiving a feedback from the environment and recalibrating the expectations and/or actions.

Secondly, knowledge is the basis and the result of any goal-oriented human action. On the one hand, it is used to solve problems and a major ingredient to make decisions in order to cope with any task with which an individual may be confronted. On the other hand, the processes of the transformation and usage of knowledge are an object of human decision processes (Kunz 2005). Humans are able to think about the fit between their *existing* knowledge base and the *required* knowledge base. They can deliberately decide to change their knowledge by learning new aspects. In some situations they can even decide whether to use their knowledge or to act contrary to it.

These two characteristics of knowledge lead to two aspects for our research perspective on knowledge management.

Firstly, the roots of knowledge lie within the individual (Krogh 1998; Buckley & Carter 2000). Therefore, the starting point of any knowledge management activities should be the individual, as Foss & Mahnke (2003, p.10) stress: “[...] it is not firms as such that learn, and firms themselves do not possess knowledge. So-called ‘firm knowledge’ is composed of knowledge sets controlled by individual agents.” This points to the importance to take the perspective of methodological individualism as the fundamental research strategy (*ibid*).

Secondly, knowledge is not a static object, but in permanent transformation. This transformation is driven by individual problem solving and decision processes. Therefore, knowledge management should take a process-orientated focus and put the effective and efficient influence on the knowledge transformation processes at the heart of its analysis.

Based on these two ideas, a knowledge management philosophy should put the individual, her knowledge processes (like transfer, creation and use) and the factors that influence these processes in organizations at the center of analysis. This means, knowledge management research has to identify the activities and measures that have a crucial influence on the direction and intensity of knowledge processes in organizations. Hence, knowledge management should actually be seen as knowledge process management.

In order to identify the scope of such a knowledge process management, a model of the individual knowledge processes (or more precisely: of the possibilities to influence these processes) is needed first. A possible structure of such a model shall be discussed in the next section.

3 Modelling the knowledge decision process

3.1 Decision processes concerning knowledge transformation¹

In academic literature different knowledge processes such as knowledge transfer, creation, storage and use are mentioned. Instead of recapitulating the existing models, we rather like to introduce a different model that fits the requirements laid out in the previous chapter.

As we have already stated, the individual should be at the center of knowledge management activities. Therefore, we want to introduce an (abstract) model of an individual in an organization that offers a more distinguished look at the individual knowledge processes and the possibilities to influence these processes. This is achieved by modeling the knowledge processes not only as ingredients of, but also as objects of individual decision processes.

Since the model is fairly complex, we will introduce it gradually. In this chapter we will present a possibility to model the main parts of the decision process an individual will perform with regard to his knowledge requirements and possible knowledge transformation processes when confronted with a new situation. We will then continue to discuss the internal and external factors that can influence this decision process.

The main assumptions about the decision process model are (Kunz 2004; Kunz 2005): Starting point of the model is the notion that one can essentially differentiate two types of mental tasks that are performed by employees in firms (Putz-Osterloh 1988; Sell & Schimweg 1998). In the first case, the agent exactly knows the necessary steps allowing him to perform the required task. In this case she just has to perform a given algorithm exploiting the personal knowledge pool in the sense of a routine based action (March & Simon 1977). In the second case, individuals may be confronted with problems, e.g. they have an idea of the result they wish to attain, but they do not know how to achieve it. (Kirsch 1970). In this situation the individual faces uncertainty and has to change his knowledge by creating new knowledge in order to perform the task. This need for problem solving leads to several further decision processes.

The literature provides a wide range of classifications for such knowledge creation processes. But in general, an individual can either increase his personal knowledge by either replicating already existing knowledge or by creating new knowledge (Buckley & Carter 2000). This classification can be further differentiated in three general (analytical) knowledge creating strategies of the individual.²

Creation can happen in two ways. Firstly, the agent can combine existing knowledge elements from his/her personal knowledge pool and thereby create new personal knowledge (*individual creation*). Secondly, he may form a group with other members of the organization and try to solve the problem by combining knowledge elements of the group members (*team creation*). *Replication* is the *imitation* of useful actions of others, i.e. the exploitation of already existing knowledge in the organization. If the individual decides to imitate or create in a team, he has to select appropriate knowledge creation partners. At the end of all three knowledge creation strategies the individual has to select and use one of the newly created or possible imitation alternatives to perform the required task.

Performing a certain kind of action or course of actions leads to specific results. In case these results are measured and feed back to the individual, the individual will learn, whether the selected alternative was appropriate or not. If it was, the probability that the individual will use this knowledge in the future when a similar situation arises. Otherwise, he will abandon or at least lower the will to use this knowledge again. Exhibit 1 summarizes the decision processes.

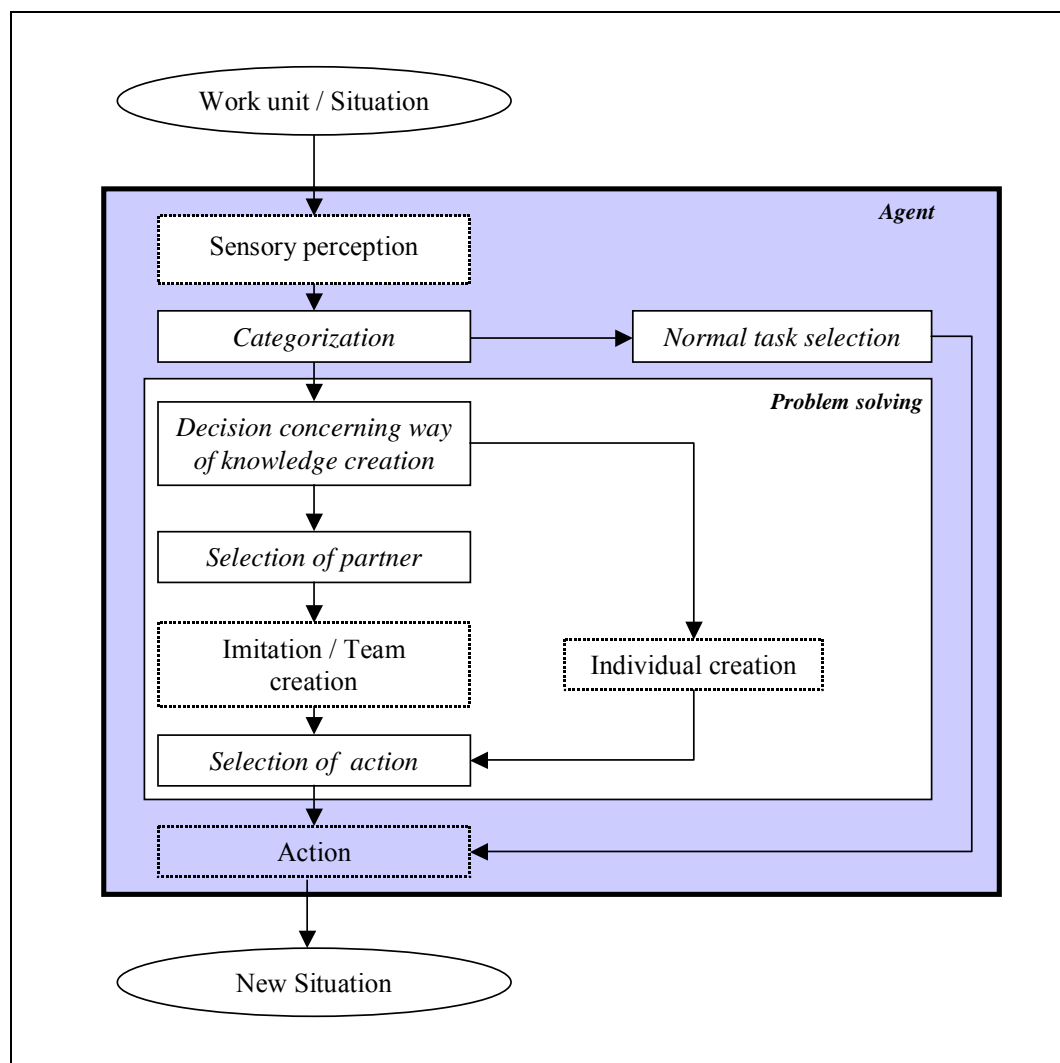


Exhibit 1: Individual decision process concerning knowledge use and transformation

This process description is certainly rather simplifying the real processes. For example, the interplay between knowledge creation strategy and selection of a knowledge creation partner is not a one-way street, i.e. an individual might decide to individually create knowledge due to the lack of an imitation partner. However, we believe that this model may offer a helpful guidance to analyze the consequences of different influence factors on the individual knowledge processes and in turn on the overall organizational knowledge processes. Organizational factors can influence the start and the direction of the individual processes at five instances: the selection and perception of situational aspects; the classification of a situation in a normal task or a problem; the selection of the appropriate knowledge creation strategy; the selection of a imitation or team partner and the selection of the most promising alternative (action) to perform the task; and, finally, the provision of feedback.

3.2 Internal influence factors

The modeled decision process with respect to knowledge use and generation is influenced both from factors that lie within the respective individual and outside of the individual. In the following, internal factors are discussed in more detail.

Psychologists have strived to identify and describe factors that influence a person's cognitive and physical actions since the inception of modern psychology some one hundred years ago. In the course of this research psychology has not only come up with many different attempts to structure these internal factors, but also many differing theories about their respective interaction and influence on decision making. However, most psychologists would probably agree, that these factors can roughly be grouped under four headings: (1) knowledge and physical abilities, (2) expectancies, (3) needs, and (4) attitudes (cf. Linder 2006).

Since these four factors impacting upon an individual's decision making and action process are defined somewhat differently from one author to the other, a clarification of what we mean by these four factors and the influence of management control systems on these factors (and thereby on the individual's knowledge processes) is necessary.³

(1) Knowledge and physical abilities

An individual's behavior is influenced by two types of abilities: cognitive abilities or knowledge and physical abilities (George & Jones 2005). By cognitive abilities or knowledge we mean all what an individual knows (know that) and can do (know how) (Ryle 1949; Daft & Noe 2001). Physical abilities, in contrast, include physical strength, endurance, flexibility, balance etc. (*ibid*).

While both types of abilities are important for the survival of a person, knowledge is – as we explained in the preceding paragraph – of special interest to our analysis. Therefore, our following analysis will concentrate on it.

Individuals differ with respect to the magnitude of their knowledge, but in general cognitive abilities are limited in comparison to what the environment would ask for (Porter & Lawler 1968). This bounded knowledge creates uncertainty for the individual about the environment, its elements and their interaction (March & Simon 1958; March & Olsen 1975). This in turn, can cause the individual to make erroneous decisions about what to do in a certain situation. However, fortunately a person's knowledge is not an entirely given or a fixed factor, but can be developed through interaction with the environment (McDermott 1999; George & Jones 2005; Kunz 2005). Such a development i.e. change in knowledge (which can result in a change in behavior but does not necessarily have to) is typically referred to as learning (George & Jones 2005).

(2) Expectancies

Expectancies as the second determinant of human behavior can be characterized as an individual's probabilistic estimates about future events – e.g. the results obtained when following a certain course of actions, or the consequences linked to these results on the individual's needs (see e.g. Porter & Lawler 1968; Heckhausen 2003).

Typically psychological literature and motivational models like the famous models by Vroom (1964a) and Porter & Lawler (1968) differentiate two types of these expectancies:

Firstly, a person will have some probability estimate about the impact of her actions and varying effort levels on the possible results. For example, a person is likely to have some kind of probability estimate with respect to what will happen if that individual goes skiing – getting down the hill nicely versus falling several times due to a lack of ability to ski. This type of expectancy is often referred to in the (social-)psychological literature as effort-performance ($E \rightarrow P$), effort-results ($E \rightarrow R$), action-results ($A \rightarrow R$) expectancy or as “self-efficacy“ (see Vroom 1964a; Porter & Lawler 1968; Bandura 1997).

Secondly, an individual will also have some expectancies about what consequences will be entailed by the results obtained by the chosen actions or effort. With respect to the earlier mentioned example, the person will have some probability estimate about what benefits or drawbacks regarding their needs will be linked to skiing down a hill fast and elegant versus hitting the ground with their nose. In the first case the individual might enjoy achievement, being recognized as a good skier and staying healthy. In the latter case, the consequences might be less enjoying – and possibly even including physical injury. This second type of an individual's expectancies is typically called instrumentalities, performance-reward ($P \rightarrow R$), result-reward ($R \rightarrow R$) expectancies or locus of control (see Rotter 1954; Vroom 1964a; Porter & Lawler 1968; Bandura 1997).

While separating these two expectancies, i.e. separating results from consequences linked to these results may seem like unnecessary fuzziness when analyzing human behavior at a first glance, it nevertheless is useful as will become clear when analyzing the impact management control systems can have on an individual's internal factors and thereby on the decision process.

(3) Needs

Needs are the latent preparedness of a person to react to specific incentives (e.g. a bonus in the case of a need for material safety or a pleasant work atmosphere in the case of a need for affiliation and social belonging) in a specific way (see e.g. Heckhausen 2003).

Fulfilling one's needs is associated with positive feelings and "satisfaction"; frustration of one's needs is associated with negative feelings and dissatisfaction. Typically, an individual will behave utilitarian or hedonistically i.e. the person will strive to maximize the balance of good over bad feelings and choose actions accordingly (cf. Galbraith & Cummings 1967).

While research disagrees over the exact list of needs, most theories of human motivation, as e.g. the theories advocated by Maslow (1954) or Alderfer (1972), include physiological needs (e.g. for food), safety needs (including a need for remuneration), needs for affiliation and friendship, needs for esteem, and needs for achievement and self-fulfillment (cf. e.g. Maslow 1954; Alderfer 1972).

While physiological needs, safety needs, needs for affiliation and friendship and social esteem are needs that can be satisfied or frustrated extrinsically, the needs for achievement/self-fulfillment can only be (partially) satisfied (frustrated) from within the respective individual (that is by means of satisfaction with one's own performance on a specific job) (Alderfer 1969; Alderfer 1972). Consequently, they are called intrinsic needs and are sources of "intrinsic motivation". Furthermore, the intrinsic need for achievement can, in contrast to all extrinsic needs, never fully be satisfied (Alderfer 1969) and, hence, will always play a role in an individual's decisions about how to act when confronted with a certain situation. Moreover, following Cameron & Pierce's (2002) extensive review of the relevant literature and in line with Alderfer's (1972) motivation theory, it can be assumed that intrinsic needs (and therefore, intrinsic motivation) cannot be influenced by extrinsic incentives.

In contrast, extrinsic motivation may not be important in the (rare) case that there are no extrinsic rewards capable of satisfying/frustrating the individual's specific active extrinsic needs, i.e. that there are either no extrinsic needs that press for being satisfied or that the incentives offered by the environment do not fit to the extrinsic needs currently dominant.

(4) Attitudes

Attitudes, which in literature are sometimes mistaken for needs and expectancies, are evaluations of certain objects (e.g. a certain action, a type of behavior, certain outcomes of behavior etc.) with respect to the satisfaction/frustration of a person's needs (Krech, Crutchfield & Ballachey 1962; Crawford, Luka & Cacioppo 2002). If an object is experienced or considered useful to satisfy the individual's needs, a positive attitude towards the object will result; if the person experiences the object to be useless or even counterproductive to satisfying its needs, a negative attitude will be learnt (Crawford, Luka & Cacioppo 2002).

The four internal factors described-above influence the decision and knowledge processes of an individual described in the preceding section: Needs and attitudes together make up something economists would call an utility of a certain action; expectancies determine the expected value of this utility taking the links between actions and results and between results and consequences into account; knowledge, finally, decides in a multiplicative manner what results actually come out when the individual chooses (based upon the expected value) a specific cognitive or physical action and effort level (Linder 2006).

3.3 Management control systems as external influence factor

After having discussed our understanding of the internal factors that influence the individual decision processes with regard to the use and transformation of knowledge, we can now turn to the external factors.

While there are multiple conceivable external influence factors on individual knowledge processes, one group of these factors is likely to be of especially high importance: management control systems (MCS). They comprise (among others) systems and instruments such as target setting and planning, performance measurement and evaluation, and reward systems (Anthony & Govindarajan 2003).

While MCS have been discussed for at least some fifty years now, the literature is still characterized by some heterogeneity concerning the definition of the scope and tasks of management control systems. Nevertheless, the majority of literature considers MCS to aim at directing the individual activities of employees towards the overall organizational goal or, if conditions change, that these goals are properly modified and actions are adapted accordingly (cf. Anthony & Govindarajan 2003; Merchant & Van der Stede 2003; Bouquin 2004; Weber 2004). Elements of management control systems mentioned in literature comprise strategic planning; annual planning / budgeting processes; performance measurement and evaluation, reward systems, responsibility centers, transfer pricing and capital expenditure appraisal techniques and processes.

MCS are likely to influence an individual's internal characteristics in order to achieve the behavioral implications mentioned-above. While with the rare exceptions of Burlaud & Simon (1997) and Kloot (1997) not mentioned explicitly (and not at all explored in detail) in the MCS literature, MCS in doing so heavily impact – as we shall see in more detail in the following chapters – upon the knowledge and knowledge processes of the individuals.

4 Influence of management control systems on knowledge processes

4.1 Selection of most important management control systems

The research field on MCS is characterized by a vast number of instruments and systems discussed under the title of MCS in the respective literature. Due to the limited scope of this paper, considerable narrowing is necessary. We thus have to limit the following analysis of the importance of MCS on knowledge processes exemplarily to only a few of these systems.

In order to do so, we would like to refer to what the leading authors on management control systems from the Anglo-Saxon, French, and German language areas consider the most important MCS. The intensity of discussion of alternative MCS in standard textbooks can serve as a rough approximation of the perceived importance of certain MCS in the field.

As Exhibit 2 shows, all surveyed seven leading textbooks on MCS from the three language areas consider budgeting and annual target setting processes and performance measurement and evaluation systems as primary elements of a MCS. All other systems are mentioned by some but not all authors. Due to its close links with performance measurement and evaluation systems, the current hype regarding “pay for performance” systems (Day et al. 2002) and the fact that the link between remuneration systems and knowledge processes has not been explored yet very well (Foss & Mahnke 2003; Laursen & Foss 2003), including reward systems in the analysis seems a promising topic. However, due to the space limitations we will limit our analysis mainly to the planning and the performance measurement and control systems.

	author							
	Anthony & Govindarajan (2003)	Merchant & Van der Stede (2003)	Atkinson, Kaplan & Young (2005)	Bouquin (2004)	Burlaud & Simon (1997)	Küpper (2005)	Weber (2004)	
	country	US	US	US	F	F	GER	GER
element of MCS								
strategic planning	yes	no	no	no	no	no	yes	
budgeting and annual target setting	yes	yes	yes	yes	yes	yes	yes	
performance measurement and evaluation	yes	yes	yes	yes	yes	yes	yes	
reward systems	yes	yes	yes	no	no	yes	yes	
responsibility centers	yes	yes	yes	yes	yes	yes	no	
transfer pricing	yes	yes	yes	yes	yes	yes	no	
capital appraisal	no	no	yes	no	no	yes	yes	

Exhibit 2: Elements of MCSs discussed in standard textbooks on Management Control from the US, France, and Germany

Consequently, we will highlight the importance of taking MCS into consideration when discussing knowledge management processes by, firstly, looking at target setting and planning systems, and, secondly, by analyzing performance measurement and review systems.

4.2 Identification of potential influence

4.2.1 Planning/budgeting systems

Planning processes clarify through their output – that is written plans and budgets – “where the organization wishes to go, how it intends to get there, and what results should be expected” (Merchant & Van der Stede 2003, p. 302). The main benefit of planning systems is, in fact, that they force employees to think about the future, prepare ideas of where to go and how to go there, discuss these ideas with others, and to commit themselves to achieving agreed-upon goals. Especially, the broad stream of literature on the “Goal Setting Theory”, originally developed by Locke (1968), has done many experiments over the last four decades that show how important target setting (or more precisely: setting explicit, clear targets) is for achieving high performance (cf. e.g. Locke & Latham 1984; Locke & Latham 1990). Thereby planning and target setting systems have a direct as well as an indirect influence on the knowledge processes. On

the one hand, they directly enlarge the individual's knowledge of where to go. On the other hand they impact upon an individual's expectations about whether the goals are attainable or not and by what kinds of actions and thereby indirectly influence his decisions in the knowledge process.

The direct influence is manifold and could be put under the heading of "If you don't know where to go, any road will take you there". Planning and target setting systems can impact the knowledge of where to go, and, therefore, the impression of the individual of whether the situation or task can be categorized as "routine" or "new". If no targets are set or if targets are only vague job descriptions (like e.g. in the form of "Drill oil wells"), the individual will not be able to select the actions as precisely as in the case of clear targets (like e.g. "Explore possible oil wells in the North Sea, keep to a budget of € 10 million, and don't take longer than twelve months."). Moreover, deciding upon whether to look for a new way of achieving the target, the individual without clear targets will not be sure about whether to ask a colleague or to go for it alone since he lacks the knowledge of whether the imprecise target might lend itself better to teamwork or individual innovation. Finally, the same holds true for the decision about selecting a possible team member (in the case the individual decided to rely on a joint-innovation for solving the problem), since he cannot compare the (unknown) target with the skills and abilities of possible innovation partners. Consequently, planning systems play an important role for all these decisions in an individual's knowledge processes, since they provide the necessary knowledge about the situation i.e. the problem to tackle.

The indirect impact planning systems can have on the individual's knowledge processes is via the employee's expectations. In (social-)psychology this influence is discussed under the headings of "self-efficacy" and "locus of control" by Bandura (1997) and Rotter (1954), respectively. While Bandura's (1997) self-efficacy, as explained before, refers to an individual's expectations about achieving certain results with his/her actions i.e. his/her resources, Rotter's (1954) locus of control deals with the respective employee's expectations about getting (or avoiding) wished (disliked) consequences like a bonus (malus) when attaining certain results with chosen actions. Planning systems have a major impact on self-efficacy while leaving (in contrast to the review systems to be discussed in the next section) the locus of control *ceteris paribus* unchanged: Agreeing upon certain target results to achieve within a specific time frame (like e.g. a year), influences the individual's expectations (that is: probability estimates) that he will finally reach these goals. If targets are set very low, the individual will almost certainly assume that he will be able to attain these goals when relying exclusively on "routine" procedures; if, however, the targets are set at a challenging level (that is: a level that seems "out of reach" with routine procedures), then the individual will be induced to think

about new ways of tackling the problem. In other words: The individual will be more inclined to leave the easy routine path and look for ways to innovate (either alone or in cooperation with others). Furthermore, if the targets agreed upon during the companies' annual planning and budgeting processes are so high that the employee considers the probability of achieving them by relying exclusively on own abilities to innovate lower than when cooperating with others, the planning system also influences the decision on whether to innovate in a team or alone. Finally, the goals set in the plan or budget will also influence the employees' expectations about the usefulness of cooperating with one colleague or another in order to attain these targets, since the goals' content and difficulty influence the likelihood that the one or the other of his colleagues can help to effectively solve the problem at hand.

As this rough discussion shows, target setting and planning systems influence the individual decision processes concerning the generation, transfer and use of knowledge in a manifold and complicated manner. Therefore, they should both be the object of further theoretical as well as empirical research concerning their influence on knowledge processes.

4.2.2 Performance measurement and review/control systems

Performance measurement and review (or control) systems have been discussed in the management control literature since its earliest days (cf. Fayol 1925). They are systematic processes of information gathering about results achieved, comparison to established targets, and variance analyses if applicable (Küpper 2005). Although performance measurement and control processes take place after the "fact" i.e. after the respective actions, they can have effects *ex ante* and *ex post*, which shall be described separately.⁴

With respect to the effects that are caused by employees believing in the existence or possibility of a later results control (i.e. what could be called *ex ante* effects), a direct and an indirect effect that are relevant from a knowledge management and innovation perspective can be distinguished (Linder 2006).

The direct influence on the employee's knowledge processes is similar to the direct effect of planning and target setting systems just described in the preceding section. In fact, as has been recognized in MCS research for some time, control systems draw the attention of employees toward the relevant tasks and the way how these tasks should be performed (Ridgeway 1956; Hopwood 1972; Cammann 1974; Locke & Latham 1990). This is synonymous to a reduction in the probability of misunderstandings occurring

between the employee and superiors (i.e. the firm) (Locke & Latham 1984). This direct effect influences all parts of the knowledge decision process. It directs the perception of the individual and is likely to improve the categorization decision, i.e. whether the employee can rely on routine actions or whether there is a need to innovate. Moreover, it may show whether innovation should occur in a team or by imitation of other colleagues and/or with whom the innovation or imitation process shall be performed.

The indirect effect influences the individual's expectancies. While the increase of knowledge about where the companies wants the individual to head to influence his ability to do "a good job", the impact upon expectancies influences the willingness to do a good job, since it lowers the results-rewards probability of actions that lead to results unfavored by the firm and increases the results-rewards expectations of alternative courses of action that lead to results measured (and assumingly possibly favored) by the organization. This change in expectancies (and the behavioral implications thereof) has been postulated in MCS literature since its earliest days (e.g. Grimes 1954) and has received a lot of attention in principal agent theory and game theory but also in psychological experiments (see e.g. Churchill & Cooper 1964; Holmström & Milgrom 1991; Wagenhofer 1992; Hutzschenreuter 1998). Such a change in expectations is likely to encourage an employee to work harder on solving a problem in a way that maximizes the *measured* results compared to the situation in which the individual knows that the results of the chosen actions will probably never be assessed. It will, therefore, possibly lead him to look for innovative ways to tackle a problem and to achieve even far stretched goals. Similarly, it is likely that he will try to ask colleagues for ideas or help in finding such new and superior ways, thereby increasing the measured results obtained.

Besides these *ex ante* effects, performance measurement and results control systems also have several "after the fact" influences on an individual's characteristics, and, thereby, indirectly on (future) knowledge and innovation processes (see Linder 2006). Once again, the first of these effects impacts the abilities and knowledge of the individual subjected to such a review through learning effects that have already been extensively discussed in literature. The second effect is related to the employee's expectancies and consists of learning effects, too. The third effect, in contrast, influences the controlled person's needs and their satisfaction or frustration. Finally, the fourth effect can be described as the (further) development of the individual's attitudes towards their work and knowledge strategies depending on the feelings of satisfaction or dissatisfaction of needs.

The first effect is a direct *ex post* effect on the individual knowledge and has been discussed and empirically analyzed in management control literature as well as the psycho-

logical feedback and employee evaluation literatures since their very beginnings (cf. Vroom 1964b, Annett 1969; Witte 1972; Luckett & Eggleton 1991; Hirst & Luckett 1992; Bonner & Walker 1994; Chenhall & Morris 1993; Bolger & Önköl-Atay 2004). While its importance for knowledge management purposes and an individual's knowledge processes has not yet been explicitly stressed in management control literature, it is obvious, that learning for one's abilities and knowledge from looking at the results obtained by certain actions and possible variances in results and their probable sources, is a key element for knowledge processes. We, therefore, do not want to elaborate on this obvious case in more detail.

The second effect is indirect and deals with changes in the employee's expectancies. It has been considered in management control literature and game theoretic models for a long time. This effect is twofold. On the one hand, control systems induce learning concerning the felt "locus of control" i.e. the results-rewards expectancies. On the other hand, control systems also have an impact on the development of self-efficacy beliefs i.e. action-results expectations. The (social-)psychology literature has focused on this aspect and points out, that self-efficacy grows when a certain course of actions has led to the wished results but will decline if not. Therefore, the change in self-efficacy is likely to induce revised decisions in future knowledge processes: If the use of routine procedures did not yield the anticipated results, the probability grows, that the next time the employee faces a comparable situation, she will opt for the innovative way of dealing with the situation. Similarly, if working together in a team to innovate turned out to be highly effective (that is: having a high probability to lead to certain anticipated result), the individual will likely choose to work again in a team in a similar situation. Otherwise the employee might rather rely upon personal skills for achieving innovative solutions.

As mentioned-above, performance measurement and review systems do also have an "after the fact" influence on the individual's level of need satisfaction/frustration: If the review shows, that the results obtained by the employee's actions are favorable, she should feel intrinsic satisfaction of her needs for achievement, while she will experience frustration of these needs if the control points to (unfavorable) deviations from anticipated targets. In conjunction with pay for performance remuneration schemes the results control can also influence the level of satisfaction/frustration of extrinsic needs like e.g. safety/remuneration, friendship, social esteem and power. However, since the question of linking extrinsic rewards/punishments to the results obtained can be separated analytically from the question of measuring these results, the effects of a pure performance measurement and control systems – as discussed in this paragraph – are limited to the earlier mentioned satisfaction/frustration of intrinsic needs. Since, according to Alderfer

(1972) the intrinsic needs of achievement of a person cannot be fully satisfied, but will constantly be relevant, a partial satisfaction of them due to a positive outcome of a review process, will not negatively impact the employee's willingness to "do a better job next time". Therefore, as long as there are only intrinsic incentives tied to performance measurement systems no significant change will take place with respect to future decision processes. The individual will then still strive to always do a better job, i.e. she will be motivated to innovate. Only in the case that extrinsic financial or non-financial rewards and punishments were also linked to a performance measurement system (so called pay for performance schemes), a control will be linked with satisfaction (positive outcome of a control) or frustration (negative outcome of a review) of the extrinsic needs and, therefore, since these needs can be satisfied completely (cf. Alderfer 1972) lead to a situation in which the individual's willingness to innovate declines to the level of a situation with pure intrinsic incentives (i.e. a sole "need for achievement" situation), even though the organization may provide the employee with extrinsic (but after satisfaction of the extrinsic needs now irrelevant) incentives, too!

Even though the experience of need satisfaction/frustration is limited (in the pure performance measurement and control case) to the achievement needs, changes in the individual's attitudes are likely: Once again, if the results measured in the review are accompanied with wished for consequences of need satisfaction, a positive attitude is likely to be created (or sustained); if the consequences were unwished for, a negative attitude towards the respective task will be formed (or sustained). This change in attitudes will, of course be increased if not only the employee's intrinsic needs get satisfied or frustrated but also his extrinsic needs as is the case in a situation where performance measurement and remuneration are linked. The attitudes an employee has and develops over this course of action and learning (i.e. satisfaction/dissatisfaction) cycles will, for example, impact the decision on whether to solve innovative problems in a team (positive attitude towards teamwork) or to rely exclusively on own abilities (negative attitude towards teamwork). Similarly, they will impact upon whom the individual chooses to work with if he decides that innovating in a team will be best.

As the preceding paragraphs showed, performance measurement and control systems (such as e.g. post-completion audits of capital expenditure projects) do have an important impact on the individual characteristics and thereby influence the individual's knowledge processes considerably.

5 Conclusions

Knowledge management and management control systems have been discussed intensively in the respective literatures for many years. Surprisingly, however, the link between the two has not yet received much attention. Nevertheless, as our discussion of possible influences of two MCS in this article showed, both knowledge management and management control activities are bound to each other, since MCS intervene with knowledge processes. Even though we cannot (at this time) present empirical proof of the propositions we made in this paper, it seems, that talking about knowledge management and ways to implement it – without taking MCS that already exist in most organizations into account – is bound to overlook a significant factor influencing the individual knowledge processes.

While we had to concentrate on only two of the MCS typically used in today's companies and were only able to roughly sketch the impact of these two MCS on individual knowledge processes in a hypothetical manner, we suggest that both, researchers from knowledge management and their counterparts from MCS research, explore in more detail the implications MCS can have on individual knowledge processes and on ways to ensure that MCS are functional from a knowledge management perspective.

Such a concentration of exploring the link between MCS and knowledge processes would also take account the fact, that while knowledge management tools are still under development or in early implementation stages in most organizations, a broad variety of MCS has been developed over the last fifty years and can be found in most of today's companies. This analysis might e.g. find out (1) that already existing MCS can be effectively used to implement knowledge management activities, and therefore the development and implementation of entirely new systems is not necessary; and (2) it may find how to re-design the existing MCS in an organization in case they perform sub-optimal or even contrary to the wished for knowledge processes.

The proposed model of the knowledge creation and usage process and the structure of dividing an employee's characteristics into abilities and knowledge, expectancies, needs, and attitudes – while both being still rough cuts and clearly in need of further empirical verification – should be helpful in achieving a micro-perspective on the influence of MCS on knowledge processes.

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¹ The following chapter describes an abridged version of a model developed in Kunz (2005).

² The following classification does not represent the in the learning psychology cited research schools, like behavioral and cognitive theories. The mentioned learning strategies represent rather a systematic list of conscious strategies to extend and change the personal knowledge base in order to solve the faced problems. They are extracted from the literature of organizational and individual learning in an organizational context.

³ Cf. for more details on the internal factors and their interaction in the human decision and action process Chapter 4 in Linder (2006).

⁴ The following paragraphs are an abridged version of Chapter 5 in Linder (2006).