Meta-knowledge - a success factor for computer-supported organizational learning in companies

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ABSTRACT
Knowledge management systems are introduced into companies as ICT-platforms for distributing and evolving knowledge. They are also related to the support of learning. In this context, learning takes place by actively dealing with the technical system and its content. From this perspective, the support of knowledge exchange and the establishing of knowledge structures get more relevant and become a learning issue itself. This specific kind of knowledge covers more than technical or professional competencies and the knowledge about using the functionalities of the technical system. We define this as meta-knowledge which is highly relevant for the success of computer supported knowledge management and organizational learning in a company. In this paper, different kinds of meta-knowledge are introduced. The availability of these kinds of meta-knowledge has positive influence on the usage of knowledge management systems. The differentiation between different kinds of meta-knowledge is a result of a qualitative study which was conducted in the year 2001 in five German companies. Based on these results, relations between the kinds of meta-knowledge and the characteristics of knowledge management systems are derived. Only if this experience with meta-knowledge guides the design and introduction of knowledge-management-systems, a technological innovation can successfully take place.

Keywords
Knowledge Management, Knowledge Exchange, Organizational Learning, Meta-Knowledge

Introduction: The Problem

Knowledge management combines predominantly the development and support of knowledge work. Activities of knowledge work are the development, usage and evaluation of knowledge (Davenport & Prusak 1998). Therefore, the main task of knowledge management is to ensure activities of knowledge work by the appropriate organizational and technical measures. Knowledge management does not consist of simply executing knowledge work. The introduction of an ICT-platform called knowledge management system is only one of the various activities of knowledge management. Such an introduction is often mentioned in close relationship to the concept of the learning organization. This learning-oriented concept is frequently considered as a guiding model for the organizational development of the entire company (Argyris & Schön, 1996). The concept of organizational learning conveys the vision that joint learning occurs regularly within an organization and individually acquired experience can become a high value for everyone in the company. Everybody attempts to get some understanding of each other’s way of working. This is a key advantage for the company since the learning organization reacts faster and more flexible to new requirements. Consequently, new products, services and practices can be innovated more timely. Against this background, the task of knowledge management is to support individual learning and the exchange amongst the employees as well.

From this perspective, learning takes place in the context of a pro-active usage of a technical system and its content. On the one hand, this means that interactive learning takes place between employees who use the technical system to exchange data which is relevant for their knowledge. On the other hand, the active and self-regulated learning of an individual takes place by using the offered content of others which is conveyed by the knowledge management system. By perceiving of and reasoning about actively selected content, employees can create new knowledge. From this perspective, the support of knowledge exchange and the establishment of appropriate knowledge structures get more relevant and become a learning issue themselves. These issues are – for example – the knowledge about how a system is appropriately used for cooperative knowledge exchange or how the content of the system is reasonably structured. We call these specific kinds of knowledge meta-knowledge. It covers more than technical or professional competencies needed for the actual job and it is not reduced to the problem of how to interact appropriately with the technical system itself. By contrast, it is mainly concerned with the question of how mutual learning can be promoted and maintained.
The concept of meta-knowledge can be related to the concept of meta-cognition: Meta-knowledge supports meta-cognition and is developed in the course of meta-cognition. In a more general definition, meta-cognition is “thinking about thinking” (Kaiser & Kaiser, 1998). The relevant literature describes two dimensions of meta-cognition: meta-cognitive knowledge and executive meta-cognitive (Flavel, 1992). The declarative dimension consists of each individual’s cognitive representations of reality (Kaiser & Kaiser, 1998, p. 26). The executive aspect includes the two processes controlling and monitoring. Meta-cognitive control provides the planning and evaluation of a cognitive activity. Monitoring covers all processes that check the progress or the correctness of the completion of a cognitive task (Nelson, 1999).

In this paper, different types of meta-knowledge are analysed, which all have positive influence on the usage of knowledge-management systems. These different types are especially related to the executive aspect of meta-cognition. Furthermore, functionalities of knowledge management systems are described which can be related to the evolution of meta-knowledge. Only if the design of knowledge management systems is guided by the insight into the relevance of meta-knowledge, the learning processes of a company can be changed and improved.

Case studies of knowledge management in companies

Evaluated Companies

The different kinds of meta-knowledge we have identified are a result of a qualitative study we conducted in 2001 in five German companies. The main task of the studies was to identify success-factors and obstacles which affect the introduction and usage of knowledge management systems and to derive therefrom various technical and organizational design recommendations.

For this reason, companies of different sizes and branches and in different phases (ranging between first planning efforts and a 2 years usage period) of introducing knowledge management systems were evaluated. The companies are specialized in branch-segments such as IT-consulting, assurance and cellular phone network operators. Their personnel varies between 80 and 11,000 employees in the evaluated subsidiaries. 47 people participated in semi-structured interviews. Table 1 provides an overview of the evaluated companies.

<table>
<thead>
<tr>
<th>company</th>
<th>branch</th>
<th>size of the company*</th>
<th>knowledge management system</th>
<th>trainings</th>
<th>usage of the system</th>
<th>number of interviews held</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT-consultancy</td>
<td>200</td>
<td>LiveLink</td>
<td>all</td>
<td>2 month</td>
<td>n = 14</td>
</tr>
<tr>
<td>3</td>
<td>Mobile phone operator</td>
<td>2000</td>
<td>LiveLink</td>
<td>Coordinators</td>
<td>6 month</td>
<td>n = 6</td>
</tr>
<tr>
<td>3</td>
<td>Insurance</td>
<td>11000</td>
<td>LiveLink</td>
<td>Coordinators</td>
<td>2 years</td>
<td>n = 18</td>
</tr>
<tr>
<td>PR agency</td>
<td></td>
<td></td>
<td>Lotus Notes</td>
<td>Coordinators</td>
<td>12 month</td>
<td>n = 4</td>
</tr>
<tr>
<td>5</td>
<td>IT-consultancy/research</td>
<td>75</td>
<td>own development</td>
<td>none</td>
<td>2 month</td>
<td>n = 5</td>
</tr>
</tbody>
</table>

Table 1. Overview of the companies in the case study
(* no. of employees in the evaluated subsidiary)

Methodology

The data was mainly gathered in semi-structured interviews (and also by observation and by analysing documents). These interviews were prepared by discussions with those employees of the companies who were in charge of the technical and organizational aspects of the knowledge management. The applied method of semi-structured interviews enabled us to identify the relevance of meta-knowledge and to deepen its description by evaluating the data. However, we emphasize that the questions asked in the interviews were not directly focused on explicating the problem with meta-knowledge but on problems and the behaviour in the course of the knowledge exchange with the technical system. The answers of the interviewees contained statements about deficits or positive experience when using their own or the knowledge of others. The analysis of the verbal data revealed deficits and requirements which occur during the knowledge exchange. These problems were mainly mentioned in an abstract or indirect way without explicating concrete content of meta-knowledge. For example,
it was mentioned that the stored content was not appropriately structured without exactly telling us what an appropriate structure is.

The evaluation took place by a qualitative content analysis. At first, we had identified the relevance of meta-knowledge and derived a set of different categories by evaluating the interview protocols of company 1. In a second step, the data was screened and the statements were related to the corresponding categories. Afterwards, we conducted a quantitative analysis of the statements with respect to the categories they were assigned to. The results were presented in the companies and also discussed with their experts in the area of knowledge management.

Figure 1. Number of statements concerning the different aspects of meta-knowledge

Results

Different kinds of meta-knowledge

The analysis of the answers regarding the knowledge exchange within the companies indicates the relevance of six aspects of meta-knowledge referring to content (a), characteristics of the participants (b), future-process of usage (c), cooperation (d), self-efficacy (e), and the way of structuring of the content (f). Figure 1 shows how many statements of the interviewees concern the different aspects of meta-knowledge.

a) meta-knowledge referring to the content
Content-related meta-knowledge addresses the quality and timeliness of the content in the system. Knowledge about the quality and timeliness of the contributed content was useful for participating in the exchange of knowledge. It is important that participants can trust in the reliability of the content and are able to rank the relevance of the content for their work.

b) meta-knowledge about the characteristics of the participants
Furthermore, knowledge about other users and their activities has influence on the characteristics of knowledge exchange. In our cases, knowledge about other participants is mentioned as a precondition for participating in the exchange of knowledge. This knowledge covers the assignment of the participating actors to organizational units as well as their competence profiles and key areas of work. It supports the actors to evaluate or rate contributions of others. It helps to build trust between certain participants and facilitates the decision whether it is sensible to store knowledge in the system and how to do this.

c) meta-knowledge about the future-process of using the entered data
The interviewees mentioned that they would like to know what would happen with the uploaded content (future-process-related meta-knowledge). The coordinators in company 3 for example would like to know who will read this content and whether it might be interesting for other employees as well. Feedback mechanisms should transmit this meta-knowledge. It can give hints to improve the content or help to estimate the importance of the content.
d) meta-knowledge about the cooperation
The knowledge about the cooperation between the actors (cooperation-related meta-knowledge) covers the guidelines and conventions of effective teamwork and the possibilities of communication processes for computer supported knowledge exchange. The participants (50 %, company 1, 2) would like to know „how to optimize the cooperation within a team“ or which communication rules are reasonable, e.g. „how to react on questions“. It is considered as valuable that the participants agree on certain rules which - for example - determine how the content is maintained or updated.

e) meta-knowledge about self-efficacy
The competence to estimate the relevance of one’s own knowledge for the work of others (self-efficacy-related meta-knowledge) is a decisive factor. Self-efficacy consists of expectations and awareness about a person’s own competences and capabilities. These expectations about someone’s own competence are influenced by the person’s previous experience, e.g. passed exams of a person (Bandura, 1994). It is difficult for the participants to find their roles in the context of knowledge management. This is made plausible by the following statement: “It is difficult to decide what content should be added, there is even fear to add something wrong and to look like a fool.” Furthermore, the interviewees mentioned that they would like to know the negative consequences of not entering an item of content into the system. It was only in the case of company 1 that a few statements revealed that the participants saw for themselves the possibility to play the role of a motivator.

f) meta-knowledge about the structuring of content
Meta-knowledge about how the representation of knowledge should be structured is predominantly related to the knowledge about the internal structure of the content. The necessity of this meta-knowledge could be observed in some companies: if it is not available, unclear content areas arise and hamper the use of the knowledge management system. Also important is the knowledge about the question, which content should and can be made available or not. This can also cover the knowledge about the perspectives of other actors on these issues. Based on this, employees have to decide which information about their own situations and context should be added to increase the likelihood that others can understand the facts that they enter into the system. Knowledge about each actor’s requirements for the knowledge structure is necessary in order to compose the structure in a mutually agreeable way.

Functionalities of systems and knowledge exchange
Besides the different kinds of meta-knowledge, we have also analysed the system-functionalities which have influenced the exchange of knowledge in our case studies. According to the statements of the participants, the modalities of the access rights, the availability of discussion forums, possibilities for enhanced search and the offer to add annotations to the items of content influence the exchange of knowledge. The possibility to restrict the group of those participants, who are allowed to have access to certain messages or parts of the content, was partially perceived as negative, because it would unnecessarily limit the exchange of knowledge. On the other hand, this restriction was considered as necessary for the work in projects. The usefulness of discussion forums was reconfirmed by the majority of interviewees, only a few participants regarded them as irrelevant. The analysis of the data in company 1 showed the relationship between the search in the system and the exchange of knowledge: to find the looked-for information in the system is useful and supportive for the company-wide exchange of knowledge. Finally, the functionality of annotations enables the participants to give a feedback about the contributed items of content or about messages and is therefore supportive for the exchange of knowledge.

Discussion and conclusion
Based on the results of the study, relations between the various kinds of meta-knowledge and characteristics of knowledge management systems can be derived: On the one hand, some of the functionalities of knowledge management systems influence the emergence of meta-knowledge. By participating and receiving feedback in discussion forums, actors can become aware of the value of their knowledge and its usefulness for other colleagues. We use the term “awareness” to indicate the perception or the understanding of a certain situation with respect to former and present activities as well as future options (Sohlenkamp, 1998). One aspect of awareness is the perception or the understanding of those activities of others which influence one’s own context and extend the scope of opportunities for own activities (Dourish & Belotti, 1992).
The configuration of access rights influences the cooperation-structure by excluding or including actors from the knowledge exchange. The concept of annotations enables the actors to obtain information about the quality of the content itself and affects their self-efficacy-related meta-knowledge.

On the other hand, the usage of a knowledge management system requires the development of certain meta-knowledge. Extending or restricting access rights require knowledge about the different roles und responsibilities in the team. A successful search within the system needs content-related and future process related meta-knowledge, because this knowledge facilitates the decision how the result of a search engine has to be judged and which parts of the system’s content are finally used.

Summarizing, meta-knowledge can be described as a success factor for the participation in knowledge exchange and thus for organizational learning in companies. Therefore solutions are needed how meta-knowledge can be conveyed and stimulated. The presented relationship between the functionality of a system and the different kinds of meta-knowledge provides helpful recommendations how knowledge management systems should be designed according to the described kinds of meta-knowledge. Further research is necessary to deepen the understanding of this relationship.

Focussing on the phenomenon of meta-cognition does not mean that we consider other psychological theories – for example motivation theory – as irrelevant in the context of knowledge management. We choose this focus, because – up to now – it has not sufficiently been taken into account for the analysis of knowledge management. Moreover, the results point out the necessity that specific kinds of meta-knowledge need to be discussed in the training of the employees if the exchange of knowledge between users – and therefore the organizational learning in a company – should be successful.

References


