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Wanted: A Framework for IT-Supported KM

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1 INTRODUCTION

The most important resource in modern enterprises is the human brain (Nordström and Ridderstråle, 1999). Consequently, knowledge is important, both as a resource and as a competitive advantage. Organizations understand that they need to know how to do well, and take advantage of this knowledge in the best possible way (Davenport and Prusak, 1998). *How* an organization manages its knowledge is crucial for organizational development (Blodgood and Salisbury, 2001).

Knowledge management (KM) is about managing knowledge, but no commonly accepted definition exists. The aim of KM is to create value for the organization and it includes activities such as creating, organising, sharing and using knowledge (Wong and Aspinwall, 2004). KM enables organizational learning and is essential if an organization wants to be a learning one. We use the definition of Hung et al (2005) that KM is

"… a systemized and integrated managerial strategy, which combines information technology with the organizational process. Knowledge management is a managerial activity which develops, transfers, transmits, stores and applies knowledge, as well as providing the members of the organization with real information to react and make the right decisions, in order to attain the organizational goals" (Hung et al, 2005, p 165).

IT is a prerequisite for effective KM (e.g. Loermans, 2002; Screiber, 2000; Wong and Aspinwall, 2004), and KM therefore involves a combination of technical and human elements (e.g. Davenport and Prusak, 1998; Bubenko jr et al, 2001; Wong and Aspinwall, 2004).

"… technology supports KM, but the actual KM is carried out by people." (Bubenko jr et al, 2001, p.45)

KM needs to be considered in modern business and is a condition for success (Binney, 2001). There is no doubt that organizations need KM, the question is *how* they can implement and subsequently manage KM (e.g. Gore and Gore, 1999; Offsey, 1997; Sena and Shani, 1999; Wong and Aspinwall, 2004). Large numbers of organizations launch KM initiatives, but a significant proportion of these fail (Storey and Barnett, 2000). One reason for this is that organizations lack support for *how* KM should be implemented, a theoretical foundation that could support and guide them through the implementation process (Wong and Aspinwall, 2004).. The aim of the paper is to address this problem. One important part of such a theoretical foundation is a KM framework. Based on an extensive literature study we argue that none of the existing KM frameworks can play this role. This opinion is supported by another literature study done by Wong and Aspinwall (2004). Existing frameworks are not holistic in the sense that they do not provide answers to both what KM is and how to implement it. Also, they do not generally pay enough attention to both technological and social aspects and their relationships.

The *goal* of the paper is to present a first version of a theoretically grounded IT-supported KM framework, which has a holistic and clear view of the role played by technology and humans in KM. This first version is focused on showing what IT-supported KM is, and will in a later version be complemented with guidelines for implementing KM.

The paper is organised as follows. Based on what is missing in existing frameworks, Chapter 2 discusses briefly why we need a new framework and what properties a framework should have to fulfil the stated goal and the aim of this paper, Chapter 3 presents and explains the framework, while Chapter 4 closes with discussion and future work.

2 WHY "YET ANOTHER FRAMEWORK"?

It is impossible to separate KM from technology (Holsapple, 2005). A weak point of existing frameworks is that they do not generally pay enough attention to both aspects. If they do it at all, they do it in a too superficial manner.

"An exclusive inclination towards either a pure technological or social view may lead to an incomplete picture of what is needed for a successful KM effort." (Wong and Aspinwall, 2004, p. 102)

Are there any more weak points in existing ones? Let us look at some important parts.

Information is interpreted data (Langefors, 1966), data equipped with meaning (Screiber et al, 2000). Wiig (1993) defines the relationship by saying that if data should be information it has to be presented in context and with some purpose, and organised so it has relevance to a problem, issue or something else. Knowledge is constructed through processes of social interaction, where issues of power and social inclusion/exclusion come to the forefront (Swan et al, 1999). Knowledge adds an aspect of purpose, potential to generate action, and has a function to produce new information (Schreiber et al, 1999). Consequently, knowledge can not exist outside the human mind, and thus it is impossible to store "knowledge" in a computerised system. Information can be processed by IT, but knowledge requires humans (Swan et al, 1999). Consequently, a framework *must clearly show where information transforms into knowledge and vice versa.* In our literature survey we have not found any framework which does this.

There is a distinction between tacit and explicit knowledge (e.g. Gore and Gore, 1999; Loermans, 1993; Nonaka and Takeuchi, 1995; Wiik, 1993). Tacit knowledge is knowledge that resides in people´s minds and explicit knowledge is knowledge that has been documented and codified (Loermans, 2002). Explicit knowledge is easily definable and accessible, and also easily transmitted by IT (Gore and Gore, 1999). Tacit knowledge is highly personal and is about insights and intuition, and it is rooted in individual actions, experiences, ideals etc. (Gore and Gore, 1999; Nonaka and Takeuchi, 1995). This type of knowledge is at the same time contextual and culturally influenced (Busch and Richards, 2004). Wiik (1993) calls knowledge that people hold in their minds internal knowledge. Knowledge that is held e.g. by books and knowledge-bases is external knowledge. In our view, external knowledge is the same as explicit knowledge and tacit knowledge is the same as internal knowledge. In the following we will use the concepts *external* and *internal*, because we find these concepts appropriate for the purpose of this paper: differentiating between knowledge that is external or internal in the view

of humans. Internal knowledge can be further categorised into two categories (Gore and Gore, 1999; Wiik, 1993). Internal tacit knowledge is personal and inaccessible to the conscious mind e.g. "know-how" and internal explicit knowledge is available to our conscious mind (Wiik, 1993). A key to knowledge creation is the degree to which knowledge that in this paper is called internal knowledge can be captured and transformed into explicit knowledge (Gore and Gore, 1999). This can be compared with one of the knowledge conversion modes in the learning spiral of Nonaka and Takeuchi (1995). Another type of knowledge is embedded in products, systems, structures etc. (e.g. Wiik, 1993; Davenport and Prusak, 1998). According to Davenport and Prusak (1998) embedded knowledge is independent of those who has developed it and because of that has some organizational stability. Consequently, this type of knowledge should have a lower priority in KM. With respect to knowledge type, IT has different capabilities (e.g. Blodgood and Salisbury, 2001; Nonaka and Takeuchi, 1995) and a framework for IT-supported knowledge management *must separate between external and internal.* A framework presented by Gore and Gore (1999) takes this into consideration, but it does not enclose other necessary aspects identified in this chapter.

In IT-supported KM knowledge changes between different states, between being knowledge and being information. There are also some knowledge/information losses because some knowledge/information will never be stored in the system. This is not only for the worse. There is captured knowledge that *should* not be stored. Let us give an example:

- If captured knowledge does not support the business, it should not be stored. This stresses the importance of the knowledge vision and its alignment with overall business objectives and strategies (see e.g. Blodgood and Salisbury, 2001; Chua and Lam, 2005; Davenport and Prusak, 1998; Gore and Gore, 1999) Wong and Aspinwall, 2004)

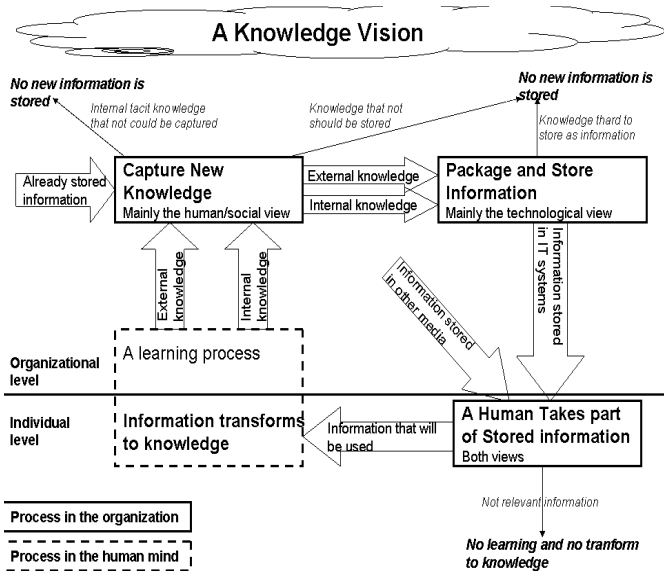
In addition, there is some internal knowledge that is hard to captured, and some knowledge which is difficult to store as information. These types of losses should be minimized as much as possible. Guidelines for implementing KM must take this into consideration, i.e. both making it clear which losses are desirable, and what can be done in order to reduce undesirable knowledge losses. Consequently, a framework for IT-supported knowledge management *must clearly show where knowledge losses are, and what types of losses there are.* In our literature survey we have not found any framework which does this.

There are different levels of knowledge-creating entities: Individual, groups/teams, organizational and interorganizational (Nonaka and Takeuchi, 1995). Knowledge conversion is performed by individuals, but the organization must provide the necessary conditions (Nonaka and Takeuchi, 1995). It is important that employees that do not participate in a distinctive KM process understand the essential steps that they have to accomplish (supported by Remus and Schub, 2003). A framework must therefore *clearly show which processes that takes place on the individual respectively the organizational level.* In our literature survey we have not find any framework which do this.

By discussing what properties a framework for IT-supported KM should have we have both answered the question in the heading, and shown what a new framework must take into consideration. To sum up, the following characteristics are found to be desirable:

- A technological as well as a human/social view needs to be taken into consideration
- Showing where information transforms to knowledge and vice versa.
- Separation between external and internal knowledge should be possible.
- Points where potential knowledge losses occur should be identified.
- Organizational and individual levels should be separated.

Figure 1. Framework for IT-supported KM



3 A NEW FRAMEWORK FOR IT-SUPPORTED KM

A framework is "*… a suggested point of view for an attack on a scientific problem*" (Crick and Koch, 2003, p.119). The building blocks in the new framework are not new in themselves, but the combination is.

As mentioned before, the goal with this first version of the framework (Figure 1) is two-fold: to answer the question "What is IT-supported KM"; and constitute a basis for developing guidelines for how to implement KM.

KM must have a vision (e.g. Davenport and Prusak, 1998; Gore and Gore, 1999; Jarrar, 2002; Nonaka and Takeuchi, 1995; Mentzas, 2001; Remus and Schub, 2003). Which business goals should the codified knowledge support? The reminder of this chapter describes the framework, for simplicity reasons in a sequential manner based on each process.

Capture New Knowledge:

- *Input:* External and internal knowledge, and already stored information
- *Process:* Aims to capture both external and internal new knowledge, new from the perspective of the IT-system and/or in the consciousness of the humans in the organization. This process is also a selection process: Is the knowledge new? Should it be stored e.g. with regard to the knowledge vision? There is internal tacit knowledge that is difficult to capture, and some part of this knowledge is not even possible to capture. Knowledge that in this paper is called internal plays an important role (Busch and Richards ,2004), and it is therefore important to minimize this knowledge loss. In a KM project it is a good idea to start with a review of existing external knowledge (Gore and Gore, 1999), e.g. information stored in documents and databases. This corresponds to combination, one of the knowledge conversion modes in the learning spiral of Nonaka and Takeuchi (1995). In an organization with a low degree of maturity in KM one approach to capture new knowledge can be participatory modelling and seminars lead by a professional facilitator (Bubenko jr et al, 2001). That this approach enables to capture and make internal knowledge explicit is in accordance with the characteristics of internal knowledge. This is also supported by Busch and Richards (2004) who have identified repeated contacts as one of three parameters conducive to tacit knowledge transfer. Culture is important for tacit knowledge (Busch and Richards, 2004) and

it is important that organizational culture and structure support this process through e.g. networks, meetings, and rewarding system. Most humans in the organization that perform KM activities need to carry out KM activities in their normal day-to-day activities (Davenport and Prusak, 1998). It is therefore necessary to provide time for these activities (Siemieniuch and Sinclair, 2004).
- *Output:* External and internal knowledge.
- *View:* There has to be a climate that encourages individuals to both contribute with their own knowledge and to value others'. Organizational culture and climate are important aspects in this process (Busch and Richards, 2004).

Package and Store information:

- *Input:* External and internal knowledge
- *Process:* Aims to package and store information in such a way that it is easy to find, share, use and complement.. In this process new knowledge is often identified and captured, and there is an iterative relationship between this process and the previous one. From a knowledge storage, dissemination and sharing perspective, IT support is a prerequisite for effective KM (Loermans, 2002; Wong and Aspinwall, 2004, Bubenko jr et al, 2001). According to our definition of information and knowledge we cannot store knowledge, we store information that supports knowledge transmission. Information changes to knowledge in the interaction with people (Swan et al 1999). We call this the knowledge process. The question is hence, how should we manage this type of information in an IT-based system in order to enable the knowledge process and learning? This activity puts organizational knowledge in a form that makes it accessible to those who need it, but how can it be codified without losing important aspects (Davenport and Prusak, 1998)? This process involves both evaluating knowledge for usefulness and appropriateness for codification - a knowledge manager´s responsibility- and to identify an appropriate medium for codification and distribution - a codifier´s responsibility (Davenport and Prusak, 1998). There is knowledge that is difficult to store as information and also in this process there is some knowledge loss. The reputation of the human who has contributed with the information is important when selecting available information (Davenport and Prusak, 1998; Lynne, 2001), and therefore it should clearly show who/which the source is. Another important area in this process is Human Computer Interaction (HCI). In a development phase in organizations with a low degree of maturity in KM it is important to work with simple structures, such as e.g. organizational patterns (Persson and Stirna, 2002), in order to identify relevant knowledge chunks. When the maturity is higher the IT-system, both the structure and the interface, in itself must have been developed in such way that it is easy to store new knowledge chunks.
- *Output:* IT-stored information that easily can be found.
- *View:* This process is an interface between the technological and human/social view. The technology dominates in this activity, but IT has no value in itself if it does not support KM.

Take part of stored information:

- *Input:* All stored information
- *Process:* Aims for humans to take part and use stored information in order to support problem solving. An individual shares the information and values it in relation to the need and what he/she already knows. If the information is relevant according to both task and earlier knowledge, i.e. the human does not already know it, the information will be used and applied. This scenario, in accordance with the definition of knowledge, will result in information transforming to knowledge (Swan et al, 1999). It is important to educate people in the IT-system, where and how the knowledge-supported information can be found. People judge information on the basis of who gives it, and it is therefore important to encourage a culture where the quality of the knowledge is more important than the source (Davenport and Prusak, 1998; Busch and Richards, 2004).
- *Output:* Information that will be used
- *View:* This process is an interface between the technological and human/social view. There must be a climate that encourages individuals to take part of the organizational knowledge, but also education in how to use the IT system.

Information changes to knowledge - a process in the human mind

- *Input:* Information that will be used
- *Process:* Aims to transform information to knowledge. A learning process takes place on the individual level, and consequently there is a learning in the organization. New knowledge, internal and/or external, has been created on the individual level. If the knowledge also is new from the perspective of the IT-system and/or in the consciousness of other humans in the organization, new knowledge has also been created on the organizational level. A learning organization is good at KM (Loermans, 2002), and despite the knowledge being new or not in the view of the organization there has been a learning in the organization. According to Gore and Gore (1999) the main reason for the adoption of a KM approach is knowledge creation.
- *Output:* External and internal knowledge
- *View:* This process in the human mind is in the human/social view, and there must be a culture that supports and encourages this process.

The presented framework has the desirable characteristics identified in chapter 2.

4 DISCUSSION AND FUTURE WORK

This paper is focused on IT-supported KM. The goal for this paper is to present a first version of a framework which shows what IT-supported KM is, and could serve as a basis for developing implementation guidelines. The presented framework clearly shows what IT-supported KM is. This part of the goal is therefore reached. Based on a review of existing frameworks Wong and Aspinwall (2004) suggest that an implementation framework should:

1. be developed with a clear structure
2. clearly delineate the knowledge resources or types of knowledge to be managed because different types of knowledge requires different types of management strategies
3. highlight necessary processes/activities which are needed to manipulate the knowledge
4. include the influence or factors that will affect the performance and bearing KM
5. provide a balanced view between the role of technology and human beings

Future work will consist of extending this first version to an implementation framework. We assume that the presented framework gives the necessary conditions to fulfil the requirements presented by Wong and Aspinwall (2004), and therefore even this part of the paper´s goal is reached. The framework does not show involved roles, responsibilities etc. at this stage. This will be part of the guidelines. During the KM process the knowledge goes through different changes. There are also knowledge losses, both desirable and undesirable. Undesirable losses should be minimised as much as possible. Guidelines for implementing KM must take this into consideration, meaning making it clear which losses are desirable and what can be done in order to reduce undesirable knowledge losses. Adoption of KM can begin with a core department in order to maintain proper functioning of the system, but the entire organization should be involved in utilising the valuable intangible assets available through a KM system (Hung et al, 2005). Consequently, there need to be different types of guidelines depending on the organization's

maturity in KM. It is both a question how to introduce KM, and how to do KM. The work with developing guidelines for KM projects will be accomplished through our participation in a planned KM project in health care.

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