Information Systems, Information Sharing, and Communities of Practice

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Abstract

In this paper, we argue that information management and knowledge management share important characteristics and thus face similar challenges. Based on a discussion of information problems observed in a large and technically well-equipped company, we suggest that information management should learn from recent trends in knowledge management. In particular, we discuss how appropriate support of communities of practice could help overcome some of the problems observed.

Keywords: information systems, information management, knowledge management, communities of practice.

1. Introduction

The conceptual roots of information systems are in the realm of database research and the term "information system" is often used as a more general term for database systems. In this case, the terms data and information are used synonymously and the perspective on information systems is in fact a database perspective which means that the focus of interest is on organizing, storing, and retrieving data.

Apart from the more general usage, the term "information system" is used to describe database systems that have been augmented with specific user interfaces allowing for easier comprehension to the data. Such interfaces are typically more comfortable to use compared to database query languages and often they provide powerful data visualization functionalities to help the user make sense out of the data displayed.

In the latter connotation of the term "information system", more attention is paid to the human user who actually using the system. Most conceptualizations of information systems and database systems incorporate the notion of a "user" but often users are considered as something that is somehow separate from the actual system. However, the very purpose of information systems is to inform people (Bell and Wood-Harper, 1998).

The very concept of a "user" has been criticized in the human-computer interaction literature to be misleading (e.g., Bannon (1991)) as in most cases the term "user" refers to the understanding of the user who is using a computer system for some specific purpose, such as retrieving data or processing a document. The term fails to denote that the interaction between a user and a computer system is part of the larger context of the interaction of the human with his or her environment. Computers are used by humans to reach meaningful goals that usually exist beyond the situation of human-computer interaction (Kaptelinin,

1996). For example, the goal of using a word processor is typically less the interaction with the computer program but the writing of a letter and, in a larger context, the communication with a person. The same holds for using an information system: the goal is not to use the system but to find information that in the end helps act upon the environment. In the realm of database research, workflow management investigates making use of information beyond the computer system but the focus of workflow management is on organizational processes rather than on human cognition and behavior.

The perspective that computer systems are generally used to reach goals beyond the actual human-computer interaction indicates that a significant part of "using" an information system is done by the user when he or she relates information gained from the system to his or her environment. Put in other words, "an information system is any system that provides the user with the necessary information to engage in action" (Bell and Wood-Harper, 1998). Putting information in context occurs in the user's interaction with his or her physical and social environment. The process is not distinct from using the information system as using the system is already a socially situated activity even if the user is alone when doing so; the knowledge how to use the system, the user's background knowledge and the user's experiences are socially shared and socially shaped.

The recognition of putting information in context as a significant part of using an information system suggests that information management faces challenges similar to those in knowledge management. Indeed the term knowledge management is sometimes used interchangeably with information management (Standing and Benson, 2000) but in such cases it is typically assumed that knowledge is as "concrete" as information in the sense that knowledge can be managed by knowledge management systems just like information can be managed by information systems. However, to the contrary, the necessity to put information in context to be useful suggests that information is as fluent and as brittle as knowledge. Therefore, the common distinction between information and knowledge may even be misleading in the context of information management as it seems to suggest that managing information is somewhat simpler or easier to automate than managing knowledge. In the end, the perspective that information management faces challenges similar to those in knowledge management suggests to investigate to what extent information management could benefit from lessons learned in knowledge management.

We proceed as follows. First, we report on an information management scenario that we investigated in a world-wide operating Swiss corporation and discuss some of the information problems observed. The situation observed has a striking similarity to what has been described by Swan et al. (1999). Then, we briefly describe communities of practice as a recent "soft" approaches in knowledge management and we discuss how appropriate consideration of the strengths and weaknesses of this approach could help solve some of the problems in the information management domain. The paper concludes with a brief summary and an outline of future research directions.

2. Information Problems in a Large Swiss Company

As part of a joint research project with industry, we have analyzed the Intranet of a world-wide operating Swiss company that crucially depends on the proper functioning of its information systems (see Lueg and Riedl (2000); Riedl and Lueg (2001) for details). The company uses a state-of-the-art Intranet to provide information to staff. In respect to this Intranet, the company's information and knowledge management is based on the "pull"

paradigm which means that users have to fetch the information they need from the internal Web. Staff are offered training courses on how to use the Intranet to retrieve information.

The company operates impressive technology and is renowned for its Web-based Intranet but the investigation nevertheless revealed some severe problems:

First, the dominance of the "pull" paradigm causes unexpected problems. Although the paradigm helps circumvent certain problems of the more common "push" paradigm, such as the threat of overloading staff with information, the "pull" paradigm implies that users have to be aware of the very existence as well as the exact location of Web pages that provide the information they are looking for. Especially in the case of recommendations exchanged during face-to-face meetings, however, recommendations often are rather generic ("there is a Web page with this type of information...") which means that users have to use search engines to find the information recommended. However, despite a vague matrix structure of the Intranet, guided experiments with users revealed that users have severe problems to locate information based on such generic recommendations.

Second, tools provided to find information on the Intranet were used inadequately although staff were offered training courses. A statistical analysis of the log files of internal Web servers and an internal information-retrieval system revealed that the most common request for information incorporated a single search term. Search requests with multiple search term were seldom and Boolean compositions of search terms were rare. Duration of search sessions, i.e., sequences of interactions with a search engine, was usually very short, and sessions lacked thesaurus-like variations of search terms. Also, the scope of the search engines was limited to certain parts of the the Intranet so that some information could not be found by using a search engine.

Third, interviews with employees revealed some sincere frustration with the Intranet as a whole. In particular, employees criticized that they were not informed about updates of pages they were interested in. Moreover, employees could not trust information to be found on the Intranet as no "garbage collection" was conducted to remove outdated information. In addition, employees had difficulties to assess the degree of confidentiality of the information presented on the Intranet as information lacks corresponding notices.

Finally, interviews indicate that the company suffers from a well-known and widely experienced problem which is that sharing information and knowledge may result in a loss of power with the result that the status reached may be threatened.

To sum up, the investigation revealed severe information management problems which can hardly be attributed to insufficient technical equipment. One problem seems to be that management is pursuing a rigorous top-down strategy trying to map organizational structures in a one-to-one manner on the Intranet. Moreover, significant parts of the company lack a culture that is supportive in terms of information sharing and that helps ensure information quality.

3. Key Points for Information Systems Development

In the context of this paper, the case study points towards two aspects that are of particular interest to information systems development. First, the study (again) shows that the application of state-of-the-art technology fails if used inappropriately. A striking example is

the analyses of the search engine log files revealing that employees are often using the search engines in such a way that the full power of these tools cannot be brought to bear. The problem with inadequate search queries is well-known from information retrieval research in the context of Web-based search engines: a large portion of users provide search queries that consist of one or two terms as search queries. Even the most advanced information retrieval techniques fail when provided such insufficient input. Whereas the problem can hardly be solved for the general case of the Web, additional training of staff could help in the particular case of the company investigated.

Second, the study indicates that the application of technology can hardly overcome cultural deficits as many of the problems observed, such as outdated information or missing information, are not due to technical limitations. To some extent, it can be argued that it is in the end technology --the information systems-- that provides the information and that organizational procedures have to be adjusted to prevent such problems. However, it can hardly be expected that organizational approaches, such as rigorous procedures where to publish information on the internal Web and how to update or replace outdated information, can resolve problems with contradictory or inconsistent information in companies as large as the one discussed in this paper. In fact, it would be naive to assume that contradictory or inconsistent information could be avoided in any realistic setting.

Support offered by organizational procedures is naturally limited when it comes to how individuals make sense out of information. Trust in information systems cannot be designed or enforced by organizational procedures. Such procedures can be supportive but in the end trust has to be built over extended periods of time by providing "correct" and "complete" information.

In a similar way, organizational procedures are also limited in the extent to which they can determine the relevance of information. Typically, it is assumed that relevance is a matter of content or --in the case of organizational procedures-- definition but recent sociological studies of information use in the context of the International Monetary Fund in Washington DC have shown that relevance can be a matter of social navigation. Harper (1999) describes how information originating from a recently set-up economic analysis institute in a particular country have been treated as if the information were non-relevant although the sheer content of the information was certainly relevant:

"It was not enough that information is somewhere out there in the world and simply gathered by some processes of human agency and technology. Rather, information was relevant when it was seen by all the parties involved." (Harper, 1999, p. 85).

To sum up, the unity of information technology and organizational procedures is brittle unless embedded in a corresponding social and cultural environment. The complexity of creating and, in particular, sustaining such an environment, however, is often underestimated.

4. Old Dilemmas and New Perspectives

It seems as if there is little hope for the management of the company discussed in this paper to gain "control" over the information situation as long as they continue to pursue a rigorous top-down strategy and try to map organizational structures in a one-to-one manner to the Intranet.

However, despite the hierarchical organization of the company, a lot self-organization is already going on. Support and (where necessary) guidance for self-organization appears to be the only promising strategy to complement the existing organization but support for self-organization would require an effective change of the paradigms that are currently guiding company policy. These paradigms are deeply rooted in military thinking and do not value cooperation and sharing yet. Moreover, new paradigms would have to account for the fact that value chains in information management and knowledge management are not necessarily profit chains and that "quality" measures applied have to account for the actual benefit for employees.

A recent investigation by Pawlowski et al. (2000) describes that information technology (IT) professionals supporting shared information systems learned about their stakeholder communities and their specific characteristics. A shared (information) system is an information system that is used by multiple communities of practice. Maintaining shared systems is challenging as system changes may be triggered in any of the stakeholder areas while effecting other areas. Pawlowski et al. (2000) argue that the IT group observed has acquired an amazingly broad view, spanning both the informal boundaries of communities and the formal organizational boundaries. In particular, the authors argue that the professionals are put in brokering roles (brokering in the sense of Wenger (1998b)) and discuss how they could be used to enable knowledge transfer among communities.

Apart from knowledge transfer which is widely assumed to require a conducive organizational culture (Standing and Benson, 2000), the IT professionals could use their knowledge of their stakeholders for taking care of the quality of the information provided by shared systems and, more generally, the quality on the information provided by Intranets of companies as the one discussed in this paper.

Pawlowski et al. (2000) discuss the activities of the IT professionals observed from a perspective based on "communities of practice" which is an influential concept in contemporary knowledge management. The term refers to a theory that builds on learning as social participation (Wenger, 1998b). Social participation, in this perspective, is not just engaging in certain activities, such as working in a team, but actively participating in the practices of social communities and constructing identities in relation to these communities. Such participation does not only shape what participants do but also how they perceive themselves and how they understand what they are doing.

Originally, the term was coined by Jean Lave and Etienne Wenger based on work in the late Eighties when they investigated apprenticeship in various types of communities ranging from midwives in Mexico and tailors in Liberia to quartermasters on U.S. Navy ships and butchers in U.S. supermarkets to Alcoholics Anonymous (Lave and Wenger, 1991). In particular, Lave and Wenger identified "legitimate peripheral participation" as an important aspect of effective learning.

Legitimate peripheral participation as a term is complex and composite in character as all three components --legitimation, periphery, and participation-- depend on each other. Legitimation refers to authority and power distribution within a social setting and describes that a community is willing to accept a newcomer as a new member of the community given that the newcomer meets what is expected from a member of the community. However, becoming a member is not a formal process like being appointed but a process of growing into the role of a full member along with its rights, responsibilities, and capabilities. This

growing into the role is supported by starting in the periphery rather than in the center of activity. The new member is able to observe how more experienced members perform tasks and how they deal with problems but the new member is not yet expected to be able to perform on a similar level. Rather, the new member might work on simplified versions or sub-tasks of complex tasks. It is important that despite periphery and reduced responsibilities, the new member is participating in ongoing activities.

Communities of practice are everywhere (Wenger, 1998a) and they have been identified for settings where effective knowledge sharing happens. However, it is yet unclear how the strengths of communities of practice could be used to enhance a company's information situation. We see two main issues in this context: creating the necessary space for communities of practice to sustain and develop, and using the social glue of communities of practice to establish an information situation that values information sharing and information quality.

In order to be able to establish a new information sharing culture on the basis of communities of practice, support from upper management is required to a certain extent. For example, goals of existing communities may conflict with current company policies. Also, it may be required to establish new communities to cover certain parts of the company's information situation. However, founding new communities is not a matter of bringing employees to work together. In such cases it would be likely that the traditional "team" idea is replicated under a new name. Founding a new community would require more passion and commitment rather than official mandate. Finally, brokers would be required to mediate between distinct communities and to propagate changes from one community to other communities. Brokers could be used to propagate changes in information policies and help adapt information kept in one community to the needs of other communities. As described by Wenger (1998b), broker are in a difficult situation as they are somehow between the lines. Apart from having the rare ability to behave in such situations, brokers may require support from upper management so that they can focus their engagement on mediating rather than on struggling with --sometimes inappropriate-- company policies. In-depth discussions of nurturing and sustaining communities of practice and the specific characteristics of brokering can be found elsewhere (e.g., Wenger (1998a,b); McDermott (1999)).

The idea is that mediating between communities is done by those who already have a broad understanding of the different communities as the IT professionals observed by Pawlowski et al. (2000). The problem is that this species of IT professionals hardly exists in the company investigated in this paper. To the contrary, it seems as if it is exactly the lack of such persons that contributes to the information problems observed. Therefore, a main task in that company would be to cultivate a new class of IT professionals who are interested in pursuing such "soft" and "non-technical" goals.

Finally, the social glue of communities of practice could be used to establish an information sharing culture in which IT professionals could act as brokers contributing to mediating the information needs of different communities. Becoming a member of such a community is not restricted to learning about practice but involves learning about how and where to find relevant information. Actually, this kind of learning happens in communities of practice (e.g., Wenger (1998b)) but it is not yet explicitly supported by appropriate tools that account for these processes. Technical approaches that could be used to provide such support are available and range from (active) collaborative filtering (e.g., Maltz and Ehrlich (1995); Lueg and Landolt (1998); Lueg (1998)) to social navigation support (e.g., Dieberger (1997);

Wexelblat (1999); Munro et al. (1999)).

5. Summary and Future Research Directions

In this paper, we have outlined that information management shares important similarities with knowledge management and thus faces similar challenges. Based on the discussion of information problems observed in a large company and experiences with supporting shared information systems reported in the literature, we have argued for support of communities of practice. Such communities are not only social groupings for effective knowledge sharing but could be the key to successful information management as well.

We are pursuing two future research directions in particular. First, we are working on collaborating with further companies in order to find out about their specific information management problems and --if applicable-- how these companies have addressed these problems. Second, we are further investigating how communities of practice can be supported in terms of information sharing and information dissemination.

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