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Editorial

Technological and Organizational Issues in Knowledge Management

It could be plausibly argued that 'knowledge management' is a contradiction in terms. One the one hand organizational knowledge is deeply contextual and embedded in the intangible, especially human, resources of an organization. On the other hand, for anything to be managed, an element of objectification and disembedding is necessary (Tsoukas and Vladimirou, 2001: 979–980). Handling this paradox is an important task of organizational knowledge management. The kind of organizational reflexivity and awareness necessary for knowledge *management* introduces a higher level of abstraction, whereby individuals attempt to dissociate the knowledge necessary for performing a task from the human or physical means they use to carry it out. This kind of abstract thinking is what enables actors to retool, restructure and redesign the organization. More generally, it is our ability to manipulate a certain capability separately from the means that we use to deploy it, which allows us to find alternative ways of deploying it. For example, our ability to address 'information sharing' and the 'coordination of production' as problems in their own right has given rise to alternative modes of organizing, such as flat hierarchies, flexible work teams, extensive outsourcing and the virtual organization. This has been possible with the identification and use of novel computer-based and administrative tools that handle information in more efficient ways.

Of course, this is not unprecedented. Changes in the organization of economic activity typically followed every major technological innovation: the steam engine, the railway, electricity, the automobile. These technologies dissociated work from the physical strength of the worker and from the geographical collocation of production and consumption. They have constituted what Giddens (1990) calls 'disembedding mechanisms'. In an analogous way, modern information and communication technologies (ICTs) offer an apparent opportunity to disembed the information and knowledge involved in a task from the means (human, administrative or technological) of carrying it out. ICTs are general-purpose technologies that enable the manipulation of information and knowledge as such, on a large scale. Herein lies another paradox. Whereas there is little doubt that ICTs have enabled this shift of attention towards knowledge management, failures of knowledge management systems abound (Damodaran and Olphert, 2000). This special issue of JKPM revisits the fine line between the enabling characteristics of technology and effective organizational assimilation of knowledge management practices and tools.

The individual knowledge worker typically performs a number of tasks as part of one or more business processes, and is capable of drawing on tacit and explicit knowledge at two levels. First, at the level of the substantive work that she/he carries out (e.g. a bank manager makes a judgment as to whether to grant a loan to a customer). Second, at the level of process coordination (e.g. the bank manager solicits the contribution of colleagues to resolve special cases and exceptions). Often we consider the business processes underlying knowledge work as given, or we envisage process redesign efforts as discrete projects (and then take the new process as given). However, complex knowledge work cannot always be structured in terms of a deterministic model of an operational process, because the sequence of tasks and the kind of coordination required are contingent on the content and context of particular instances of the process. This kind of contingency gives rise to a multitude of interlocking business rules, ultimately increasing the degree of overall complexity to a level which may not be algorithmically tractable. This is where the knowledge worker needs to be able to apply experiential heuristics and expert judgment at the level of process coordination, and not only in terms of the substance of a given task. In such environments, business processes are formed and rearranged almost in real time, depending on contingent contextual factors. Clearly, process redesign efforts and other organizational change initiatives aim at simplifying and standardizing this complexity as much as possible. Although this may be feasible for a broad range of

processes, there will always remain a number of higher-level knowledge processes that will not be amenable to such treatment. This subtle distinction between substantive knowledge for carrying out a task and knowledge of task organization is analogous to the distinction made between product and process innovation (Rosenkranz, 2003). Although the two tend to go together, this is a useful conceptual distinction inasmuch as it clarifies the nature of expectations from knowledge management systems.

At the outset, a computer-based knowledge management system (KMS) is intended to capture knowledge as it is created, processed or communicated, and to redistribute it where it might contribute to better decision making or better work practices (Alavi and Leidner, 2001). There are several reasons why it is very difficult, if not impossible, to disembed knowledge from its human operators and its organizational context.

Probably the most important reason is ontological. Knowledge, in particular tacit knowledge, is by its nature constituted by the context in which it is created and shared. Organizational knowledge, defined as the capability individuals have to draw distinctions, in particular contexts, by enacting sets of generalizations, whose application depends on historically involved collective understandings (Tsoukas and Vladimirou, 2001: 983), can be meaningful (thus valuable) only within a specific context: the context that provides the objects for which to draw distinctions, defines the validity of generalizations, and renders those distinctions relevant to its members. Although the means (technologies) by which knowledge is created, shared and documented might change, the recipient of knowledge can be considered to become more knowledgeable only if he is also a member of the same context. At best, information systems may assist a knowledge worker to extend his capability to sift through large volumes of data and to do this in a particular organizational setting (Galliers and Newell, 2001). In order to get from data to knowledge, the organization and the individual must commit to reinterpret this information in relation to existing knowledge structures and to re-embed it into their work routines, thus converting it to organizational knowledge. The more removed the recipient of such information is from the original context of knowledge creation, the more difficult it is to interpret and embody it. Indeed, reinterpreting ideas across markedly different contexts is considered to be a key source of creativity and innovation, exactly because such reinterpretation tends to give rise to insights unknown and probably unintelligible in the original context (Robinson and Stern, 1998).

There are three main ways by which KMS designers attempt to address the importance of context. First, by limiting the deployment and use of the system within the scope of the same context (broadly defined as a work practice within some limited geographical and historical boundaries). This may be a desirable approach for certain cases but, ideally, knowledge management aspires in principle to promote cross-fertilization of knowledge across different organizational settings.

Second, by using techniques and technologies that attempt to maximize the relevance of a piece of information to the context of use. Examples of such techniques include intelligent searches (Cakir and Polat, 2002), autonomous software agents (Hess and Rees, 2000), case-based reasoning (Butler, this issue) and explicit links with workflow tasks (Kumar *et al.*, 2001). The downside of these approaches is that they are necessarily incomplete because human agents, as the ultimate judges of such systems, still have to receive, reinterpret and take up the information provided by the system.

Third, by asking that users of KMS themselves record additional explanations and analyses around every document, in an attempt to make the context of original knowledge creation and use explicit to 'outsiders'. Thus, the practice of KM has spurred a host of new roles such as reviewers, evaluators or moderators of content in a KMS (Davenport and Prusak, 2000). Their goal is to maximize the potential relevance of KMS information to unknown recipients in a distant (in terms of geography, time, or social relations) locale. The most obvious disadvantage of this approach is that it is often imposed as an additional burden to already busy managers, without any clear benefits for them. In addition, expert knowledge workers cannot be expected to let go of their valuable personal intellectual assets in an environment that does not provide sufficient social and material motives for sharing. Further, it is practically difficult and time-consuming for anyone to distance himself from the context of his work and to describe that context explicitly for the benefit of unknown potential future users of that information, if any. Ideally, one hopes that if a KMS attains a certain critical mass of users and information, it will be self-sustainable because people will find it intrinsically valuable to participate in such knowledge exchange. Unfortunately, as Bansler and Havn show in this issue, this is far from straightforward.

In this respect, it is useful to consider the distinction between the cognitive and community views on knowledge management (Newell *et al.*, 2002: 106–108). Each perspective seems to highlight a different aspect of the same reality. The cognitive

view focuses on information processing as an input–output system. According to this perspective, information and knowledge are codifiable and, once codified, subject to analysis and manipulation of almost infinite complexity. Thus, knowledge management boils down to effective knowledge elicitation and good user requirements. Information and communication technologies provide virtually endless capabilities to satisfy even the most demanding users. According to the community view, knowledge is socially constructed and, thus, necessarily embedded in given webs of social relations. Knowledge is reproduced and shared through the processes of socialization. Thus knowledge management is about cultivating a shared purpose, instilling trust and encouraging social interaction. To illustrate the difference, consider that where the cognitive perspective sees recent trends towards 'lean' organization as exemplars of efficient IT-enabled knowledge management, the community perspective sees knowledge loss due to disrupted social networks. Having said that, it would be rather unproductive to adopt one perspective and ignore the other.

Clearly, ICTs enable data processing on a large scale, crossing the boundaries of time and space. It is equally evident, though, that organizational action cannot be anything else but social. Therefore, any technology-driven intervention aimed at supporting knowledge management needs to be aligned with the social-organizational mechanisms of knowledge exchange. It is important to note that the success of such an endeavour depends critically on the preparedness of the organization to revise its prevalent models of work practice and to commit itself to assimilating suitable technological capabilities. It is worthwhile considering a well-known, albeit unique, example of effective knowledge creation and sharing, entirely mediated by ICTs. Open source software communities develop some of today's most innovative and valuable knowledge through a complex web of social relations, which is entirely mediated by Internet-based tools. The technologies supporting these communities are almost trivial. Yet the community itself has developed such norms of conduct that render electronic communication and coordination efficacious (Raymond, 2001). This is a case where both the cognitive and community views of knowledge management converge.

This discussion is not entirely new. The long history of information systems project failures is full of lessons that sound systems design and good project management go hand-in-hand with organizational transformation and effective leadership (Lyytinen and Robey, 1999). The collection of papers in this special issue presents a wealth of empirical evidence of apparent successes and failures with KMS interventions, as well as theoretical investigations into the interplay between technology and organization in knowledge management.

Starting with an explicit disclaimer regarding knowledge management systems, Tom Butler presents empirical evidence supporting those theoretical claims that computer-based information systems do not and cannot codify and communicate tacit knowledge. Butler tracks an IT company as it tries to commercialize its CBR (case-based reasoning) technology in three distinct applications for different clients. The three cases represent a total failure, a complete success and an intermediate outcome respectively. All three converge on the idea that complex tacit knowledge and thought processes do not lend themselves to engineering approaches. As Butler points out, information systems may reconstruct only highly attenuated versions of the knowledge intrinsic to people and communities of practice (in Butler's words, 'knowledge-informing data'). It is interesting to follow the case organization as it tries to find applications for its technology. In the process, the company makes several attempts to revise its own understanding of the technology and of its applicability in context.

In their paper, Bansler and Havn present the story of a global pharmaceuticals company that tried to promote the sharing of best practices through an intranet-based application. After two and a half years of continuous efforts to make it work, the company abandoned the project because its intended users simply ignored it. The technology employed was very simple and though user-interface design had been a problem in the first phase of the project, the authors demonstrate five non-technical reasons for system abandonment. These reasons appear rather paradoxical. Although there was a strong sharing culture within the company, managers felt they needed some extrinsic incentive to contribute best practices to the database. But, of course, documenting or reviewing a certain business practice in writing is more time consuming and less satisfying than face-to-face networking, especially if it is a net addition to normal workload. Indeed, informal personal networks were very powerful means of knowledge sharing, though bragging about one's achievements was not considered acceptable behaviour. Thus, broadcasting a 'managerial best practice' on the intranet was not culturally endorsed. Ultimately, most submissions were perceived irrelevant by readers. This paper may be read both as a case study of information systems failure and as a case of poor understanding of knowledge processes in organizations.

The paper by Papavassiliou *et al.* turns our attention to the individual knowledge worker. Their focus is on providing technology support to the knowledge worker in environments characterized by weakly structured processes and high complexity. The authors present a framework for modeling knowledge-intensive processes and the implementation of this framework into a public administration process, namely the approval of old-age pensions. This process is highly complex in nature because it depends on a very large number of regulations. Further, these regulations may be overlapping and their application is often ambiguous. A particular candidate for a pension may fall within the scope of several, sometimes conflicting, rules. The social-security employee must be able to apply her/his own judgment as to the course of action and decisions that must be taken. Finally, this process must be dependable, fair and equitable, and legally traceable. The system presented in the paper is designed to serve the social-security employee with all documentation that is relevant to the context of each task, while at the same time recording decisions and actions taken for future reference and perusal. This system has already led to increased productivity in processing pension applications and is expected to improve the reliability of the process, as measured in terms of appeals.

Samiotis *et al.* demonstrate how a bank organization gradually assimilated a knowledge-management system. As with many IS initiatives, this project started as a technological solution looking for a problem. In the beginning there was a design vision in terms of the new system and its functionality for KM support, but the organization lacked a clear understanding of how this system could add any value to their work practices. As the project progressed and as the bank itself went through various other change initiatives, key participants were able to gradually refine their appreciation of how technology might support knowledge-intensive activities. Over time, different constituents that took part in this project contributed their own interpretations and aspirations, which, eventually, produced a shared vision for embedding the new technology into the daily practice of knowledge workers in a productive manner. This is a case of an emergent KM strategy, which came about in a bottom-up way as a result of experimentation with a new technological system.

Heiskanen and Assinen attempt a longitudinal explanation of how an organizational unit (the IT Department of the University of Helsinki) learned to respond and adapt to broader organizational responses to information systems projects. The authors review the development of a large number of IS projects over the course of nearly 18 years. They document how the university administration responded and contributed to successes and failures. However, the main focus of the paper is on the ways in which the IT department learned from smaller or greater failures and adapted its stance towards new projects. It is noteworthy that the authors were themselves among the protagonists of the events being recounted and interpreted. Their approach draws on the principles of action science, although it is an *ex post* review of organizational action. Heiskanen and Assinen identify three historical learning phases and they use three metaphors to illustrate the respective actions, namely 'linear strategy', 'logical incrementalism' and 'skunk works'. Each historical phase (and each metaphor) represents a higher level of learning and responsiveness to the characteristics of the organizational and technological environment.

Sven Carlsson develops a theoretical argument concerning the role of information technologies in supporting inter-organizational knowledge management. He establishes the criticality of knowledge in inter-organizational networks and, by drawing on the resource-based view of the firm, emphasizes the role of such inter-organizational knowledge in competitive strategy and comparative advantage. The author adopts the view of knowledge as the process by which individuals and organizations create and share knowledge assets as part of their normal routines. In the case of inter-organizational relations, knowledge management is thus seen as the process by which organizations share their experiences and through various forms of interaction they augment their individual and collective stocks of knowledge. Carlsson views networks of organizations as the unit of his analysis and identifies three categories, namely extra-networks, inter-networks and open networks. This classification is based on the extent to which the network is controlled by a focal firm and by the extent to which membership to the network is open or 'gated'. In order to illustrate the potential role of information technologies in this context, the paper focuses on the new-product development process and presents examples of how companies engage their customers through various forms of networks (extra-, inter- and open). It is of particular interest here how interaction mediated by various Internet-based tools and structured in various forms can give rise to valuable knowledge for all parties involved.

Dick Stenmark addresses a similar concern by taking a close look into the potential support that intranets lend to organizational knowledge

creation. By drawing on extant literature, the author identifies seven enabling factors of organizational creativity. He then highlights the key characteristics of intranet technologies and demonstrates how they support creativity-enabling factors. Intranets are thus shown to be ideal tools for promoting organizational creativity. Having made this case, Stenmark takes issue with the apparent gap between the potential of intranet technologies and the actual results of intranet use in companies. The paper identifies the command-and-control structures prevalent in most organizations as inhibitors of productive use of the intranet. In effect, companies superimpose the hierarchical structure and tightly controlled processes of the organizational chart onto a medium (the intranet) which is by itself amorphous and does not need such limiting structures in order to operate effectively and efficiently. The potential opportunity thus presented by intranet technologies is that a flexible, unrestricted information infrastructure can coexist with the formal hierarchical structures thus adding a significant degree of serendipity, autonomy and rich information provision to a traditional structure, which, de facto, has little or none of that.

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