

■ Research Article

Towards an Integrated Approach to Knowledge Management: 'Hard', 'Soft' and 'Abstract' Issues

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Companies are often unaware of the potential value of corporate information and extent of data held in their systems. It is increasingly argued that analysis of such data and information can be transformed into knowledge that in turn can be used to gain business benefits such as a competitive advantage, minimization of costs, improved quality, responsiveness, or improved service to customers. This paper investigates the benefits of a systematic and interdisciplinary approach to research in knowledge management, particularly in investigating technical ('hard'), organizational ('soft'), as well as philosophical ('abstract') aspects of the concept. It describes in detail the framework used in research undertaken by the Centre for Knowledge and Business Process Management at Brunel University. We argue that this framework is useful to researchers and practitioners alike as it contributes to a systematic and more effective knowledge management approach. Copyright © 2002 John Wiley & Sons, Ltd.

INTRODUCTION

In order to survive in competitive and continuously changing business environments, organizations need to adapt to new conditions and respond to change. Various change management concepts have flourished in the business and management literature for several decades (Currie and Hlupic, 2000a). Such concepts, often presented in the management literature as panaceas (see Currie, 1999), include Total Quality Management (TQM), Just in Time (JIT), Process Innovation and Business Process Re-engineering (BPR). The latter concept, although praised in theory, has been particularly controversial in practice, with multiple instances of failed implementation (e.g. Hammer and Champy, 1993). As a result, researchers have studied both business and technological issues, focusing, in the

case of the former, on the types of organizations that would benefit from BPR and, in the case of the latter, reflecting on the role of information technologies in supporting the change process. However, little research has addressed how these issues are experienced by the people involved or affected by the process (Choudrie and Hlupic, 2001) and more specifically how organizational (business and people) issues interact with technological factors. This is considered as an important reason for the lack of an in-depth understanding of BPR in practice, and consequently as responsible for implementation failures.

This paper argues that there is a risk that similar issues will be raised in the uptake of the increasingly popular notion of knowledge management. Knowledge management can be considered as the latest management panacea for organizational effectiveness. In essence, KM emphasizes the importance of knowledge for organizations and its pivotal role in achieving competitive advantage. This is because, in turbulent business environments, one of the main sources of lasting competitive advantage is

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knowledge (Nonaka and Takeuchi, 1995). This knowledge exists in a variety of places and formats, including databases, intranets, filing cabinets and peoples' heads.

An important reason why knowledge management is becoming increasingly popular is that the capabilities of contemporary information systems make the codification, storing, generation and exchange of information and, some would argue, knowledge (e.g. Selvin and Buckingham Shum, 2000; Costa *et al.*, 2000) easier than ever. Technology changes at a fast pace, with ever increasing functionality, while at the same time knowledge workers become increasingly competent in its use. Similarly, the knowledge content of products and services is increasing and the availability of virtual working environments and interactive learning environments is increasingly taken for granted. Knowledge management systems are broadly defined technologies, which enhance and enable knowledge generation, codification and transfer (Ruggles, 1997). Their increasing capabilities facilitate knowledge management but are still limited. Despite their name, knowledge management systems are in essence limited to handling data rather than knowledge, since they are usually designed to deal with structured data, where 'information' is directly entered into fields or can be categorized in some manner. The difficulties of developing and validating patterns (Brash, 2000) or dealing with unstructured data (Selvin and Buckingham Shum, 2000) are reflected in the research pertaining to these systems.

At the same time, it is recognized that the effective management of knowledge involves more than simply exploiting the data held on information systems. It also requires attention to the 'softer' parts of the corporate knowledge base, as found in the human and cultural aspects of businesses, particularly the experiences and tacit knowledge of employees (Savage, 1996; Starr, 1999). It is the organizational structures and processes that harness and combine intellectual and human capital for learning, innovation and problem solving. Also it is through the impact on business processes that better knowledge management can contribute to providing better service to the customers, leveraging knowledge for innovation and empowering employees through the exchange of knowledge with others in the business environment.

Both the 'hard', technological, and the 'soft', organizational and human, aspects are important for knowledge management. Furthermore, knowledge management is based on more abstract aspects, dealing with theoretical, philosophical, epistemological and ontological aspects of this

concept. Despite the multiple publications, research projects and conferences related to knowledge management, no consensus has been reached with regards to what knowledge management is. In order to exploit successfully the opportunities that a knowledge management perspective offers, it is necessary to study these aspects as well.

Importantly, we will argue, it is the *integration* of these 'hard', 'soft' and 'abstract' parts of the knowledge base that are critical to business success. These include: the technological tools that allow for easier and more powerful forms of data access and manipulation; the organizational structures and processes that harness intellectual and human capital for learning, innovation and problem solving (Albert, 1997; Applehans *et al.*, 1998; Landaurer, 1995); but also an understanding of the essence and theory of knowledge management.

The next section of this paper presents the latter problem in detail. In reviewing the similarities and fundamental differences in the definitions of knowledge management, the paper unveils the lack of a holistic understanding of knowledge management. The following section three then argues that although both the organizational and the technical issues of knowledge management present theoretical and practical challenges, the most critical challenge is the integration of their study. This forms the basis for the presentation of an integrated framework for knowledge management research. Using this framework we present some research projects that have been formulated using this framework; they provide examples of a suggested revised research agenda for knowledge management. We also argue that it is possible to draw parallels between BPR and knowledge management as change management panaceas, and illustrate how problems associated with former can also be associated with the latter, and possibly avoided with an integrated approach to research in knowledge management. The paper concludes by stressing the importance of systematic, integrated and interdisciplinary research in knowledge management.

WHAT IS KNOWLEDGE MANAGEMENT?

Economies driven by information represent a paradigmatic shift from competition-based strategies (reactive, imitative and unclear of consumer demands in emerging mass markets) towards 'first-best strategies based on value innovation' (Kim and Mauborgne, 1999). Value innovation seeks through the application of knowledge management techniques to 'make the competition

irrelevant' by redesigning buyer value to expand existing markets and create entirely new markets. This section takes a close look at this paradigmatic shift, explaining why knowledge management is seen as a vehicle to effectiveness, and focuses on the different perceptions of knowledge management in the academic and practical business literature.

Knowledge management is essentially an organizing principle aimed at satisfying and where possible, exceeding customer expectations. By providing the right information, to the right people at the right time, knowledge management techniques and software applications enable companies to design dynamic operational processes and make effective use of their human resources (Malhotra, 1997). Sustainable organizational competence has been considered a factor of organizational capacity to create new knowledge through a continual learning process (Argyris, 1994). At present most information systems simply support organizational structures to perform the functions of information collection and dissemination. Leveraging companies towards learning organizations requires the synergistic development of information systems with organizational structures and the application of knowledge management principles to enable 'intelligent' information processing and utilisation based on user needs and organizational effectiveness (Rzevski and Prasad, 1998).

Accordingly, knowledge management would give organizations the operational ability to:

- (1) Identify, appreciate and respond to strengths, weaknesses, opportunities and threats.
- (2) Act, assimilate feedback and react in these arenas simultaneously.
- (3) Develop the capacity to operate in real-time environments.
- (4) Understand and create 'real' value as determined and perceived by the end consumers.

Although the potential benefits of knowledge management are apparent and much attention is focusing on the research in knowledge management, there is still confusion about what knowledge management really means. The normative literature has been unable to agree on a definition or even on the key concepts behind the term 'knowledge management'. The following paragraphs discuss this in detail.

Defining knowledge management

A possible reason for the vagueness and ambiguity in defining knowledge management seems to be

that the word 'knowledge' means different things to different people. Such differences become explicit where multinational companies wish to adopt knowledge management principles (Kidd, 2000). For example, according to Malhotra (1997) organizations in eastern countries such as India understand knowledge to be intellectual property whereas western organizations refer to knowledge as something that exists in peoples' heads. Sveiby (1999), as well as Phillips and Patrick (2000) point out another difference in the interpretation of the term 'knowledge': some research focuses on the individual whereas the focal point for other researchers is the organization.

An additional factor, which creates confusion, is that there are many different types of knowledge that need to be 'managed' differently. The most common distinction in the literature is between explicit knowledge, where the information is easy to understand and financially tangible, and tacit knowledge, which is difficult to document or categorize and is non-financially tangible. Marshall and Brady (2000), in their critical review of the different types of knowledge that have been identified in the literature, attribute the importance of the distinction between tacit and explicit knowledge to 'a preoccupation with externalisation, or the conversion of tacit into explicit knowledge' (p. 288). They also argue that such classifications of knowledge may be misleading, depicting knowledge types as mutually exclusive categories. Tacit and explicit knowledge in particular need to be seen instead as 'co-existent and inter-penetrating dimensions in the process of knowing' (p. 289).

Thus, there are differences both in the understanding of the term knowledge as there are in the understanding of its dimensions. Defining knowledge management has proved extremely difficult due to three factors. The first factor is the intangible nature of knowledge, where 'knowledge' itself is an extremely complex concept to define. Second, when the subject being considered is in the management domain the difficulty is compounded even further due to the subjective and eclectic nature of the field. Lastly, when the subject is not only in the management field but is also emerging rather than established, then the difficulty with definitions is even further magnified. Therefore, it is not surprising that there are diverse views of what knowledge management is. As an obvious illustration for this lack of consensus, Table 1 presents some representative definitions of knowledge management.

A cursory reading of the definitions reveals that KM is seen as relating to both theory and practice (De Jarnet 1996; Quintas *et al.*, 1997). Much of the

Table 1 Definitions of knowledge management

Source	Definition
Snowden (1998)	KM can be defined as the identification, optimization and active management of intellectual assets, either in the form of explicit knowledge held in artefacts or as tacit knowledge possessed by individuals or communities.
Huysman and de Wit (2000) Davenport <i>et al.</i> (1998)	Knowledge management is about the support of knowledge sharing. ...attempt to do something useful with knowledge, to accomplish organizational objectives through the structuring of people, technology and knowledge content.
Wiig (1998)	KM is the systematic, explicit and deliberate building, renewal and application of knowledge to maximize an enterprise's knowledge-related effectiveness and returns on its knowledge assets and to renew them constantly.
Malhotra (1998)	KM caters to the critical issues of organizational adaptation, survival and competence in face of increasingly discontinuous environmental change. Essentially it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings.
Bassi (1997)	KM is the process of creating, capturing and using knowledge to enhance organizational performance. KM is most frequently associated with two types of activities. One is to document and appropriate individuals' knowledge and then disseminate it through such venues as a companywide database. KM also includes activities that facilitate human exchanges using such tools as groupware, email and the internet.
De Jarnet (1996)	KM is ... knowledge creation, which is followed by knowledge interpretation, knowledge dissemination and use, and knowledge retention and refinement.
Taylor (1997)	Powerful environmental forces are reshaping the world of the manager of the 21st century. These forces call for a fundamental shift in organization process and human resource strategy. This is Knowledge Management.
Quintas <i>et al.</i> (1997)	KM is the process of critically managing knowledge to meet existing needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities.
Brooking (1997)	KM is the activity which is concerned with strategy and tactics to manage human centred assets.
Petrash (1996)	KM is getting the right knowledge to the right people at the right time so that they can make the best decision.
Hibbard (1997)	KM is the process of capturing a company's collective expertise wherever it resides — in databases, on paper, or in people's heads — and distributing it to wherever it can help to produce the biggest payoff.
Macintosh (1996)	KM involves the identification and analysis of available and required knowledge, and the subsequent planning and control of actions to develop knowledge assets so as to fulfil organizational objectives.
O'Dell (1997)	KM applies systematic approaches to find, understand and use knowledge to create value.
Van der Spek and Spijkervet (1997)	KM is the explicit control and management of knowledge within an organization aimed at achieving the company's objectives.
Beckman (1999)	KM is the formalization of and access to experience, knowledge and expertise to create new capabilities, enable superior performance, encourage innovation, and enhance customer value.
Frappaulo and Toms (1997)	KM is a tool set for the automation of deductive or inherent relationships between information objects, users and processes.
Laudon and Laudon (1999)	KM is the process of systematically and actively managing and leveraging the stores of knowledge in an organization.
Beijerise (1999)	KM is achieving organizational goals through the strategy-driven motivation and facilitation of knowledge workers to develop, enhance and use their capability to interpret data and information (by using available sources of information, experience, skills, culture, character, personality, feelings, etc.) through a process of giving meaning to these data and information.

existing literature on knowledge is highly theoretical and conceptual, especially in the field of cognitive psychology. However, broadly speaking, most of the reflective literature on KM combines both theory and practice in a fairly seamless and often recursive manner.

Some definitions are not predicated on information technology (IT) — for example, Brooking (1997), Taylor (1997), Quintas *et al.* (1997) and De Jarnet (1996). This emphasizes the importance of non-technical or soft issues. In contrast, some definitions are predicated to IT — for example, Malhotra (1998), Frappaulo and Toms (1997), Snowden (1998) and Bassi (1997). This emphasizes the integral importance of technology (or hard issues) for KM. Beijerise (1999) proposed an interesting definition which does not actually mention IT explicitly, but rather emphasizes the knowledge worker's capability to interpret and add meaning to information. Definitions proposed by Malhotra (1998) and Snowden (1998) consider both the enabling role of IT for KM and the importance of the creative capacity of individuals/communities (i.e. application of tacit knowledge).

Hibbard (1997) and Petrash (1996) essentially use the same definition, but in different ways. Petrash's (1996) definition is rather vague, but Hibbard (1997) has expanded it to give it a clearer meaning by applying the process of knowledge capture. However, both of these definitions emphasize the activity of knowledge distribution only either directly (Hibbard, 1997) or indirectly (Petrash, 1996), which seems to be quite limiting.

Macintosh (1996), Van der Spek and Spijkervet (1997) and Beijerise (1999) link KM to the achievement or fulfilment of the organization's objectives/goals. However Van der Spek and Spijkervet (1997) and Macintosh (1996) emphasize 'control' rather than value creation, whilst Beijerise (1999) emphasizes the development of the knowledge workers capabilities. Definitions from Wiig (1998), Beckman (1999) and O'Dell (1996) do not say anything about IT or tacit knowledge directly, but they talk about 'knowledge' and relate it to the overall organizational process in terms of value creation and performance (or effectiveness). When compared to Bassi (1997) whose definition is long and tedious and is quite specific/prescriptive it refers to particular technologies (e.g. groupware).

All in all, what is evident is that the wide range of definitions also reflect the fact those people working in the field of KM come from a wide range of disciplines, such as psychology, management science, organizational science, sociology, strategy, production engineering and so on (Nonaka and Takeuchi, 1995). Thus KM not only

combines theory and practice but is also multi-disciplinary. Scarborough (1996) comments: 'the sprawling and eclectic literature and the ambiguity and definitional problems...allow different groups to project their own interests and concerns onto it'.

Despite the differences in KM definitions, it seems that there is one common parameter in different knowledge management definitions: knowledge management is seen as the vehicle for organizational effectiveness and competitiveness. This common parameter implies an instrumental approach to knowledge management and, as Marshall and Brady (2000) put it, 'emphasizes a utilitarian understanding of knowledge which has little patience for reflecting on anything other than its contribution to organizational effectiveness' (p. 295). With reference to the discussion in the previous section, knowledge management is thus seen by many as the new management panacea.

Another common element of knowledge management definitions is that knowledge or information and sometimes experience or expertise are at the centre. This is hardly surprising; what is interesting, though, is that information and knowledge are often treated as synonyms. Also, it is rather different aspects of this information, knowledge or expertise that some definitions focus on: innovation that derives from the synergy of data and information processing with human innovation and creativity (Malhotra, 1998), knowledge sharing (Huysman and de Wit, 2000), structures (Davenport *et al.*, 1998), and stores of knowledge (Laudon and Laudon, 1999). This is representative of the diversity pertaining the knowledge management literature (cf. Phillips and Patrick, 2000).

Furthermore, even though there are several definitions within the literature, it is increasingly evident that these do not adopt an interdisciplinary approach, despite the interdisciplinary interest in knowledge management (McAdam and McCreedy, 1999; Phillips and Patrick, 2000). Instead, a managerial perspective is often predominant, that does not necessarily accommodate the capabilities of information systems. Sveiby (1999) acknowledges this implicitly when he divides research publications in this field into two categories. The first is where the researchers come from a background which is computer and/or information science oriented; they perceive knowledge to be an object and knowledge management to refer to 'Management of Information'. The second category consists of researchers from a philosophy, psychology, sociology or business/management background who consider knowledge to be related to processes and knowledge management to be the 'Management of People'. It

is worth noting, however, that recent conferences on KM (e.g. in Warwick and Aston in the UK in 2000) have made a conscious effort to develop a more inclusive, multi-disciplinary approach to understanding and researching the field of KM (cf. Davenport *et al.*, 1998).

These similarities and differences in the conceptualization of knowledge management are important in 'creating and refining an appropriate conceptual language for what is a difficult and highly variegated area of inquiry' (Marshall and Brady, 2000). In this paper, however, we are predominantly interested in how the differences in the definitions imply differences in the underlying assumptions that guide research in this area. Indeed, some research focuses on the technical dimension of knowledge management (i.e. on how information technologies can support it). Other research, however, focuses on the organizational dimension of knowledge management, emphasizing in particular the importance of people (Sutton, 2000; Al-Hawamdeh and Ritter, 2000) or groups (Dijkstra and Verwijs, 2000). While some research also makes reference to the organizational context within which the technology will be used (e.g. Delesie and Croes, 2000; Edwards and Gibson, 2000), there is little evidence of whether or how the organizational and technical dimensions have been integrated. The reasons for these differences and the implications of the lack of integration between the technical and organizational dimensions are discussed in detail in the next sections.

It follows from this section that research in knowledge management is diverse. As knowledge management can provide several benefits, as outlined earlier in the section, there is a challenge for the research community to suggest an integrated approach to the study and practice of knowledge management. This is advocated later in the paper.

HARD AND SOFT ASPECTS OF KNOWLEDGE MANAGEMENT: SEPARATED BUT INSEPARABLE

It follows from the previous section that the existing research and empirical efforts in knowledge management are currently focused on one of two broad categories: technical issues or human and organizational issues. The following paragraphs present some of the challenges in each category. It is argued, however, that the most critical challenge for effective knowledge management as well as for knowledge management research is the integration of these 'hard' and 'soft' aspects.

Technical ('hard') issues

Knowledge management tools, as all tools, aim to assist in the completion of a task with ease and efficiency. KPMG (1999) defines KM systems as 'the web of processes, behaviours and tools which enables the organization to develop and apply knowledge to its business processes'. There is an array of technologies that support KM of which Laudon and Laudon (1999) present a good categorization. According to them, KM tools can be categorized into four groups: tools that support knowledge sharing (e.g. groupware, intranets and the Internet); tools that support knowledge distribution (e.g. electronic calendars, desktop databases and desktop publishing); tools that support knowledge capture and codification (e.g. expert systems, neural networks and intelligent agents); and tools that support knowledge creation (investment workstation, CAD and virtual reality). Similarly, Ruggles (1997) suggests three categories of knowledge management tools, which are believed to represent the primary knowledge activities of most organizations:

- *Knowledge Generation* — the creation of new ideas, recognition of new patterns, the synthesis of separate disciplines, and the development of new processes.
- *Knowledge Codification* — the auditing and categorization of knowledge.
- *Knowledge Transfer* — the forwarding of knowledge between individuals, departments and organizations.

Each of these stages presents technical challenges. One important issue is indexing, in other words, the appropriate structuring of data or information to facilitate or lead to knowledge discovery (Delesie and Croes, 2000). Knowledge acquisition and representation can also be difficult to address in knowledge management systems (West *et al.*, 2000), as they are for knowledge-based systems; issues that have been recorded extensively in the artificial intelligence literature. With knowledge management systems, an important issue is the need to move beyond simple structured data mining towards the capture, mining and manipulation of tacit or unstructured data. This is a challenge that artificial intelligence research has tried to address for a number of years; knowledge management actually complicates this challenge by requiring technological solutions that 'work for a broad population of people — the knowledge workers inside companies' (Smith and Farquhar, 2000). To use artificial intelligence terms, knowledge management is

about eliciting knowledge and replacing or supporting a broader population of experts: experts in organizational processes and whose understanding collectively forms the organization's memory and intellectual capital. This is a kind of expertise that most organizations are uncertain about appropriate ways of exploitation — the emphasis on knowledge management in recent years at least has motivated more organizations to acknowledge its value.

This becomes evident when practitioners and researchers alike identify tacit data as a, if not *the*, corporate resource to be managed and exploited for competitive advantage in the information intensive economy — but one that is problematic to achieve. Another key challenge for the design of knowledge management technology is the identification of patterns (Brash, 2000) that enable reuse of the technology and contributes to system flexibility (Selvin and Buckingham Shum, 2000). System flexibility, however, also presumes situated real-time capture of knowledge, which can be conflicting with the requirement for reuse (Selvin and Buckingham Shum, 2000). An interesting case of knowledge management tools can be computer supported collaborative work technologies, since these can facilitate knowledge management and empower even international team members (Edwards and Gibson, 2000). Yet the effective use of such systems is contingent on the willingness of team members to share knowledge and on effective conflict management. In general, similar to all information systems, although knowledge management tools can be a great benefit to an organization, they will not be effective if used in the wrong environment. Effective knowledge management enables access to the right information at the right time. The introduction and implementation of a knowledge management tool does not result in a 'knowledge environment' if other knowledge activities are not supported. For instance, it would be impossible to achieve knowledge transfer if the culture within a particular organization was that of hoarding knowledge. As a result, cultural constructs need to be developed and nurtured, to facilitate a knowledge environment (Irani and Sharp, 1997).

It has been argued that the obstacles to computerized support for knowledge management include knowledge drift, the subjectivity of knowledge but also the reputation of knowledge-based and artificial intelligence systems; that consequently knowledge management is still at an immature state (Edwards, 2000; Smith and Farquhar, 2000; Spiegler, 2000). It is interesting to note that it is difficult to make explicit the difference of

knowledge management tools from other information systems and artificial intelligence systems in particular. However, from the discussion in this section and current research on knowledge management tools it is evident that there are several challenging technical issues that need to be resolved for knowledge management to become more effective.

These technical issues are nevertheless witnessed and can only be addressed within a particular organizational and cultural context. Whilst technology is certainly important, it cannot be considered in isolation as cultural and human aspects are at least equally important. These 'hard' and 'soft' aspects of knowledge management are also interrelated. For example, appropriate, user-friendly tools (such as Internet/intranet search and mining facilities, technology-based learning, knowledge bases and maps containing experiential learning gained by past projects or information about employees' expertise) can contribute to creating a knowledge-sharing culture. Conversely, a knowledge sharing culture can in turn initiate a need to acquire and use knowledge management tools. The challenges and difficulties related to the human and organizational aspects of knowledge management are reviewed in detail below.

Human and organizational ('soft') issues

Knowledge management, while supported by technology, is also influenced by human and organizational issues. In the following paragraphs we review these issues at three separate but interconnected levels, where knowledge management benefits are realized: the individual, organizational and international levels. This classification allows for a balanced discussion between the factors that facilitate and those that inhibit effective knowledge management. This discussion then leads to the realization that the human and organizational issues both shape and are shaped by knowledge management practices.

First, at an *individual level*, knowledge management provides opportunities and tools to operate, and where possible flourish, in an environment of continuous change. Attention to the individual level signifies acceptance of idiosyncratic knowledge, recognizing that personality plays a critical role in the way that people acquire, perceive, value and use knowledge as well as that the creation of knowledge is affected by the world view of the individual (Guns and Välikangas, 1998). There is, however, a potential risk for organizations to see knowledge management as management of individual learning instead of collective learning

(Huysman and de Wit, 2000), missing the opportunity to capitalize on the individuals' knowledge for the benefit of the organizational community.

Second, at an *organizational level*, knowledge management supports the streamlining of activities and facilitates improved organizational response to internal and external changes. This often places attention on the processes and presents several challenges, not least the difficulty of identifying processes (Nickols, 1998). Furthermore, Huysman and de Wit (2000) have identified several 'traps' that relate to knowledge management at this level:

- An opportunity trap — knowledge management will be more effective if it is problem-driven, i.e. if it responds to concerns that are relevant in the particular organizational context, rather than if it is technology-driven or attempting to imitate other businesses, as is often the case.
- A codified knowledge trap — it is difficult to record previous knowledge for others to access, especially as new knowledge keeps being created and human actors are busy making sense of the new knowledge and conditions.
- A management trap — knowledge management is dominated by management initiatives, but, it is unlikely to be effective unless knowledge workers willingly take part in it.
- The operational level trap — knowledge management should not be limited to the operational level, in the same way that knowledge exchange processes cannot be limited to this level.

Finally, at an *international/regional level*, it enables to competing globally against larger regional trading blocs, removing their economy of scale advantages. The problem at this level is that different cultures have different mental models of collaboration or trust (Kidd, 2000).

Two key 'soft' issues underpin knowledge management at all three levels: knowledge sharing and culture. Once an organizational culture is being established by its employees it is difficult to measure and to change (Burrows, 1994). Organizational culture is an important factor to consider in the context of knowledge management, as its boundaries may often restrict the flow of information and knowledge among employees and they might resist sharing of information. It can be claimed that one of the critical success factors for effective knowledge management is that employees must be willing to both share and use expertise and knowledge available within an organization,

which in practice is not easy to achieve. According to Gates (1999), cultural factors need to change so that people are rewarded for sharing information, rather than simply holding on to it, so it seems that one of the main challenges of knowledge management is ensuring that knowledge sharing is rewarded more than knowledge hoarding. Indeed, several knowledge management researchers argue that people in practice *share* knowledge constantly (Marshall and Brady, 2000; Huysman and de Wit, 2000); the problems in sharing knowledge are related to ineffective management. However, as has been argued in previous research in information systems, the attitudes to sharing are complex (Constant *et al.*, 1994) and are affected by organizational norms as well as by personal idiosyncrasies. In short, no evangelizing might work within organizations in order to reap the benefits of knowledge management. Knowledge must be useful for employees, and only when everybody gains by knowledge sharing can an adequate culture for knowledge management be developed.

If knowledge management is not to become another management 'fad' that claims to offer too much (Currie and Hlupic, 2000b) but instead develops into an actual management philosophy for the information age, several areas need to be addressed. These include in particular organizational culture, issues of organizational learning, operational management and human resource management. Research needs to be directed towards understanding how these areas limit or enhance the competitive benefits of knowledge management theories and models; what this new way of working entails with regard to skills, organizational structures and operations.

As yet, there is no generic model of knowledge management, grounded in empirical research, which companies or industrial sectors can use as a basis for organizing and managing their information resources. In doing so, such a model could allow organizations to leverage their core competencies and key skills. Already in this section it has become evident that both 'hard' and 'soft' issues of knowledge management raise significant challenges. However, it is also evident that, even though they are often separated in the literature, in a practical context they are inseparable as they inform and influence each other. We argue that research in knowledge management should reflect this synergy of organizational and technical issues. The next section presents the context and motivation for a framework within which such research can be realized.

INTEGRATED KNOWLEDGE MANAGEMENT RESEARCH FRAMEWORK

The framework advocated in this paper is based on the premise that knowledge management is an interdisciplinary subject consisting of a number of elements. These include: our understanding of concepts related to knowledge and knowledge management and our research approach to such issues (*ontological and epistemological aspects*), research on organizational features conducive to capturing, sharing, and utilizing knowledge (*organizational learning*), as well as the study of computer-based systems capable of extracting useful patterns from previously unconnected data, text, images and voice messages stored in a variety of formats throughout an organization (*knowledge management systems*). More specifically:

- Ontological and epistemological aspects of research include investigations into the distinctions between information (e.g. as useful patterns) and knowledge (e.g. as a means of learning), as well as investigations into the most effective ways of organizing knowledge (e.g. into facts, concepts, principles, theories and methods) and researching knowledge management issues (e.g. case study research).
- Organizational learning research includes investigations into organizational structures (e.g. networking) and cultures (e.g. participative, caring and sharing cultures) which may provide certain advantages under current dynamic economic, political and social conditions in comparison with traditional hierarchies.
- Knowledge management systems research includes investigations into effective ways of knowledge discovery (e.g. extracting knowledge from information by means of pattern

recognition) using appropriate technologies, including intelligent multi-agent swarms.

Table 2 summarizes the main elements of an integrated approach to research in knowledge management. It also illustrates the main research areas set out by the Brunel Knowledge and Business Process Management Centre. These are further exemplified in the next section.

Brunel Centre for Knowledge and Business Process Management: research agenda

The Brunel Centre for Knowledge and Business Process Management aims to investigate how the effectiveness of knowledge management and business process change in general can be improved by addressing the lack of a systematic and multi-disciplinary approach in this research area. The Centre has been established to mark the research collaboration between members of the Department of Information Systems and Computing and the School of Business and Management at Brunel University. The members of the Centre include academic staff and research students who have a broad range of diverse skills from backgrounds including business, organizational and management studies, economics, information systems and engineering. We postulate that such diversity supports innovative and interdisciplinary approaches to knowledge management and business process change. The Centre also aims at providing a forum for academics and practitioners for promoting and disseminating best practice in knowledge and business process management research and practice through workshops, projects, publications and consultancy.

The main objective of the research carried out within the Centre is to investigate how the

Table 2 Elements of an integrated approach to research in knowledge management

Technical (<i>hard</i>) aspects	Human/organizational (<i>soft</i>) aspects	Ontological and epistemological (<i>abstract</i>) aspects
<ul style="list-style-type: none"> ● Technical aspects of KM tools ● KM tools evaluation ● KM tools selection methodology ● Requirements for further development of KM tools ● Multi-agent technology for knowledge discovery ● Processes and tools for knowledge recognition ● KM tools surveys 	<ul style="list-style-type: none"> ● Organizational learning ● Business intelligence ● Cultural aspects of KM ● Organizational structures that support KM ● Best practices in KM ● Human resource management in the context of KM ● Project management in the context of KM ● Operational management in the context of KM 	<ul style="list-style-type: none"> ● Definitions of KM ● Philosophical and psychological aspects of 'knowledge' ● Taxonomy of KM ● Epistemology and ontology of KM ● Appropriate methods for investigating KM phenomena



effectiveness of knowledge management can be improved. The members of the centre claim that this could only be achieved by taking into consideration technical, human/organizational and abstract aspects of knowledge management. The aim of the Centre, therefore, is to study the integration of the two existing key research areas in knowledge management and applying the previous framework in practice. Importantly, the Centre also intends to ground and integrate the results at a more fundamental, normative level that considers the notion of knowledge management but also the methodologies that are appropriate for its study. The other important area of research carried out within the Centre is investigating how to improve the success rate of business process change projects. The two areas are seen as closely related; specifically, both knowledge and process change management research need the synergy of technological and organizational research and are concerned with business change, even though the emphasis may be at different levels (individual-organizational for knowledge management and process-organizational for process change management).

The specific objectives of the Centre are to conduct research in these areas and to facilitate the transfer of knowledge management methods and tools from researchers to practising managers. Some specific research areas that form the core of the Centre's research activity at the moment include:

- Processes and tools for knowledge recognition and discovery.
- An integrated approach to knowledge management incorporating abstract and socio-technical aspects.
- Knowledge management for organizational learning.
- Knowledge management in e-commerce.
- Business intelligence and customer relationship management.
- Business process change approaches.
- The role of teams in knowledge management and business process change.
- E-learning and personal knowledge management.

One of the projects carried out within the Brunel Centre for Knowledge and Business Process Management Centre concerns the parallel study of multi-agent tools and organizational structures for more effective knowledge management in e-commerce. This project aims to *integrate technical and organizational aspects of KM and to deliver a set of*

interrelated frameworks and techniques for improving the state of the KM art. In particular, the project aims to *investigate the potential of multi-agent software applications and data-mining tools for KM in e-commerce based business environments as well organizational structures needed to support KM in such environments.* The project involves theoretical and empirical research carried out by an interdisciplinary team that works closely with both knowledge management software developers and e-commerce-based user organizations. The project draws from the framework presented in the previous section and should result in new frameworks and techniques for use across business sectors.

The ambition of this project will be a *multimedia, Internet-based showcase of 'best practice' in e-commerce-based KM.* This will discuss (1) the findings from the case studies, (2) the tools developed for designing and implementing KM systems in e-commerce-based organizations, and (3) the theoretical and conceptual developments. The showcase will have an *embedded e-learning tool* that will be used for creation of new knowledge. It will have a clear business focus, as well as making a distinct contribution to KM more generally. The project team will work closely with both user organizations and KM software developers and, in so doing, produce new frameworks and techniques for use across e-commerce business sectors.

Another project, currently being undertaken, relates to investigation of technical aspects of knowledge management. As part of this project, extensive evaluation of a set of KM tools is being carried out, with the aim to produce an evaluation framework for KM tools and a selection methodology for such tools (Patel and Hlupic, 2000). Despite the technical focus, we expect to incorporate valuable lessons from the other aspects of knowledge management, as described in the framework, so that the results can be relevant to business and theoretically grounded as well as informed by business practice. In particular, the organizational aspect will be driven by the need to evaluate tools in a relevant business context whereas the fundamental abstract aspects will be represented in answering what the users of knowledge management tools consider 'knowledge' to be and whether they perceive it as a competitive differentiator (cf. Currie and Pouloudi, 2000).

These projects will therefore demonstrate the importance of using a holistic approach to knowledge management and the need for an interdisciplinary research team, that will themselves benefit from sharing and managing knowledge. Furthermore, it is hoped that our framework will generate

research interest, will inform and strengthen other knowledge management projects and will be expanded with knowledge from other research groups.

CONCLUSIONS

Knowledge management is arguably presented as the latest management panacea for organizational effectiveness. Consequently, there are lessons to be learnt by knowledge management researchers and practitioners from the analysis of the reasons for the failure of previous panaceas, e.g. reengineering projects. In particular, the lack of top management commitment and support through the process of the project, poor consultation, unclear role of IT, and the deficient consideration to the cultural, social and political issues (Belmonte and Murray, 1993; Moad, 1993; Grint and Willcocks, 1995) are expected to be critical for the success of knowledge management projects as well. The literature provides examples of the need for an integrated and systematic approach to BPR (including 'hard', 'soft' and 'methodological/abstract' elements) in order to increase the chance of success of BPR projects (Hlupic *et al.*, 2000; Hlupic, 1998). In this paper we have argued that the same is needed for knowledge management research and practice, if this management concept is to make more of a difference for organizations than previous management fads.

More specifically, we have argued that knowledge management (KM) is a complex research area that brings together hard, soft and abstract aspects: technical issues related to knowledge management tools, organizational issues related to the culture, structure and context within which these tools may be used and the organizational learning that may result from their use, as well as more fundamental ontological and epistemological issues about the notion and approach to the study of knowledge management. While research in knowledge management is growing and attempts to address the challenges relating to each of these aspects, there is currently little empirical or theoretical work that provides a systematic, integrated, interdisciplinary perspective to the study of knowledge management. The Brunel Knowledge and Business Process Management Centre advocates such an approach and currently undertakes a series of projects in this area. Our aims are to bridge gaps in existing KM research and contribute to systematic and more effective knowledge management practices that are theoretically

sound as well as relevant to the business community.

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