
Intellectual capital and knowledge management effectiveness

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Abstract

Building on the complexities of organizational knowledge creation the paper explores the alignment of knowledge management practices with the epistemological beliefs of individuals or groups in organizations. A pan-European research project investigated individual's philosophy about truth, knowledge and the optimum approach of knowledge creation. These individual viewpoints and requirements are then contrasted with the knowledge management practices implemented in organizations. The results highlight significant misalignment between knowledge management requirements in epistemological terms and individual's perception of organizational knowledge management activities. The paper claims these differences lie at the heart of problems companies experience with extracting value from knowledge management initiatives. The paper suggests ways of identifying and evaluating resource transformations in organizations, in order better to understand and manage knowledge creation to grow the intellectual capital of organizations.

Introduction

Intellectual capital (IC) is a key driver of innovation and competitive advantage in today's knowledge based economy (Teece, 2000). At the same time, knowledge management (KM) is recognized as the fundamental activity for obtaining, growing and sustaining IC in organizations (Marr and Schiuma, 2001). This means that the successful management of IC is closely linked to the KM processes an organization has in place; which in turn implies that the successful implementation and usage of KM ensures the acquisition and growth of IC.

Current performance management thinking recognizes the need to address the management of IC and the introduction of frameworks such as the Balanced Scorecard (Kaplan and Norton, 1996), the Performance Prism (Neely *et al.*, 2002), and the IC-Index (Roos *et al.*, 1997) underline the importance of managing the financial and non-financial value contributions of IC. However, we believe that a discrepancy exists between theory and practice in terms of the management of intellectual capital in organizations, in particular concerning the influence of epistemology on the IC production capability of KM.

Both the creation of knowledge and IC are closely associated with the epistemological viewpoints of individuals. Epistemology is the science and study of knowledge. Montague (1962) describes epistemology as the extent to which the things and qualities of the world are dependent upon their being related as objects to a knower or subject. Plato defined the concept of knowledge as "justified true belief" and there has been an unremitting philosophical discourse about epistemology throughout the evolution of philosophy involving philosophers such as

Aristotle (1928), Descartes (1911), Locke (1987), Kant (1965), Hegel (1977), Wittgenstein (1958), Heidegger (1962), or Merlau-Ponty (1962). This discussion shows that epistemologies differ between individuals and therefore there are divergent views of the knowledge creation process, influenced by the social and cultural contexts as well as by the ontology of individuals or groups of individuals.

von Krogh *et al.* (1994) introduce the concept of corporate epistemology as the theory of how and why organizations know and how they believe knowledge is developed. Accepting this concept of corporate epistemology we deduce that in order for KM initiatives to be successful there has to be alignment between the epistemologies of individuals and the corporate epistemology within which these individuals are to operate.

The concept of epistemology has only recently been touched upon in the field of IC management and measurement (Pike and Roos, 2002). The aim of this research is to advance the exploratory work done by Pike and Roos and show that a link between KM effectiveness and epistemology is justified. Hence an investigative research study with seven firms in Europe was undertaken to study the relationship between epistemological viewpoints and knowledge management practices. Specifically the research reviews the literature on IC management and KM before the three different epistemologies – cognitivist, connectionist, and autopoietic – are discussed. Our hypothesis is that an alignment between corporate epistemological paradigm and the epistemological paradigm of the individuals in the company facilitates the choice of KM approach. We therefore believe that the suitability of KM approaches differs depending on the existing



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epistemological paradigms. It is also assumed that if the personal epistemology matches the corporate KM practices, then those practices are viewed as being more effective. Empirical data collected via surveys and interviews are presented and discussed before implications for future research and the management of knowledge and IC are drawn.

Management of Intellectual Capital

Today IC is recognized as a key strategic asset for organizational performance and its management is critical for the competitiveness of organizations (Grant, 1997; von Krogh and Grand, 2002; Grant, 1996; Boisot, 1998; Griffiths *et al.*, 1998; Roos and Roos, 1997; Spender, 1996). According to Roos *et al.* (1997) and Marr *et al.* (2003) the management of IC involves:

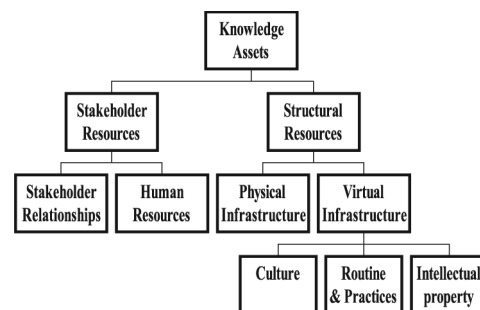
- identifying key IC which drive the strategic performance of an organization;
- visualizing the value creation pathways and transformations of key IC;
- measuring performance and in particular the dynamic transformations;
- cultivating the key IC using KM processes; and
- the internal and external reporting of performance.

A visual representation of these steps can be found in Figure 1; each of these steps will be explained briefly below.

The first step is to identify the key IC resources in an organization. The traditional starting point is the strategy in which organizations identify the most important resources, especially the knowledge[SP1] resources (see Figure 2), in order to achieve their strategic objective. Advocates of the resource based view of the firm, such as Penrose (1959) and later Wernerfelt (1984) and Barney (1991), view the set of organizational resources as drivers for the strategy development. Either way, managers have to identify the IC that drives the value creation in an organization. IC resources might include human resources (skills, know-how,

Figure 2

Classification of knowledge assets



Source: Marr *et al.* (2002)

competence), stakeholder relationships (customer relationships, licensing agreements, distributions agreements), and organizational resources (systems, processes, organizational culture, management philosophy, intellectual property, brands). Closely related to IC are the physical resources (buildings, physical networks) and financial resources (investments, cash) that act as enablers to value creation.

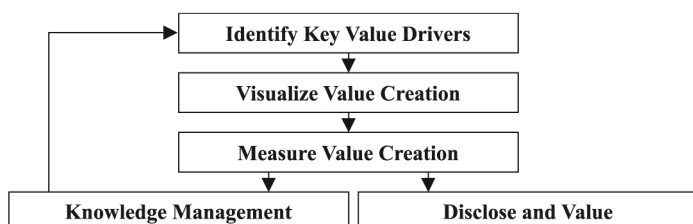
The second step is to visualize how IC helps to achieve the overall strategic objectives of the organization. This visual representation of causal relationships or transformations in maps is described by Kaplan and Norton (2000) as strategy maps, by Neely *et al.* (2002) as success maps, and by Gupta and Roos (2001) as Navigator building on the original work of Edvinsson and Roos in the Skandia IC supplements (Roos and Lövingsson, 1999). Such maps are representations of the business logic and they show the assumed value creation pathways that will lead to the achievement of the strategic objectives and satisfaction of key stakeholders.

When organizations have mapped the value creation pathways they can develop performance indicators that help them to understand whether the organization is successful in implementing its strategy. Building measures around the business hypothesis allows organizations to test the assumptions about how the business works.

The IC management phase will use the insights gained from identifying, mapping, and measuring knowledge assets. At this stage managers decide whether to cultivate and nurture the existing IC using KM processes or whether the assumptions of value creation were wrong in which case they have to go back to step one and identify the real drivers of success. The performance capacity of the company is based on the knowledge of its people (Savage, 1990) as well as on the collective or organizational knowledge (von Krogh *et al.*, 1994). This

Figure 1

Managing the intellectual capital



explains why companies are thriving to become learning organizations pursuing the objective of continuous development of their knowledge assets (Senge, 1990). The important strategic role of knowledge has lead academics and practitioners to define concepts, approaches and tools to make IC an identifiable and manageable resource. KM practices represent the tools that allow organizations to maintain and grow organizational knowledge assets. A more detailed discussion about knowledge management is provided below.

Knowledge management

We define KM as the collective phrase for a group of processes and practices used by organizations to increase their value by improving the effectiveness of the generation and application of their intellectual capital. KM processes are meta-processes which cannot be uniformly observed like physical processes and differ according to their means of creation, nature, recording, transmission and mode of use (Boisot, 1995). According to our definition, no two KM implementations will be the same since socio-cultural contexts differ and more importantly because human beings with different perceptions and philosophies are central to all KM applications.

The reasons why companies invest in KM are that it either gives them a temporal effectiveness or efficiency advantage over their competitors, or they do it to try to negate the competitive advantages of others. Many dress up the decision to invest in KM in softer terms but the underlying motives remain simply advantage or survival (Lyles and Schwenk, 1992; Huber, 1990). Practice reviews show that KM is not just a fad and is taken seriously by companies and governments (Ruggles, 1998; KPMG, 2000). Given this, it is rather unexpected to find that according to surveys such as that by CTP (1999) few companies think that their investment in KM was a success while between 16 per cent and 36 per cent felt it was a failure. Other studies find that KM practices often increase the knowing-doing gap (Pfeffer and Sutton, 1999)

Nonaka *et al.* (2000) state that despite the widely recognized importance of IC, albeit they primarily equate IC with knowledge, as a vital source of competitive advantage, there is little understanding of how organizations actually create IC by dynamically managing knowledge. Furthermore, according to Nonaka and Konno (1998) knowledge creation requires a shared context which they call

“*ba*” (equivalent to “place” in English). *Ba* is a shared space which can be physical, virtual, or mental. Knowledge, in contrast to information, cannot be separated from the context – it is embedded in *ba*.

The requirements for *ba* imply that in order for organizations to succeed with KM, an understanding of exactly what it is that is being managed is required and, in addition, an understanding of who is using it to do what. It seems crucial that the KM practices in organizations match the knowledge creation requirements of individuals or group of individuals who are involved in the knowledge creation. In addition, it is usual to find that different parts of an organization use different KM practices to fulfil their allotted function. This means that if organizations have global and uniformed KM practices, or if the KM practices have been designed for the requirements of one specific group, that the KM system is not adequately serving all or at least one of the groups and is therefore sub optimal. Typical modes of failure are that the KM system is ignored and knowledge is created outside the KM system. Thus, in order to ensure effective KM for the key functional groups in the company it is important to understand their epistemological belief systems with regard to knowledge and how it compares with the corporate epistemology which is represented by the company KM system. Furthermore, it is vital to determine the roles that knowledge plays in creating value for the company and how it changes the company through organizational learning. To shed more light onto the issue of epistemology below we will discuss the different theories of knowledge and knowledge creation.

Differing notions of knowledge creation

There is considerable latitude among human beings as to the nature of knowledge, what it means and how it should be managed, if at all. If organizations try to impose a model of knowledge creation and then attempt management on a basis foreign to the workforce they will most certainly fail. It is therefore critical to understand people’s beliefs and use of knowledge in order to design the KM system that matches the requirements of individuals and groups of individuals.

The theoretical understanding of organizational knowledge has evolved over the last 50 years. A predominant view is the positivistic science view of knowledge creation. The so-called cognitive perspective

(Simon, 1993; Varela *et al.*, 1991) is characterized by information processing and rule-based manipulation of symbols. Under this epistemological view, knowledge is seen as abstract, task specific and oriented towards problem solving (von Krogh *et al.*, 1994). The world is seen as pre-given and representations of reality can be re-created and stored (Varela *et al.*, 1991). This means managers and organizations are able to create representations of truth through processing information available to them in their external environment, which are then storable and retrievable in KM systems (March and Simons, 1958; Daft and Weik, 1984; Prahalad and Bettis, 1986).

In a contrasting view of autopoieses, knowledge is seen as socially constructed and therefore objective observation is impossible. Realities are not pre-given and representable, instead reality and knowledge is context-sensitive and history-dependent. In this autopoietic view, cognition is a creative act of bringing forth a world and knowledge is created through an interpretation process and social cognition connected to observation (von Krogh *et al.*, 1994). This view conforms with the Japanese intellectual tradition where knowledge involves emotions, values and hunches and is not viewed simply as data or information that can be stored (Takeuchi, 2001).

A third view is the connectionistic epistemology in which organizations are seen as self-organized networks composed of relationships, the rules of how information is processed are not universal, they vary locally (Venzin *et al.*, 1998). IC consists of individual knowledge and of the organizing principles (Kogut and Zander, 1995). Kogut and Zander (1995) distinguish between know-how and information. Knowledge is held by individuals, but is also expressed in regularities by which members cooperate in a social community.

The differing philosophical positions impact how individuals and organizations view the practicalities of knowledge creation. In the more positivistic-scientific viewpoint of the cognitivists knowledge can be codified and made available in systems. Therefore, organizational knowledge can be created separately from individuals. In the contrasting interpretive and phenomenological viewpoint of autopoietics, on the other hand, knowledge is seen as private and constantly interpreted and re-interpreted depending on the social context and experience of the individual (Habermas, 1984; Bhaskar, 1975; Weber, 1962). In the connectionistic viewpoint, private and public knowledge is combined, and firms

only exist because they are better at transferring and sharing knowledge than the market (Kogut and Zander, 1995). The three epistemological classes are described in further detail by Venzin *et al.* (1998) and Habermas (1984) as they relate to KM. Table I shows an interpretation of these epistemological classes in a KM setting.

To determine the value beliefs of the various functional groups in companies and their attitudes to knowledge, a questionnaire comprising 16 questions devoted to epistemological issues has been developed. The questionnaire included statements reflecting the three different epistemological views described above and the subjects could choose one of the three options for each of the 16 questions. The questions were repeated in that respondents are first asked to describe their own view on knowledge creation and secondly, how they see the capabilities of their company's KM system. It should be noted, that the questionnaire was not aimed at determining the software characteristics but rather the KM environment of the company so that KM practices and management attitude are also reflected. Although not exhaustive, the questionnaire aims at providing a broad general picture of the respondent's views of knowledge and truth and then the respondent's views on how they perceive their company. Data collection can either be in paper form or electronically.

Collected data are analysed by attributing each response to the epistemological class to which the response belongs. In general, this leads to mixed responses in which people select responses which indicate them to be in more than one epistemological group. As the analysis is intended to be indicative rather than definitive, it is necessary only to determine the predominant epistemology.

This survey has been applied to functional groups or departments of several European companies from various industries. For this paper we selected six representative organizations, which show patterns that were repeated throughout the larger study. Each member of the group or department was given the survey to fill in. We analyzed 198 surveys from these six companies, however the number of surveys varied depending on the size of the group or department. In order to reflect the view of the groups and departments we included at least 80 per cent of the members of each group or department, which varied in size between 12 and 78 members.

Proceeding in accordance with an agreement for non-specific attribution, the questionnaire results were coded and

Table I
Three cognitive distinctions of knowledge creation

Cognitivist	Connectionist	Autopoietic
Cognitivists consider the identification, collection and central dissemination of information as the main knowledge development activity. Organizations are considered as open organizations that develop increasingly accurate pictures of their pre-defined worlds through the assimilation of new information. Knowledge is developed according to universal rule, hence the context of the incoming information is important	There are many similarities here to the cognitivist viewpoint but a difference being that there are no universal rules. As rules are team-based and vary locally, organizations are seen as groups of self-organized networks dependent on communication. The connectionists believe that knowledge resides in the connections and hence focus on the self-organized dispersed information flow	Here the context of information inputs is unimportant as it is seen as data only. The organization is a system that is simultaneously open (to data) and closed (to information and knowledge). Information and knowledge cannot be transmitted easily since they require internal interpretation within the system according to the individual's rules. Thus autopoietics develop individual knowledge, and respect that process in others

analyzed using algorithmic content review to place the respondents answers on the surface as shown in Figure 3. Results are plotted by calculating the mean of the coordinates for each response. For example, an autopoietic response contributes one unit in the direction of the autopoietic vertex. Similarly, a cognitive response or a connectivist response would contribute one unit in the direction of the appropriate vertex. The mean position for all 16 responses for each individual is found and plotted as the response for that person. The survey process was exploratory and thus not designed to enable statistical treatment of results, nor to test or confirm any specific hypothesis.

Follow up interviews were conducted with participants to investigate their perceived effectiveness of the existing KM system. Our assumption was that the better the organizational KM matches the epistemological requirements of the functional groups the more effective the KM system is perceived. The interviews were conducted in person and by phone and

involved about 50 per cent of the participants in the survey.

Findings of the study

The epistemological results are shown in Figures 4-6). In these diagrams, the horizontal-lined areas depict where the responses fell when respondents were considering themselves. The crosshatched areas depict where the responses fell when respondents were considering their company's KM system. The sizes of the bubbles are a measure of the conformity in opinion where smaller bubbles represent more consistent viewpoints whereas larger bubbles represent greater variety in viewpoints. The results from this analysis from six representative organizations are shown below.

One feature that has dominated most of our survey findings was the misalignment of KM systems in the minds of people from different companies. Clearly, the greater the degree of mismatch between the person and the company, the less the relevance the person attaches to the KM system and the less likely it is to have a meaningful impact on the operation of the company. This result is not surprising since the follow up interviews revealed that especially in larger organizations the KM system was dominated by a document management/information retrieval system. On the other hand, where the size of the organization was relatively small a significantly better alignment in individual and corporate epistemology was found to be present.

Furthermore, the results showed significant differences depending on the principal business activities of the organizations involved. The differences allowed us to

Figure 3
Classes of epistemology

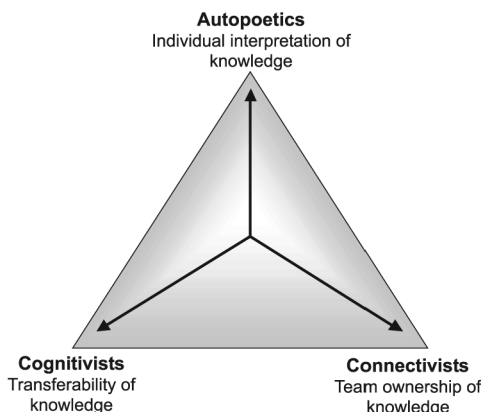
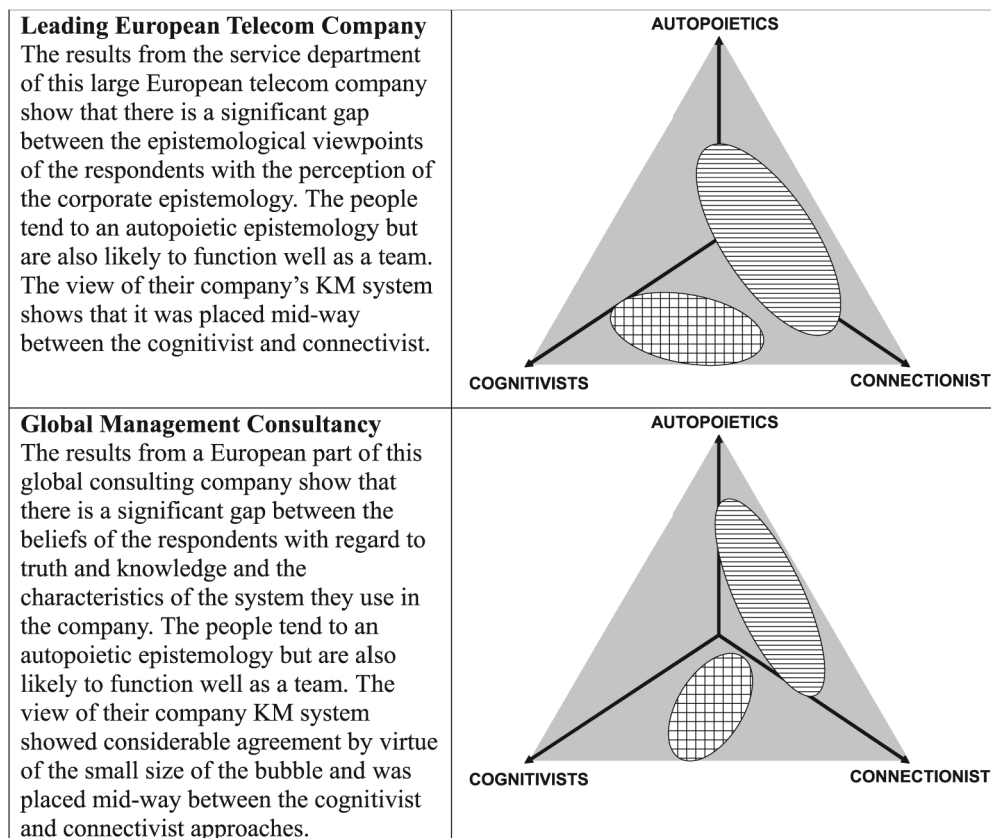


Figure 4
Results for service-based firms



categorize the participating firms into three different categories: service-based firms, production-based companies, and knowledge-based organizations. The service-based firms showed the most significant misalignment between personal epistemology and corporate KM systems. The findings from the participating production-based companies revealed partial alignment between KM practices and personal knowledge views. The best alignment was found in the knowledge-based organizations in our sample.

The follow up interviews validated our assumption and showed that in organizations where KM practices matched the requirements of the individuals the KM processes were perceived to be more effective and efficient. In organizations where there was a mismatch between KM practices and individual epistemology, KM systems are not seen as effective and efficient. In organizations that showed a misalignment the KM systems were often viewed as additional constraints with little added value. One senior manager said in a follow-up interview:

The organizations does not understand how knowledge is shared here and I tend to ignore the knowledge management initiatives forced upon us whenever I can.

Figure 4 shows the results of two service firms. Both diagrams illustrate significant misalignment between the individual view of knowledge creation and the organizational processes aimed to facilitate knowledge creation.

In both cases the organizational view of knowledge creation is between the autopoietic and the connectivist view whereas the individuals view of knowledge creation is placed between cognitivist and connectivist views.

Figure 5 shows the results of two production-based companies. Both diagrams demonstrate that there is partial overlap between organizational KM processes and individual views of knowledge creation.

Figure 6 illustrates the results from two the knowledge-based organizations. Both examples show an apparent alignment between the KM processes in place and the individual's needs and views of knowledge creation. Both organizations recognized the KM requirements of their people and did not follow the route of implementing complex document management systems, which would not match the autopoietic orientation of the individuals in these organizations.

Figure 5
 Results for production-based companies

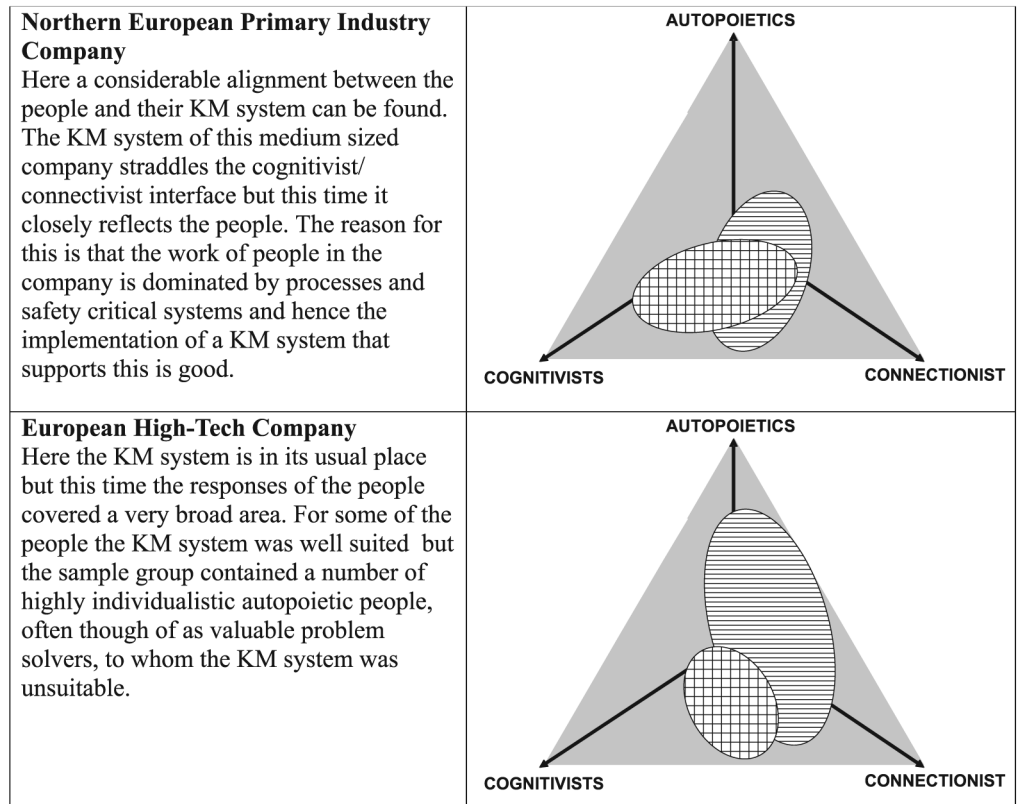
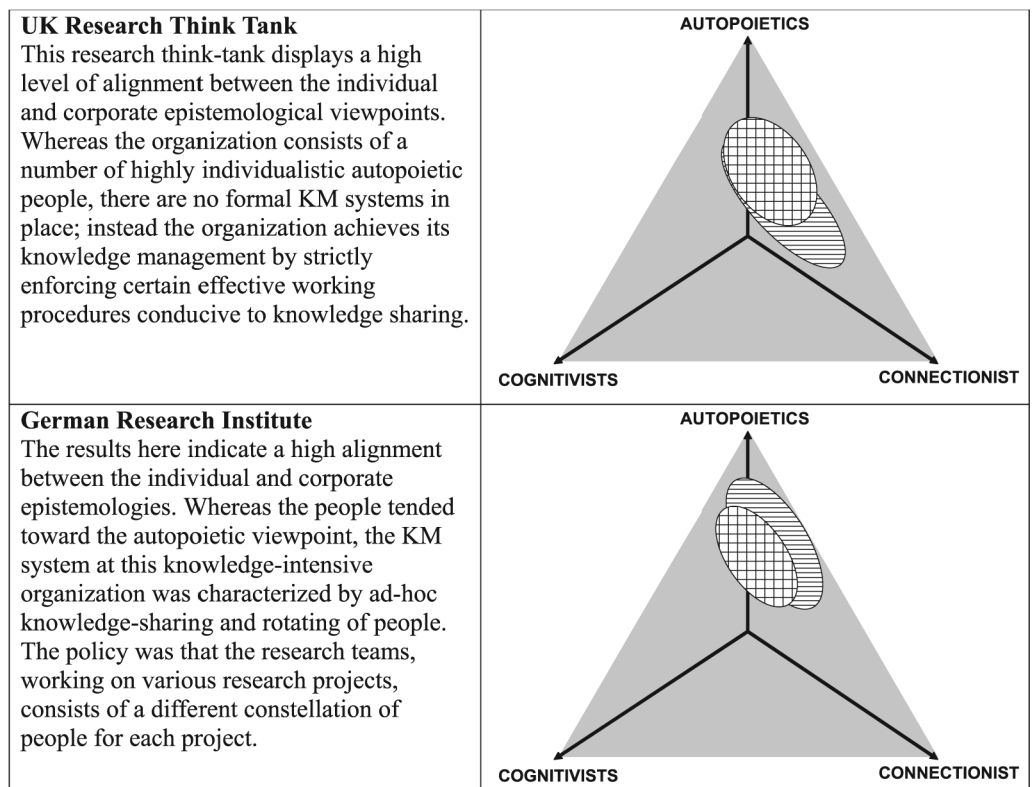


Figure 6
 Results for knowledge-based organisations



Discussion

It seems that with an understanding of what the workforce believes about knowledge, it is possible to look at how organizations deal with the practicalities of creating, managing and using knowledge in order to nurture and grow their IC. The findings show that one of the problems faced by organizations when designing KM systems is that inside any organization, knowledge is used in diverse ways in different places. The nature and use of knowledge differs, for example, in parts of companies responsible for the generation or delivery of the product is likely to be dominated by explicit knowledge embodied in processes and procedures (Nonaka and Takeuchi, 1995). Self-generated modifications to that knowledge based are likely to be controlled by processes to ensure that there are no unexpected or unwanted consequences of the changes. The dominant epistemology is likely to be a cognitive one. On the other hand, in the same company, the research group is likely to be very different in nature. The people are much more likely to operate under an autopoietic epistemology and tacit knowledge and exchanges of it will dominate knowledge exchange (e.g. von Krogh *et al.*, 1994). Development and management could easily follow another model. The use of knowledge in organizations seems to be complex and so its management and measurement will not be amenable to simple solutions. One single enterprise wide KM approach seems to be irrational unless the individuals in an organization share the same epistemological viewpoint. In our research this was only the case in smaller knowledge-based organizations. In larger organizations and in particular large service-based firms there seems to be a broader set of epistemological views, which are not addressed in the KM system used in the organization.

In order to be able to address diverse epistemological beliefs it is essential to understand where and how in organizations the critical knowledge is used, which individuals or groups use it and what their requirements and views on knowledge creation are. In order to understand the knowledge creation process it seems imperative to visualize the value creation pathways and transformations (Roos *et al.*, 1997; Gupta and Roos, 2001) as described in step 2 of managing IC (Marr *et al.*, 2003). An example of such visualization is presented in Figure 7. These models of critical transformations can then be used to determine the usage of knowledge and the individuals or groups involved.

As these visual representations are essentially conceptual in nature, they can easily be formatted to highlight meta-processes such as those which characterize knowledge creation and use. This approach has its inherent advantages. Early discussions about KM were difficult and confusing because each individual was envisioning a different concept. However, developing a representation of knowledge transformations as a visual model creates a basis for dialogue around knowledge flow. The ensuing discussions invariably help to make differences in perspective apparent or coalesce. For example, even at the coarse level of granularity, such as in the example depicted, it can be seen that the key influencing pathways aside from the final generation of cash are first the transformations from "tacit knowledge" to "explicit knowledge" and "image", and from "explicit knowledge" to "image", and secondly the "cognitive competence" to "cash" transformation. This could be interpreted as a company which depends on knowing how to deliver a service through excellent standard processes but is also innovative in its product. These two pathways have no direct link and are to a significant degree, independent. With such a clear difference, it is unlikely that a single KM solution or simple KM behavioral environment will function effectively.

Implications for practice

From our findings it appears that different KM practicalities suit different epistemological beliefs of groups of individuals. Taking the knowledge process classifications suggested by Marr and Schiuma (2001) Table II is a first attempt to map the different knowledge processes onto the different knowledge views. Figure 5 shows the different KM processes and how those could be addressed in each of the epistemologies.

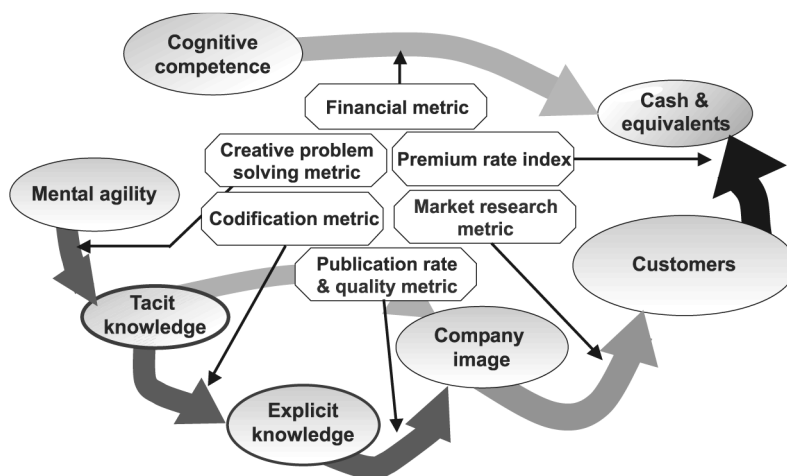
Conclusions

The paper shows that a clear understanding of epistemological issues is at the centre of choosing a successful KM approach within an IC framework. From understanding the different value creation pathways and knowledge transformations organizations can move on to understand the requirements of the groups involved. This allows organization to design KM processes that best suit the epistemologies of their employees in order to ensure effective and

efficient systems to manage their knowledge. The findings confirm the existence of different epistemologies as suggested by Von Krogh and Roos (1996) and Venzin *et al.* (1998), which means that organizations need to recognize the different needs and ways knowledge is created in order to successfully manage its IC.

Modern intellectual capital processes seem to facilitate the measurement and management of IC resources and meta-processes. Especially the visualization of knowledge transformations is seen as a

Figure 7
Example of an IC Navigator and knowledge flow metrics



key element towards a better understanding of the knowledge creation process. The outcome of this exploratory research is that the hypothesis that alignment between corporate epistemological paradigm and the epistemological paradigm of the individuals in the company facilitates the choice of KM practices cannot be rejected. Furthermore the hypothesis that different KM approaches are differently suitable to different epistemological paradigms can also not be rejected nor that alignment of epistemological paradigms with the KM practices generates a higher success rate of KM-projects. However, we call for further research into the knowledge creation process in organizations and the impact of differing epistemologies. Building upon the foundations laid in this paper further empirical research is encouraged to test the theories proposed.

We would like to encourage further research into distinctions of organizational epistemologies and their categorization in various organizational environments. There is a need to better understand whether specific epistemologies are predominant in certain types of organizations. More research is needed to understand the knowledge management practices suitable for different epistemological beliefs, and into the impact of epistemologies on the effectiveness of IC management. The research presented in this

Table II
Knowledge management practices and epistemological paradigms

	Cognitivist	Connectionist	Autopoietic
Knowledge codification	Codification of universal knowledge as a key concept	Limited codification of concepts, not all knowledge can be codified without more information about context	N/a
Knowledge storing	Storing of knowledge in, e.g. databases as a key concept, document management	Storage of information, not knowledge, storage of local rules	N/a
Knowledge mapping	Mapping of knowledge	Mapping of information and rules	Mapping of individuals with knowledge, capability directories
Knowledge sharing	Expert systems, knowledge data bases, codified manuals	Both, regulated and unregulated meetings, semi-regulated group forums, group ware	Unregulated meetings, casual chats, free-form discussion forums
Knowledge acquisition	Process that can be captured in IT systems, scientific searches, codification	External relationships to convert knowledge into internal context	Open networks and relationships
Knowledge creation	Can be strictly directed and managed	Unregulated within local rules	Openness, freedom, apparent chaos

paper and the suggested research directions should contribute to disentangle the relationships between epistemological beliefs of individuals or groups and the effectiveness of organizational KM processes and the management of IC.

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