Information vs. Knowledge:
A Case Study of Knowledge Management

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ABSTRACT

Knowledge has widely been acknowledged as one of the most important factors for corporate competitiveness, and have witnessed an explosion of IS/IT solutions claiming to provide support for knowledge management (KM). A relevant question to ask, though, is how systems and technology intended for information such as the intranet can be able to assist in the managing of knowledge. To understand this, we must examine the relationship between information and knowledge. Building on Polanyi's theories, all knowledge is tacit, and what can be articulated and made tangible outside the human mind is merely information. However, information and knowledge affect one another. By adopting a multi-perspective of the intranet where information, awareness, and communication are all considered, this interaction can best be supported and the intranet can become a useful and people-inclusive KM environment. In this paper, seven enabling factors of organizational creativity are identified and discussed. These factors are then compared to the specific characteristics of intranet technology in order to find out when and how this environment may stimulate creativity

Key words

Knowledge Management, Intranet, Internet, Information Technology, Information System

1.0 INTRODUCTION

In today's highly dynamic business environment, organizational creativity is one of the most important sources of competitive advantage. Although the unpredictability of creativity makes it difficult to plan for, it may still be possible to facilitate knowledge creation given that we understand what affects it. Organizations' ability to create new knowledge is regarded as a primary source of competitive advantage already today and increasingly so in the future, and finding ways to actively support the process of organizational knowledge creation is therefore an activity that should be prioritized. In this paper, in terms of intranets and Internet, we focus entirely on the web-based part, i.e. services based on the hypertext transfer protocol (HTTP). This is explained further in section three. In this paper, seven enabling factors of organizational creativity are identified and discussed. These factors are then compared to the specific characteristics of intranet technology in order to find out when and how this environment may stimulate creativity. The results show that intranets are most likely to contribute by providing a variety of information in dynamic and unpredictable environments. However, standard management literature instead unanimously prescribes organizational convergence as the default strategy for the modern manager. Our analysis suggests that this control approach not only conflicts with some of the creativity-enabling factors but also clashes with the fundamental principles underpinning the web.

2.0 FROM PHILOSOPHY TO IT

Ever since the ancient Greek period, philosophers have discussed what knowledge is. Early thinkers such as Plato and Aristotle where followed by Hobbes and Locke, Kant and Hegel, and into the 20th century by the likes of Wittgenstein, Popper, and Kuhn, to name but a few of the more prominent western philosophers. In recent years, we have witnessed a booming interest in knowledge also from other disciplines; organization theorists, information system developers, and economists have all been swept away by the knowledge management avalanche. It seems, though, that the interest is particularly strong within the IS/IT community, where new opportunities to develop computer systems are welcomed. A plausible question to ask then is how knowledge relates to information technology (IT). Can IT at all be used to handle knowledge, and if so, what sort of knowledge? What sorts of knowledge are there? What is knowledge?

It seems we have little choice but to return to these eternal questions, but belonging to the IS/IT community, we should not approach knowledge from a philosophical perspective. As observed by Alavi and Leidner, the knowledge-based theory of the firm was never built on a universal truth of what knowledge really is but on a pragmatic interest in being able to manage organizational knowledge (Leidner, 2001). Ontology wise, knowledge may be seen to exist on different levels, i.e. individual, group, organization and inter-organizational (Nonaka, 1995). Here, primary interest is on the group and organizational levels. However, these two levels are obviously made up of individuals and are thus bound to examine the personal aspects of knowledge as well, though be it from a macro perspective.

3.0 OPPOSITE TRADITIONS – AND A MIDDLE WAY?

When examining the knowledge literature, two separate tracks can be identified: the commodity view and the community view (Swan, 1999). The commodity view of or the objective approach to knowledge as some absolute and universal truth has since long been the dominating view within science. Rooted in the positivism of the mid-19th century, the commodity view is still especially strong in the

natural sciences. Disciples of this tradition understand knowledge as an artifact that can be handled in discrete units and that people may possess. There is also another tradition that can be labeled the community view or the constructivist approach. This tradition can be traced back to Locke and Hume but is in its modern form rooted in the critique of the established quantitative approach to science that emerged primarily amongst social scientists during the 1960's, and resulted in the publication of books by Garfinkel, Bourdieu, Habermas, Berger and Luckmann, and Glaser and Strauss.

Table:1 Definition of Data, Information and Knowledge.

Author(s)	Data	Information	Knowledge
Wiig [41]	-	Facts organised to describe a situation or condition	Truths and beliefs, perspectives and concepts, judgements and expectations, methodologies and know.how
Nonaka and Takeuchi [23]	-	A flow of meaningful messages	Commitments and beliefs created from these messages
Spek and Spijkervet [32]	Not yet interpreted symbols	Data with meaning	The ability to ssing meaning
Davenport [15]	Simple observations	Data with relevance and purpose	Valuable information from the human mind
Davenport and Prusak [16]	A set of descrete facts	A message meant to change the receiver's perception	Experiences, values, insights, and contextual information
Quigley and Debons [28]	Text that does not answer questions to a particular problem	Text that answers the questions who, when, what, or where	Text that answers the questions why and how
Choo *et al.* [12]	Facts and messages	Data vested with meaning	Justified, true beliefs

These authors argued that reality (and hence also knowledge) should be understood as socially constructed. According to this tradition, it is impossible to define knowledge universally; it can only be defined in practice, in the activities of and interactions between individuals.

Thus, some understand knowledge to be universal and context-independent while others conceive it as situated and based on individual experiences. Maybe it is a little bit of both. A concerto pianist has the knowledge – i.e. the ability – to play the piano, something the Metropolitan opera audience is able to appreciate. This pianist, given a suitable instrument, would be able to express his or her knowledge equally well in some other location with a completely new audience. Thus, knowing how to play resides within the pianist and is, in this sense, context - independent. However, should the same pianist be stranded in the middle of the Amazon jungle and picked up by some

unknown Indian tribe, her knowledge cannot be manifested. Even if a piano would be available, the Indians would not be able to recognize (and possibly not even appreciate) a classic masterpiece. To make sense, the piano-playing knowledge of the pianist requires the context of a knowledgeable audience. Thus, knowing how to play is meaningless in the wrong tradition or environment.

4.0 DATA, INFORMATION AND KNOWLEDGE

Not many would question the fact that information can be made tangible and represented as objects outside of the human mind. Knowledge, on the other hand, is a much more elusive entity. Add data, and we have a both intricate and challenging situation of intertwined and interrelated concepts. It has often been pointed out that data, information, and knowledge are not the same, but despite efforts to define them, many researchers use the terms very casually, as is evident from "Table 1".

Not only are the definitions of the three entities vague and imprecise: the relationships between them, although non-trivial, are not sufficiently dealt with. It is unwise trying to define these entities in terms of each other since such definitions seem to further confuse the picture. "Figure 1" depicts a view that is commonly found, in variants, in the literature (Ackoff, 1997;Bellinger 1997;Choo 2000). The problem with the oversimplified figure is that it holds three tacitly understood assumptions.
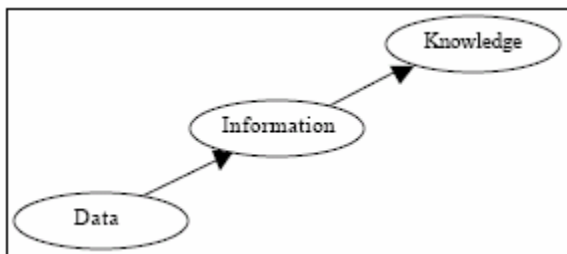

Figure 1: Links between three aspects

Firstly, the image suggests that the relationship between data, information, and knowledge is linear. The distance between data and information is the same as the distance between information and knowledge, implying that the effort required moving from one entity to another is the same. Though it may not be possible to correctly state the true relationship between these entities, there is nothing that indicates that is should be linear. Secondly, the image implies that the relationship is asymmetrical, suggesting that data may be transformed into information, which may be transformed into knowledge, but it does not seem to be possible to go the other way. This assumption can be noticed also in Table 1, where several commentators define information in terms of data and knowledge in terms of information. Thirdly, it connotes the appraisement that knowledge is more valuable than information, which in turn is superior to data. The three entities influence each other and the value of any of them depends on the purpose for which it is to be used. Both data and information require knowledge in order to be interpretable, but at the same time, data and information are useful building block for constructing new knowledge. When the information is used, i.e. interpreted in the light of the user's previous knowledge and experiences, or, as Kidd puts it, when new facts inform us, the information does not "become" knowledge but it alters the existing knowledge by increasing or shifting the individual's knowledge state, thereby opening new possibilities to act(Choo,1998; Kid 1994) .

5.0 ADDING AN IS/IT PERSPECTIVE

When analyzing the data / information / knowledge relationship discussed above from an IS/IT perspective, it is obvious that computers are very good at handling and processing data. The transformation of data management into information management also went rather smoothly since computers lend themselves well also to information systems. However, when we now try to cross the border and go into knowledge management things become more complicated. Whereas most people agree that data and information may exist outside humans, supporters of the community view of knowledge would argue that knowledge can never be separated from the knower and thus never stored digitally (Galliers, 2001). Computer support for knowledge management is thus, in a sense, impossible. Those who subscribe to the commodity view of knowledge would claim that knowledge can be explicated and turned into information, which can be handled by computer.

By taking an interest in the user perspective, we acknowledge that though a document may be seen to carry its own information representation, the user wraps this content in an interpretative

envelope, thereby giving the information a subjective meaning. It is argued that this combination of content and interpretation is what the user finds valuable (Choo,1998). The value of any given piece of information does thus reside in the relationship between the information and the user's knowledge. On its own, the information is useless. Consequently, the same objective information may result in different subjective meanings and values. An IS researcher with a user perspective would thus not only examine the information itself but also the user's cognitive and psychological needs and preferences. This means that design of KM-systems must be based on an understanding not only of information architecture and structure, but also of the situation where the user develops the information need, and analysis of the usage of the same information once it has been obtained and interpreted by the user.

Different aspects of knowledge

The division of philosophy that investigates the origin and nature of knowledge is called epistemology, and its objective is to establish the foundations upon which human knowledge rests. By examining and justifying different aspects of knowledge and make explicit the relationships and interactions between them, we can develop knowledge systems or schemata capable of answering to questions about the outcome of such interactions. Nonaka distinguishes between tacit and explicit knowledge (Nonaka 1994); Boisot advocates a typology consisting of proprietary, public, personal, and commonsense knowledge (Boisot,1995); Tsoukas acknowledges that the dichotomy between tacit and explicit knowledge and the taxonomies derived from this duality by several authors have advanced our understanding of organizational knowledge by showing its multifaceted nature (Tsoukas,1996). However, such typologies also limit our understanding by the inherent formalism that accompanies them. Building on Pepper, Tsoukas observes that t]his conceptual categories along which the phenomena are classified must be assumed to be discrete, separate, and stable. The KM community seems to think that the topic has been exhausted and that it is time to move on. However, giving up the distinction between tacit and explicit knowledge is maybe not the best option, especially so since most analytic work on KM has been organizational theory informed research and not IT related studies. The point made here

is that some things in organizations are tacitly expressed, but therefore not outside the reach of IT support (Stenmark, 2001).

7.0 KNOWLEDGE AS A TACIT BACKGROUND

In Polanyi's understanding of tacit knowledge, it is related both to the society in with we act and to our personal interests and commitments (Polanyi,1958). The cultural inheritance we carry is transferred from generation to generation through a social interplay that both utilizes and transcends language. Via socio-semiotic cues and verbal manifestations, we learn not only from the individuals we interact with directly, but also from generations before them. Although experiences cannot be accumulated in a strict sense, our language enables us to be part of a process where individuals and tradition interact. Individuals and tradition shape each other. Without being aware of or able to express the knowledge that is tacitly embedded in our tradition and culture, we use it as an unarticulated background against which we distinguish the particulars to which we currently attend.

Therefore, although the statement "mass equals energy" is not difficult to say, it does not imply that it is easy to understand, since there is no knowledge in the words *per se*. There is a difference between the description and the object being described. When one says, "I cannot describe how to do it", one often means that one cannot describe it sufficiently for someone else to fully understand it or be able to do it, since understanding requires familiarity with both the concepts themselves and the context to which they normally belong. Hence, knowledge is always tacit. The question, then, is what the phrase "explicit knowledge" is supposed to mean.

8.0 WHAT IS EXPLICIT KNOWLEDGE?

Is there any explicit knowledge? If so, what is the difference between explicit knowledge and information? These seem to be important questions and fundamental to our understanding of knowledge management from an IS/IT perspective. It is therefore surprising to see that they remain unanswered. Choo [suggests that explicit knowledge is knowledge that is made

manifest through language, symbols, objects, and artifacts. Explicit knowledge can further be object based, i.e., found as patents, software code, databases, technical drawings and blueprints, chemical and mathematical formulas, business plans, and statistical reports, or rule based, i.e., expressed as rules, routines, and procedures. Organizations tend to depend primarily on this sort of explicit and articulated knowledge, written down in memos and illustrated with graphs and used in decision-making processes, or institutionalized as operating procedures, Choo observes. Blackler, elaborating on the categories defined by Collins describes various forms of explicit knowledge. One is referred to as embedded knowledge, i.e. knowledge that resides in systemic routines such as organizational procedures, rules, and regulations (Blackler, 1995; Collins, 1993). Another form is encoded knowledge, which contains anything that uses signs and symbols to convey meaning.

All the examples of explicit knowledge given above are such that they easily can be disseminated within and across organizational borders. However, Choo admits that it does not follow that the receiving party immediately can comprehend and correctly value the knowledge due to different language, different level of maturity, or lack of required capabilities. How, then, can it be knowledge? Tradition, profession, and organizational belonging all carry their own assumptions, and the more overlapping these tacit assumptions and experiences – i.e. the personal knowledge – are, the better from a knowledge sharing perspective. If all three realms overlap, the likelihood that two persons (e.g., two North American software developers working for Microsoft) will be able to understand each other increases, and the discrepancy between the information provider's intended meaning and the recipient's interpretation will be small.

Information therefore requires knowledge both to be created and to be understood. Although information and knowledge are related, the information *per se* contains no knowledge. Alavi and Leidner posit that "information is converted to knowledge once it is processed in the mind of individuals and knowledge becomes information once it is articulated". The fact that routines, procedures, rules, manuals, books, blueprints, and all the other examples given above are useful does not make it knowledge. They all need

knowledge to be decoded and are therefore not knowledge but information, albeit interwoven with the knowledge required to create it. Knowledge, which remains tacit, is also needed to interpret the information. Although some argue that "knowledge" may be embedded in a text (e.g., a balance sheet where columns and totals have predefined meanings), the reader cannot appreciate it without bringing the required personal knowledge. Figure 2 illustrates the separation between knowledge and information, between the tacit and the articulated. Knowledge is understood as the tacit part of our traditions and experiences while information is the small part we are able to articulate.

9.0 KNOWLEDGE IN ACTION

When Schön elaborates on the relationship between the tacitly implied and the reflected, he admits that we often cannot say what we know (Scon, 1983). When we try, we end up with descriptions that are obviously inappropriate, and there must always be such a gap between the description and the reality to which it refers.
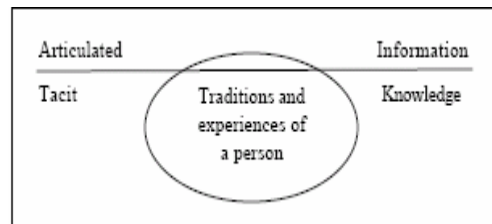

Figure 2. Our tacit knowledge can be articulated into information if made focal

A practitioner's tacit knowledge is always richer in information than any description of it, and her knowledge is implicitly found in the patterns of his actions. According to Schön, our knowledge is in our actions. Although actions in themselves are rather ephemeral in character, they often leave a tangible result, such as when building a house, making a sculpture, or imp lamenting a software system. There are also actions that do not result in new artifacts but yet change the state of things, such as driving a car from A to B, and actions that are totally ephemeral, such as the playing of an instrument. Regardless of which, actions are the only way through which

knowledge can manifest itself. This does not mean, however, that knowledge *must* result in action in order to exist. The ability to take action is sufficient, but as long as the knowledge remains inactive, it is of no organizational value.

Schön [26] claims that new understanding comes from reflection. Reflection can occur in action, but this requires the practitioner to mentally "step back" while observing one's own actions. Such reflection, however, can only take place when the practitioner is not fully preoccupied by the action itself. Reflection in action thus requires a certain level of experience that enables the practitioner to shift attention from doing the action to how the action is done. Reflection can benefit greatly from being done in dialogue, either with colleagues within a community of practice or with one self, but dialogue means articulating and making tacit understanding explicit. Reflection in dialogue with others thus requires an arena that allows a multitude of formats and interactions. This is best achieved in face-to-face situation but when physical meetings are impossible or impractical, virtual meetings on an intranet may provide a viable substitute.

10.0 INTRANETS IN KM WORK

Though an intranet can be conceived as many things, the prevailing image is that of an information silo or a repository of unstructured information. This illustrates the often-used information-centric perspective of intranets. As argued above, for KM systems to be successful they must include users and provide mechanisms for these users to locate and interact with each other. One important objective for an intranet would be to provide a context where dialogue, reflection, and perspective making could occur. Nonaka and Konno use the Japanese word *ba* to describe a shared space of physical, virtual, and/or mental nature, which could be seen as an example of such an environment (Nonaka and Konno, 1998). However, Nonaka and Konno primarily see IS/IT as a facilitator of the *Cyber ba*, i.e. an environment for supporting the combinational phase of knowledge creation where old explicit knowledge is mixed and merged to form new explicit knowledge. Though such support would facilitate the access to and the interaction with information, the remaining knowledge creation phases that deal also with tacit knowledge, i.e., humans, are not covered. One suggestion is to view the intranet as a shared

information space for content, communication, and collaboration . The merit of such a model is that it acknowledges that the information-centric view of the intranet is not sufficient. However, the distinction between communication and collaboration has been criticized by the CSCW community, where it has been convincingly argued that though there is a clear pragmatic difference between the two, the distinction is useless from a theoretical/analytical perspective (Carstensen, 1996; Sorensen 1996). This is illustrated in figure 3.
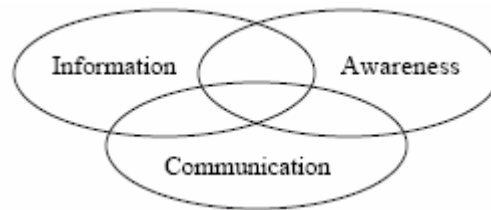

Figure 3. A multi-perspective view of the intranet

Based on this critique, we instead suggest a model where the intranet as a KM environment is seen from three different perspectives; the information perspective, the awareness perspective, and the communication

The *information perspective* is the most obvious view of the intranet, since information provision is a fundamental part of the infrastructure. Seen from this perspective the intranet gives the organizational members access to both structured and unstructured information in form of databases and documents. Access to rich and diverse sets of information is important for organizational knowledge creation since it provides rich stimuli and requisite variety. The intranet thus affects the interaction between information and knowledge in today's organizations by increasing the consumer's access to information and the opportunities for producers to reach a larger audience. To merely read the text is not enough, though. The reader must also reflect upon her assumptions, her actions, her experiences, and what consequences changing the rules will have on her future actions. Reflection therefore enables us to learn how to learn. Information plays an important role as a catalyst for reflection and an information perspective on the intranet is thus highly relevant for work that requires knowledge. On top of the infrastructure, applications must be built to complement the information perspective by

providing awareness and facilitating communication.

The *awareness perspective* suggests that not only explicit information links but ales o tacitly expressed connections should be exploited to hook up organizational members with information and people they might otherwise have missed. The large amount of information available can result in information overload, and to avoid such a situation and maintain the awareness perspective, tools to assist the organizational member by prompting when new and relevant information is added must be developed. By making users aware of peers who not only share an official job description but also have accessed the same information or authored similar documents, the networks of practice discussed earlier can be established. Such a network is a prerequisite for community building, and increases the likelihood for successful communication and collaboration.

The *communication perspective*, finally, enables the organizational members to collectively interpret the available information by supporting various forms of channels for conversations and negotiations. The intranet communication perspective promotes reflection by making salient different interpretations and viewpoints. By offering workflows and co-coordinating routines as well as support for more informal collaboration such as shared whiteboards and project areas, the intranet provides means for organizational members to work together. When engaged in collaborative work with peers that share your objectives and understand your vocabulary, the common context necessary for knowledge sharing exists. From a communication perspective, we can act upon our new understanding, thereby transforming our knowledge to organizational benefit. A major objective for the intranet must therefore be to enable people to actively work together based on the information available to them, and facilitate the documentation of their experiences. The intranet would thereby leverage the knowledge of the organizational members. The communication perspective must not be isolated from the information and the awareness perspectives. Only as a holistic whole are the potentials for successful knowledge management fully utilized.

11. CONCLUSIONS

When trying to manage organizational knowledge various types of IT-based systems have been devised, seemingly without much concern for the nature of knowledge or how knowledge is different from information. In this argumentative paper, we have examined a broad range of relevant literature and pointed to the differences in perspective that exist. We have looked into the relationship between information and knowledge and presented examples from the literature and from our own understanding. Furthermore, we have tried to position IT in relation to this discussion and in particular argued for a multi-perspective view of the intranet.

Based on Polanyi, we claim that knowledge is based on personal experiences and cultural inheritance and fundamentally tacit. We use our knowledge to perform actions such as creating information. Although the knowledge required to create the information is interwoven with the information, the reader must still have knowledge similar to that of the creator to be able to interpret the information. The more overlapping the cultural background is between the two, the easier the information is understood. Information is thus a vehicle for reflection that may, by informing the reader, expand or relocate his or her knowledge state. Information and knowledge are different but they affect one another.

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