Intranet-supported Knowledge Creation: Factors and Technology for Organisational Creativity

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Abstract

In today's highly dynamic business environment, organisational 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 it given that we understand what affects it. In the first argumentative part of this paper, the author criticises the demand for organisational convergence often found in management literature and instead suggests seven other enabling factors of organisational creativity. Information technology's role in knowledge management-related activities have also been debated. While the technocrats often promote IT as the solution to virtually every KM-related problem, others claim that KM is fundamentally a people-related activity and warn of the IT-bias in today's KM approaches. In particular, when it comes to the role of corporate intranets in KM efforts, many contradictory views have been reported. The second part of this paper identifies the characteristics of the intranet and relates these to the seven enabling factors for creativity. The objective is to find when and how intranets can stimulate creativity, and the conclusion is that intranets are most likely to contribute by providing a variety of information in dynamic and "unmanaged" environments. The organisational implications of these theoretical findings are that we need both an updated management attitude and more sophisticated technology.

1. INTRODUCTION

Organisations' ability to create new knowledge is regarded to be the primary source of competitive advantage already today and increasingly so in the future. The works of scholars from a multitude of disciplines have suggested that access to a rich variety of information stimulates creativity and knowledge creation (cf. Bawden, 1986; Kanter, 1988; Nonaka & Takeuchi, 1995). However, in contrast to most organisations desire to structure and control their information environment, new knowledge seems to emerge from and thrive on the serendipitous mixing that occurs in more unstructured settings. The Internet is an enormous source of bottom-up provided, cross-disciplinary, and mostly uncontrolled information. When organisations adopt Intranet technology to set up in-house versions of the web – intranets – they have what seems to be a good foundation for knowledge creation. Intranets were also quickly hailed as the ultimate solution to many organisational issues, including anything from

dissemination of management vision to integration of seemingly incompatible computer systems (Scott, 1998). Although intranets have enthusiastically been implemented in fields as diverse as medicine, law, manufacturing, and education, the reports concerning actual business value have been largely anecdotal (Ryan & Martin, 1997). Instead, we receive reports of poor utilisation and information feudalism that block information and knowledge sharing (cf. Newell *et al*., 1999).

Knowledge management (KM) has received enormous attention from academia and industry alike in the last few years. Despite (or perhaps due to) this broad interest, no clear definition of KM has emerged. Instead, the literature is cluttered with different, albeit similar, interpretations of KM. Having reviewed the available literature, Alavi and Leidner (2001) conclude that KM is largely regarded as an organisational process consisting of a number of various activities, but both the number and the labels of these activities differ between authors. However, a minimum of four basic KM processes can be identified: knowledge creation, knowledge storing/retrieving, knowledge transferring, and knowledge use. In this paper we shall focus on knowledge creation only.

Also regarding the relationship between KM and information technology such as intranets, scholars have come to contradictory conclusions. On the one hand, representatives of the information system (IS) community claims that the perhaps most far-reaching impact on the organisation an intranet can have is on the organisational knowledge creation process (cf. Scott, 1998). On the other hand, from the field of organisation science are heard voices suggesting that intranets are encouraging fission instead of integration and is in fact reinforcing existing barriers to knowledge sharing (Newell *et al*., 1999). These seemingly conflicting views on the possibilities of the intranets call for a further investigation of the relationship between intranets and aspects of KM such as knowledge creation. This paper therefore describes an attempt to develop a framework for organisational knowledge creation and then use this theoretical base to examine the characteristics of an intranet in order to understand *when* and *how* intranet technology can contribute to organisational knowledge creation.

The structure of this paper is as follows. In the next section, the author shall argue that the seemingly popular assumption that organisational intention is a necessary condition for knowledge creation is erroneous. Based on the literature, section three then outlines seven enabling conditions for knowledge creation in an organisational context, while section four identifies the characteristics of the intranet. Using this as a theoretical backdrop, the section five compares and evaluates the enabling factors in regard to intranets and in section six we discuss the organisational implications of these relationships. The conclusions are summarised in section seven.

2. ORGANISATIONAL INTENTION IN RELATION TO CREATIVITY

Several authors have claimed intention (Nonaka & Takeuchi, 1995), alignment (Robinson & Stern, 1998), or shared vision (Senge, 1990) to be of vital importance for corporate knowledge creation and creativity. For example, Nonaka and Takeuchi claim that an organisational intention is needed in order to create knowledge (1995, p.74-75). If the intention of the organisation is not conceptualised and collectively communicated to the employees as a vision, the authors claim the individuals would not be able to evaluate or justify the result of a creative act. By referring to Michael Polanyi, Nonaka and Takeuchi acknowledge that human commitment underlies every knowledge-creating activity, but they incorrectly assume that this commitment must be collective and in line with corporate strategy. Commitment is indeed important, but, as will be argued in the following sections,

the propelling force for creativity is instead the intrinsic motivation of empowered individuals.

Robinson and Stern take a stance similar to Nonaka and Takeuchi when arguing that "[c]orporate creativity is more sensitive to alignment than any other aspect of business or management. A company has to be strongly aligned in order to be consistently creative" (1998, p.104). These two authors posit that a company is more likely to be able to reach its goal if all employees are pulling in the same direction, and they define alignment in a corporate setting to mean the degree to which the actions of the employees support the organisational goals. However, there seems to be an obvious risk that a potentially profitable business opportunity is missed because of a strongly aligned employee failing to pursuit a creative thought simply because it appeared to fall outside the goals stated by management. Robinson and Stern themselves acknowledge this dilemma by admitting that "alignment is a double-edged sword; at the same time that it promotes an organization's creativity, it also limits it" (1998, p. 103). They further give actual examples of companies successfully profiting from creative acts totally outside of the organisations' normal business frames; Japan Railways' multi-million business of selling mineral water (1998, pp. 1-2), and Searle & Co.'s serendipitous discovery of a new sweetener – aspartame (1998, pp. 33-38).

The idea of the shared vision is a vital factor also according to Senge: "Shared vision is vital […]. While adaptive learning is possible without vision, generative learning occurs only when people are striving to accomplish something that matters deeply to them. In fact, the whole idea of generative learning […] will seem abstract and meaningless until people become excited about some vision they truly want to accomplish" (1990, p. 206). Here, too, the author seems to confuse personal motivation with company vision. What Senge suggests is that in order to be creative a person needs to have a vision. However, if a vision at all is needed, it does not have to be a company provided vision. Research suggests, and this will be articulated in more detail later in this article, that what people become "excited" about is the opportunity to work with things in which they are interested.

In addition to the two examples from Japan Railways and Searle & Co. given above, history is full of successful creative acts that have come about without the creator having first envisioned them. All in all, the above authors fail to show support for their claims, which instead seem to be remains from an epoch gone. It may have been so in the industrial era that strong alignment was necessary and desired due to large investments in machinery and facilities and relatively stabile or only slowly evolving business situations. In contrast, in today's rapidly changing world of business, companies cannot afford to be strongly aligned. Being able to act rapidly, to seize new business opportunities as they emerge, and to create new knowledge for a previously unanticipated need are now far more important than to stay focused and march in the same direction. Alignment can thus not be an enabling factor for creativity. Let us instead look at some other candidates.

3. KEY FACTORS FOR KNOWLEDGE CREATION

One very distinctive aspect of true creativity is that it tends to show up where it is least expected. Obviously, you may have creative meetings or brainstorming sessions where you sit down and produce innovative decisions or new solutions to known problems, but these are exploitations of familiar concepts – you start with a given problem. Even when given "creativity-boosting" methods such as brainstorming, lateral thinking, and guided visualisation, it is (close to) impossible to come up with a truly new and creative idea out of sheer will-power. Unpredictable as it may be, creativity can still be promoted (Stenmark, 2000). If you in a library start reading book after book looking for a particular word, you

cannot predict when and where it will show up, but you know with certainty that you will eventually find it. Further, you also know that by selecting what shelf to start from, you may increase the probability for the sought word to turn up. Similarly, managing creativity is about raising the probability for creative acts to happen by stimulating the factors that works in favour of creativity (Robinson & Stern, 1998). We are now about to discuss seven of those factors found in the literature.

3.1 No-preconceptions principle

Creativity incorporates a large element of surprise and most creative acts are often totally unplanned. The opportunity to innovate and the source of innovation are both uncertain and unpredictable (Kanter, 1988). It is therefore impossible to known in advance who will be involved in a creative act, what the act will be, when it will take place, or how it will occur. These principles are fundamental to creativity and not being able to appreciate it may result in unnecessary limitations to corporate creativity. In their report on corporate creativity, Robinson and Stern (1998) refer to this condition as the ”no-preconceptions principle”, and they present numerous examples of how violation of this principle have hampered corporate creativity; e.g. by appointing teams of “creative” workers while excluding others equally likely to be creative (predicting who); by trying to control and steer the result of creativity (predicting what), or; by establishing quotas for how many creative ideas to produce per month (predicting when).

3.2 Autonomy

Planned actions can only take an organisation in directions already anticipated. To reach the unexpected, the company must go beyond what is scheduled and put its trust in the unplanned actions that are often the results of user initiatives. Frontline-employees are confronted with new customer requirements and notice new business opportunities much earlier than does management. By the time an emerging trend has reached top executive level, been converted to official corporate strategy, and communicated back to the employees, the opportunity may be long gone. Instead, seize the opportunity by empowering the frontline-employees to act *autonomously* (Nonaka & Takeuchi, 1995). Every unanticipated activity begins as an unofficial task (Robinson & Stern, 1998), and very often, these unanticipated and unofficial activities are also user initiated. User interests rather than official job descriptions is what triggers such activities (Stenmark, 2001a).

However, corporate settings with deadlines and resource constrains do seldom allow for much spontaneous self-initiated activities. The lean organisations of today do not allow the *redundancy* that is so vital to knowledge creation (Nonaka & Takeuchi, 1995). Actions are therefore required on the companies’ behalf to set free the desire that already exists within most people to initiate creative acts, by planning for redundancy and actively supporting and encouraging user-initiated activities (Stenmark, 2000). Companies should therefore allow and encourage their employees to act as autonomously as possible and support as much unofficial skunk work as it can (Nonaka & Takeuchi, 1995). To be truly effective, however, a system that promotes such entrepreneurship must not be restricted to any particular group, but reach everyone in the organisation, since, again, it cannot be determined in beforehand who will be creative.

3.3 Serendipity

Many commentators have stressed the importance of serendipity as a creative-enhancing factor. However, most authors over-emphasise the “accident” part and overlook the equally important role of “sagacity”, i.e., the acute mental discernment that comes from being well prepared and having an aptitude for remembering details. The original, richer meaning of the

word is more helpful when it comes to understand creativity (Robinson & Stern, 1998, pp. 78-83). An accident can only result in a useful invention if someone is able to recognise its potential. A particularly important point in regard to chance is thus the preparedness that comes from being informed. The more information that has been assimilated the more likely it is that a happy accident will be utilised. However, the information does not have to be restricted to facts closely related to the problem or task at hand. On the contrary, information apparently unrelated to the current problem seems to be particularly important for major conceptual breakthroughs (Bawden, 1986).

How, then, can companies stimulate and promote serendipity? Three approaches have been suggested (Robinson & Stern, 1998): Firstly, increase the frequency with which potentially fortunate accidents can happen. Companies should encourage tinkering, experiments and empirical research work not as separate events but blended into the ordinary work. This can be done in large scale by creating a "creative chaos" (Nonaka & Takeuchi, 1995). To intentionally upset and question the prevailing routines and premises upon which the organisation rests, can, when done skilfully and providing enough time for reflection, spark creativity.

Secondly, increase the awareness of the accidents that do happen. Serendipitous events happen more often than most people realise. By paying attention to the unexpected and carefully examine exceptions to accepted schemes and inconsistencies within established theories we may detect fortunate accidents. A related track is the consideration of old ideas and concepts that were introduced in the past but archived due to lacking technology or disadvantageous political or financial climate. It is thus not sufficient for new discoveries to be useful – they must also be compatible with the prevailing political and philosophical assumptions (Douglas, 1986).

Thirdly, and finally, the domain of sagacity must be increased. By actively creating redundancy, i.e. an unused potential for change, the organisation may move beyond the predetermined mindset that comes from only pursuing what is needed for the current task. This can be achieved by having the employees take classes or attend conferences not related to their work or encouraging job rotation across functions. The further apart these functions are (e.g. R&D and Marketing), the more redundancy is built (Nonaka & Takeuchi, 1995).

3.4 Diverse stimuli

It is impossible to tell in advance what stimuli will spark an innovative idea since what stimulates one person may not even be noticeable to another. Trying to feed stimuli to the employees will therefore only have a limited effect on creativity and can in fact violate the no-preconceptions principle. Though taking off-target courses may increase serendipity, it does not necessarily provide the stimulus needed to set of creativity. The chances that an employee should get an innovative idea during a, say, five-day course are obviously much smaller than the chance that the ideas comes during some of the other 360 days of the year. Instead of sending employees away on creativity-enhancing activities, the organisation should help its members to get stimuli while performing their ordinary work, and facilitate the sharing of such stimuli. This may be achieved by regularly hosting cross-functional meetings, encouraging contacts with customers and vendors, welcoming outside visitors, and supporting all sorts of other activities that exposes the employees to new input.

Cross-disciplinary contacts have been emphasised by several authors as being of great importance and it is remarkably how many scientists, who have made important contributions, have had wide and diversified interests, or have changed from one field or subject to another (Bawden, 1986). Kanter (1988) have coined the expression "kaleidoscopic thinking" to describe the cross-fertilising process behind creativity: a kaleidoscope allows

people to shake the fragmented reality into new patterns. These patters are however not static – if the perspective is changed, the same fragments form new patterns. A long known finding is that it seems that the most creative persons are those who spend more time with people who do not share their values and beliefs (Petz & Andrews, 1966). It is clear that the cross-disciplinary aspect of information and knowledge sharing must be considered when trying to support creativity. However, facilitating cross-boundary communication is a big challenge for several reasons, where the use of field-specific jargon is but one (Bawden, 1986; von Krogh *et al*., 2000).

3.5 Rich information provision

Although information may be seen as yet a stimulus among many others, it has a more profound importance, as indicated when discussing serendipity above. The relationship between information and knowledge has been a recurring theme in the KM literature but often discussed in a superficial way. Information and knowledge are interrelated in more complicated ways than the discussion in many IS related forums imply (Stenmark, 2002b; 2002c). Since surprisingly little attention has been paid to the particular aspects of information provision for invention and knowledge creation, the role of information and information systems in creativity work deserves to be spelled out. Bawden (1986) has identified the most appropriate means of organising and retrieving information for creativity and knowledge creation, and his use of the verb browsing is interesting. Browsing means the unstructured reading of various sources of information in order to receive inspiration or accidentally run into new pieces of information, and may be seen as either purposive (in the meaning that one is deliberately seeking information in a specific topic), capricious (in the meaning that one searches randomly without having a particular goal), or exploratory (indicating that one is literally searching for inspiration) (Bawden, 1986). The concept of browsing, as discussed here, relates well with the earlier discussion of serendipity, and is almost by definition supported by the hyper-link architecture of the web.

There is also what may be labelled "false knowledge", which includes outdated knowledge or knowledge that used to be valid but for various reasons have become obsolete without anyone noticing. Particularly dangerous is the it-is-known-to-be-impossible kind, which by numerous commentators is seen as having prevented or postponed otherwise successful experiments and important breakthroughs (Bawden, 1986). However, even false knowledge may be useful if handled with care. When used as a spark for imaginative thinking it does not matter whether the information or knowledge is true or false. It is the outcome of the process that should be evaluated – not the input. In order to stimulate a discussion it is a very good idea to start from an unorthodox point of view, and speculative ideas, though not otherwise always welcomed, might then be useful.

3.6 Internal communication

Although the importance of outside contacts as sources of diverse stimuli and rich information provision has been stressed earlier, internal communications is also vital to organisational creativity. As stated several times above, creative acts are unplanned and often happen as the result of the bringing together of actors or component from unexpected places. When these actors all belong to the same organisation, and thus can be expected to share certain objectives, there is a greater incentive to co-operate.

Traditionally, corporate communication channels were implemented to promote vertical information sharing only. However, if only such official channels are used, people in different part of the organisation will never interact. A company's creative potential increases rapidly with size, since more competence and more stimuli are likely to be present. The flip side is that larger organisations automatically mean longer distances between people, and

there is an obvious risk that the potentials will never be realised without efficient ways for the members to communicate across department boundaries (Robinson & Stern, 1998).

Fortunately, unofficial means of communication usually exist and companies need only more actively support activities and places where employees that normally do not work together can meet informally and share stimuli and ideas. By being aware of ongoing activities the employees gain sufficient understanding of the capacity of the organisation and are thus able to tap into the organisation's resources. However, for such unanticipated co-operation to work, the company must adopt a policy that prioritises internal information and knowledge sharing. All employees, including managers, must understand the importance of helping colleagues asking for advice (von Krogh, 1998), and all employees should have equal access to corporate information (Nonaka & Takeuchi, 1995).

3.7 Motivation

It appears that when people are primarily motivated by their own interest in the work and the enjoyment of that activity, they are more creative than they are when primarily driven by some goal imposed on them by others. The use of extrinsic motivation such as rewards or bonuses tend to cause a focus on the reward rather than on the task at hand, and winning the reward becomes more important than finding the most creative solution (Stenmark, 2000). Such suggestions are consistent with the findings that helped Amabile form what would become the cornerstone of the social psychology of creativity – the intrinsic motivation hypothesis (Amabile, 1983). Her latter book, supported by overwhelming empirical evidence, upgraded this initial hypothesis to a general law of human behaviour – the intrinsic motivation principle (Amabile *et al*., 1996). Robinson and Stern (1998) too stress the importance of intrinsic motivation and point to the strong correlation between use of intrinsic motivation and high participation in the improvement processes.

Self-initiated activities are powerful because they are driven primarily by intrinsic motivation. When employees are allowed to, and in fact encouraged to, pick and pursuit their own projects, they are driven by their personal interests. Research in a corporate setting has shown that professional interests rather than espoused theory is what motivates people (Stenmark, 2001a). It is recognised that creativity often requires extra-ordinary dedication and commitment, and that most employees would willingly do far more than the company could possibly ask of them if only they were allowed to work with things in which they were really interested. A management strategy to promote creativity would be to present and motivate the *direction* for work but leave the individuals to conduct the work as they see fit. Management should further match people to projects according to their interests or where their competence is challenged and developed.

Rewarding creative work must be done skilfully since it presents a delicate balance between intrinsic and extrinsic motivation. The rewards should be used to recognise the competence or the work ability of the group or individual, and the reward should be used to motivate further work and not act as a bribe. Encouraging work-focused feedback (as opposed to person-focused feedback) and discouraging excessive initial critique of new ideas foster a positive attitude towards creativity (Stenmark, 2000). By demonstrating that innovations and creativity are valued by communicating the potential of the work and accomplishments that have been made, intrinsically motivated user initiatives could be further propelled.

We have so far identified and described seven enabling conditions for corporate creativity and knowledge creation. The question now is if some or all of these can be facilitated and supported by a corporate intranet. The remaining of this paper shall be concerned with this relationship.

4. CHARACTERISTICS OF AN INTRANET

The web is, as most people now probably are aware of, an internet-based distributed hypermedia system, originally developed to be ”*a pool of human knowledge, which would allow collaborators in remote sites to share their ideas…*” (Berners-Lee *et al*., 1994, p. 76). As an information systems environment, the web differs in many important aspects from the systems that reigned prior to 1990 (Lyytinen *et al*., 1998; Damsgaard & Scheepers, 1999). In other words, and from a technological point of view, the web has three unique features that distinguish it from other IS/IT environments, and there is a fourth aspect in which the intranet differs from the Internet. This gives the intranet four distinctive characteristics, which are presented below.

4.1 Hyperlinked

The intranet is hyperlinked. The web was initially invented to allow scientists and researchers to communicate, collaborate, and exchange information in a transparent way. Much of this transparency is due to the hyperlink concept, which is partly responsible for the success of the web by providing easy access to documents (Baecker, 1993). The ability to create hyperlinks to other resources is perhaps the most significant feature of the web and something that allows it to transcend both printed media and other computer paradigms. The hyperlink feature provides the users with extremely easy access to a huge amount of information, available at their fingertips. Any object anywhere in the web may be easily addressed and thus likewise easily accessed. This "superconnectivity" aspect enables single individuals as well as large organisations to distribute information equally easy (Turoff & Hiltz, 1998). The web is by orders of magnitude the media with the highest ratio of production-access to audience-access, and nowhere else can so many people reach so many other people with such ease.

Unlike email, TV, or radio, the web does not push information to the passively receiving users. Instead, the web is pull-oriented and entirely user-driven (Nonaka & Konno, 1998; Damsgaard & Scheepers, 1999). Using the hyperlink feature, the user requests information from the server; the server never sends information pro-actively. The user may visit sites and pages in any desired order, and interact with scripts and forms as he or she chooses. The hyperlinks also allow individual users to create their own collections of useful resources and reorganise existing information by providing individual sets of links and texts.

4.2 Networked

The intranet is networked. The web is obviously highly networked in the sense that it is distributed both physically and in authority. The client/server architecture and the Uniform Resource Locator (URL) allow information to be placed anywhere in the network, making the physical whereabouts of data transparent to the user. The web, being distributed and not relying on a single focal point, is thus always available though individual servers may be temporarily off-line. There is further no central management or predefined hierarchy structure, which means that anyone can publish anything. Web users are therefore not restricted to be simply information consumers, but may almost as easily be information providers, publishing whatever they have to share.

4.3 Open

The intranet is open. The web is a bottom-up technology based entirely on open and publicly accessible standards. The access mechanism of the HTTP protocol allows even proprietary formats to be used without having to standardise. A web page does thus not restrict either the type or the amount of information presented, which helps guarantee information richness. The openness also enables other to develop add-ons, which in turn guarantees adaptiveness

and access to formats and types not yet existing.

The Internet technology is open also in the sense that it is multi-purpose, unlike many other IS solutions such as e.g. payroll systems (Damsgaard & Scheepers, 1999). To function as a multi-purpose tool the web is not restricted to text only, but is instead very media-rich, allowing a variety of forms and formats including images as well as video and audio. Unlike most other client/server models, the web does not require the installation of any proprietary products or protocols. A standard web browser and a TCP/IP connection are all that are needed. Information may then be displayed independently of network or server topology. The open standards, the in-place world-wide net, and the availability of free-to-use software for both servers and clients paired with the relatively low training requirements also makes a web server inexpensive to set up and an intranet a low-cost implementation (Scott, 1998).

4.4 Organisationally bounded

The intranet is organisationally bounded. In a strict technical sense, an intranet is a subset of the Internet, and therefore shares all of the above characteristics. In addition, intranets contain only users from within the own organisation or company. This is an important factor from a KM perspective since it enables the organisation to more freely share information not intended for competitors. Intranet users belonging to the same organisation can further be presumed to share certain objectives and subscribe to the same set of values and beliefs. Intranet users differ in these aspects from Internet citizens, and the intranet can be seen as providing a minimum level of coherence that is absent on the web as a whole.

5. INTRANETS AND ORGANISATIONAL KNOWLEDGE CREATION

We shall now try to relate organisational knowledge creation and creativity as discussed above to the specific characteristics of an intranet to see when and how an intranet may facilitate creativity. Unlike the framework suggested by Scott (1998), who uses Nonaka's SECI model exclusively (e.g., Nonaka & Takeuchi, 1995), the schema presented here has a broader base, and by paying attention also to the characteristics of an intranet, it adds further depth to our understanding when and how intranets can be utilised. Table 1 illustrates where the particular characteristics of an intranet do and do not affect the enabling conditions. We shall now discuss what aspects of organisational creativity an intranet is likely to be able to support, what components are not or only marginally affected, and what organisational implications can be drawn from this mapping.

Table 1: Mapping enabling conditions and web characteristics

	Non-preconception principle	Autonomy	Serendipity	Diverse stimuli	Rich information provision	Internal communication	Motivation
Hyperlinked	√		√	√	√		
Networked	√	√	√	√	√	√	
Open	√		√	√	√	√	
Org. bounded	√				√	√	

5.1 Aspects of creativity which can be supported by an intranet

From Table 1 it can be derived that the non-preconception principle and rich information provision are the aspects best matched by the characteristics of the intranet and these shall therefore be discussed first. Thereafter follows the aspects of serendipity, diverse stimuli, and internal communication.

The No-preconception principle

The no-preconception principle stipulates that it cannot be decided in beforehand who will be involved in a creative act, what the act will be, when it will take place, or how it will occur. It is therefore imperative that innovation and knowledge creation is not limited to a certain group of people, to a specific geographical location, or to a scheduled occasion. The uncertainty aspect of creativity that the no-preconceptions principle expresses, further suggests that static organisational and pre-defined information-related groupings can hinder creativity. While traditional information systems often relied on well-defined user domains and strictly enforced access control, the intranet architecture signals other values, and innovative organisations use intranets to quickly form groups based on common interests rather than on formal structures (Curry & Stancich, 2000).

Web technology affords a bottom-up approach to information dissemination and does not restrict publication rights to management functions only. The web does thereby acknowledge that anyone in the organisation may have valuable information to share. Web-based information is not being pushed to the users in a predefined or centrally controlled manner. Instead, users interactively pull whatever information they find interesting or useful from wherever it may be published. By distributing responsibilities and not singling out any technical platform in particular, the intranet can be said to honour the no-preconceptions principle.

Intercultural and cross-disciplinary communication may be problematic, but on an organisationally bounded intranet, where perspective making (Boland & Tenkasi, 1995) has matured and the members can be expected to have a more common language, this is likely to be less of a problem. Allowing access to organisational members only, the corporate intranet enables otherwise sensitive information to be openly shared.

Rich information provision

Web technology provides at-your-fingertips accessibility to a variety of targeted as well as peripheral and speculative information, and the web can therefore be said to support rich information provision. The networked aspect makes documents and reports from departments in remote geographical locations as easy to access as the ones from the group next to you, and people who may never meet in person due to physical distance may meet in virtual “team-rooms” and share thoughts and ideas electronically. Again, the openness caters for a variety of information formats, ranging from static HTML homepages and PDF files, via chat functions to dynamically created news feeds and live broadcasts. At Olivetti, they see the intranet as an excellent tool to ensure that researchers have access to the largest possible amount or information (Scott, 1998).

Suggestions and ideas not currently supported neither by experimental evidence nor by theoretical frameworks are usually difficult to publish and disseminate using formal communication channels, but the web’s bottom-up design allows it to lend itself to all sorts of horizontal and informal interaction. In such an environment hypothesis may be published for discussion rather than as proven facts. Web-based forum dedicated to open exposure of embryo ideas and tentative solutions are examples of such initiative (Stenmark, 2001b; 2002a).

The fact that the intranet is separated from the Internet makes it possible to publish and share information not intended for readers external to the organisation. While protecting such internal information, the intranet still offers the organisational members access to Internet information, thus adding to the information richness.

Internal communication

Bottom-up IT environments such as the web help blurring the boundaries between formal and informal communication by offering support for lateral or horizontal information systems such as email and teleconferencing (Bawden, 1986). An intranet could therefore be an important tool for within-company communication, enabling peer-to-peer information sharing. The open architecture can further enhance within-company communication by connecting previously incompatible user communities (i.e., Mac, PC, and Unix users), thereby giving users access also to information from outside their sub-organisation. Since the web not only simplifies access to reading material but also enables decentralised information publishing at grass-root-level, any user can post information and thereby share his or her experiences. The fact that the intranet by definition is organisationally bounded and shielded from the outside world by security devices such as firewalls enables also more sensitive corporate information to be shared. For example, Ford used their intranet to link developers both in Europe, Asia, and the US for the development of the 1996 Taurus (Cortese, 1996).

Serendipity

By allowing tinkering, serendipity can be stimulated and the hyperlinked concept of the web enables the sort of casual browsing that gives the user easy access to cross-disciplinary and seemingly unrelated information that can help upset existing routines. Also the networked and open aspects of the web contribute to serendipity. The chance that an unexpected piece of information should cross your path increases on an intranet since web technology enables anyone to publish anything, and the openness of the web further enables a cross-fertilisation. This should increase awareness of exceptions and inconsistencies. The relative ease with which a potentially very large audience can be reached, attracts and encourages information providers from all kinds of fields, thereby increasing the domain of sagacity.

Diverse stimuli

Although it is impossible to tell in advance what stimuli will spark an innovative idea, it is generally recognised that more and diversified stimuli increases the chances for creative ideas. The concept of hyperlinks makes the web a pull-oriented technology, which means that it does not try to deliver stimuli based on some pre-established rule. A networked technology such as the web can span geographical borders, allowing input from different cultures to mix and add to the variety of possible stimuli. By clicking on hyperlinks, the user effortlessly receives these inputs, which due to the openness and transparency of the web, can come in a variety of media formats, including images, video, and audio, thereby providing stimuli in many different shapes.

Autonomy

For organisational members to act autonomously they must be empowered with decision making rights and encouraged to engage in entrepreneurships. Such an approach opens for unexpected information needs and joint ventures between unforeseen parties. The networked architecture of the web supports such contacts.

5.2 Aspects of creativity unaffected by intranets

From Table 1 we notice that motivation is a key factor that an organisational intranet would not actively support. Autonomy is another important aspect only marginally facilitated by

web technology. This is not so say that intranets work *against* motivation and autonomy; my interpretation instead is that the implementation of an intranet would *per se* not be enough to provide intrinsic motivation or inspire autonomous and self-initiated activities. However, people *already* being motivated and acting autonomously may obviously still benefit from an intranet, since the technology does not in any way counteract such initiatives.

Similarly, the fact that an intranet prevents users from outside the organisation to access the information has no effect on the organisational members serendipity or their access to diverse stimuli. However, if the firewall was customised to prevent the organisational members from accessing information outside the intranet, it would limit the access to information and could thus have a negative effect on creativity.

The hyperlink aspect of the web contributes to the technology transparency that has helped the web gain popularity. Although this superconnectivity is likely to have boosted communication and information dissemination in general, it does not seem fair to say that it has had a profound impact on corporate *internal* communication.

6. DISCUSSION

The two creativity-enabling conditions best matched by the specific characteristics of the intranet are the no-preconception principle and rich information provision, and the values connoted by these two factors are unpredictedness and diversity. However, theory and reality sometimes differ and the way today's intranets have been implemented and managed tells another story. While the World-Wide Web still can be categorised as a "creative chaos", the intranets have been subjected to the standardisation and control urge that shaped organisations of the industrial age. Like the machines it produces, industry is most comfortable when there is stability, order, and control (Stenmark, 2002c). This mechanistic management approach finds expression in the needs for control and measurement advocated by numerous commentators. For example, Hinrichs (1997) concludes that the ability to effectively manage the intranet is one of the most significant constrains to further development. Curry and Stancich (2000) similarly argue that intranets "must be well managed and planned, not allowed to evolve merely in an *ad hoc* manner, which can too often be the case" (p.250). Also Damsgaard and Scheepers (2000) subscribe to this belief, claiming the intranet content and use must be controlled via standardisation and formalisation, and unless procedures and routines are established and enforced the intranet will collapse. Therefore, they argue, must rationalisation and management control be the superordinate goals.

However, before advocating a certain intranet strategy it might be wise to ask the purpose of the intranet and examine the context in which it is to be implemented and used. The Tayloristic approach suggested above may be the best choice in a traditionally organised hierarchy characterised by stability, predictability, and recurring events. In such an environment, where there is less need for revolutionary innovations, bureaucracy is the most efficient approach. In contrast, in the environment where rapid change, uncertainty, and new challenges are integrated parts of the every day work, the creation of new knowledge requires a different type of intranet paired with an updated management approach. Management in an organisation with a climate open to creativity is characterised by open-mindedness, respect for diversity, understanding of employees' point of view, appreciation of ideas, encouragement of pro-activity, providing feedback, and making the objectives clear (Roffe, 1999). A decentralised and bottom-up intranet offers the organisational members to share information with a minimum of bureaucracy, and the need for consistency between sites can therefore be questioned when the content is more important than its cosmetic attributes

(Wachter & Gupta, 1997). Although voices advocating a balance between empowerment and control are heard (cf. Duane & Finnegan, 2000), the majority of the commentators speak in favour of a more strict information governance model, not recognising that excessive bureaucratic control can stifle intranet use and has been pointed out as one of the biggest impediments of intranet adoption (Bernard, 1997).

To support creativity and knowledge creation in a dynamic and inter-linked environment, companies may have to take a different approach to their intranets and abandon the traditional view more suited for stable situations. Such ideas can be seen in some companies where it turns out that letting go of control enables the intranet to fulfil many roles at once. "Our intranet doesn't need an owner", is the device by which these organisations operate, and as a result they claim that their intranets are more alive. "It's fairly chaotic, and that's good", says the director of technical communities at one large international company (Anders, 2001). However, such an approach being actively sponsored by corporate official and management is still a rare sight, and one reason for this may be that management have not been prepared for the cultural changes an unleashed intranet may initialise. Intranets tend to flatten organisations by the media's ability to ignore and by-pass traditional and hierarchical communication channels, and it may be politically correct to empower your employees by providing direct access to information, but this have some radical implications not always understood by senior executives (Duffy, 2001).

Much of what is discussed above thus requires a level of redundancy not often found in today's organisation. Serendipity, and the chances of the "happy accident" to occur or to be detected, can, as we have seen above, be increased with a technology that allows casual browsing. However, in today's anorectic organisations there is little room for undirected "surfing" – a fact that in the long run may seriously hamper creativity. As pointed out by Nonaka and Takeuchi, redundancy conflicts with the Western idea of efficiency (Nonaka & Takeuchi, 1995).

What also remains a major problem to solve, should companies adopt a more liberal information sharing policy, is the issue of information overload. This problem is often marginalised or ignored by technology evangelists who promote the use of IT in KM-related work (cf. Scott, 1998). Though redundancy of information helps creativity, it also increases the risk of being flooded with useless information (Nonaka & Takeuchi, 1995). Acknowledging the importance of new managerial attitudes towards intranet use, technology still has a role to play. In addition to opportunities for browsing, large pools of information also need more traditional information retrieval (IR) tools, however modified and improved. The personal nature of creativity must be supported by an equally personal approach to information retrieval. The power of future IR tools must be released to the end-users, who are the ones doing the creative work. Being compelled to use an intermediary, as was often the case with library systems in the eighties, creates an unnecessary comprehension gap that would affect the retrieval process negatively (Bawden, 1986).

It has since long been argued that search tools for non-IR professionals should not only be based on Boolean logic, but rather on *similarity between items* since this would support creative work by facilitating the finding of analogies and more loosely related material (Bawden, 1986). It has also been suggested that the challenge for IT developers is to design systems that allow users to engage in active networking through creative environments (Swan et al., 1999). In compliance with such suggestions, research has shown that recommender systems based on agent technology and previous user activities, are IT artefacts that can be employed to provide an increased awareness of both new information and other knowledge users (Stenmark, 2001a; 2002c). It can be speculated that the potential of such technology lies

in its ability to provide for rich information while not depending on clearly defined distribution channels.

7. CONCLUSIONS

Although intranets have been implemented in many diverse fields, solid reports of actual business value are rare. Instead, we receive reports of poor utilisation and information feudalism that block information and knowledge sharing, and scholars have come to contradictory conclusions regarding the usefulness of intranets in KM work. While organisational researchers may have an overly negative and sometimes too simplified view of information technology, their insights are useful to counter-balance the often over-enthusiastic voices heard from the technocrats in the IS/IT community.

This paper refers to an attempt to theoretically examine when and how intranets can be useful in KM work, and the contributions of this paper are two. Firstly, it presents a theoretical framework for organisational knowledge creation based on seven key factors: the no-preconceptions principle; autonomy; serendipity; diverse stimuli; rich information provision; internal communication, and finally; motivation. Secondly, it points out the characteristics of the intranet and puts these in relation to organisational creativity and knowledge creation.

It has been suggested that it cannot be decided in beforehand who will be involved in a creative act, what the act will be, when it will take place, or how it will occur. It is therefore imperative that innovation and knowledge creation is not limited to a certain group of people, to a specific geographical location, or to a scheduled occasion, and it is concluded that intranet provides an environment were such limitations are less likely to occur. The intranet's ability to effortlessly provide information of all sorts is another important characteristics that can support creativity and knowledge creation.

However, for the potentials to be fully exploited, intranets must be unleashed in the sense that management must let go of their control desire and empower the organisational members to take a more active role. In order to avoid information overload, innovative technology must be added to offload the users and enable them to navigate in and make sense of the dynamic environment we call intranets.

Hopefully, these findings will be of use for both organisational and technological studies.

8. REFERENCES

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