

The Creative Intranet: Factors for Corporate Knowledge Creation

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Abstract

Intranet tools for knowledge management are becoming increasingly popular. In this paper, it is argued that intranets are indeed particularly suitable for supporting and facilitating corporate creativity and the knowledge creation process. Building on existing literature, I explain the mechanisms involved in creativity and present a theoretical framework for future research. I finally show how the nature of an intranet facilitates matches most of the identified factors. An important factor that seems to fall outside the scope of IT is that of incentive and motivation.

Keywords: organisational knowledge creation, corporate creativity, intranet tools

1. Organisational knowledge creation

In their often-referenced work on innovation and knowledge creation, Nonaka and Takeuchi (1995) posit that organisational knowledge is created through a continuous and dynamic inter-personal interaction between tacit and explicit knowledge. Individual knowledge is organisationally amplified and elevated to higher ontological levels through a process referred to as the “knowledge spiral”. This spiral involves activities such as sharing of experiences, explicating models and metaphors, exchanging and combining explicit knowledge, and embodying by learning-by-doing (pp. 62-73). All these activities are social to their nature and performed by groups of people tied together by a shared set of practices. These communities of practice thus enable knowledge creation by sharing and cross-pollinating tacit and explicit knowledge across organisational levels (Choo 1998).

The knowledge conversions taking place in the knowledge spiral require support for many different modes of communication. Though much of it must be based on physical face-to-face interactions, it has been concluded that information technology (IT) may be used to facilitate some events, especially those that involve exchanging and combining *explicit* knowledge (Nonaka & Konno 1998). Contemporary research has however shown that a corporate intranet can be an important tool for many various sorts of Knowledge Management (KM) efforts, facilitating activities such as tacit knowledge sharing, “smart” information retrieval, community building, awareness, and large group brainstorming (Stenmark 1999a, 1999b, 2000a, 2000b, 2000c). The theoretical basis for empirically informed work such as those referred to above has however been fragmented and unclear and no coherent structure on

which to build future research has yet been presented. My intention in this article is to suggest such a structure.

2. Research approach

In this argumentative paper, I base my discussion mainly on the work of Robinson and Stern. In their work on corporate creativity they have investigated hundreds of creative acts from around the world and suggested six elements to be essential for creativity (Robinson and Stern 1997). Their list offers a very useful start point for studies of organisational creativity. However, being a reflective practitioner with insights in both the corporate world and that of academia, I have some problems with the elements suggested by the two authors. Reading also the work of other scholars and adding my own experiences from more than 13 years in industry, I find that I must modify and add to the list provided by Robinson and Stern. One objective for this paper is thus to introduce and argue in favour of the eight success factors for corporate creativity that I have synthesised.

Being an IT professional, I have an addition objective for this article. Not only do I want to identify and understand the factors that best stimulate corporate creativity – I also want to investigate how information technology can facilitate creativity by supporting the eight success factors. Here I find Bawden's 1986 article on whether information systems can contribute to knowledge generation very insightful. Of my years in industry, I have spent the last 6 years working with intranets technology, and I have witnessed the change in perspective that the advent of the World-Wide Web (the web) has brought about. I cannot help but noticing how well the web fits Bawden's description of technology as enabler. The many intranet-based KM-tools available on the market are *not* anchored in any theory. In this paper I therefore also outline the characteristics of the web and argue that a corporate intranet is particularly well equipped to support most of the identified factors.

I hope that the framework that the eight success factors and the intranet characteristics together constitute will further both practitioners' and researchers' understanding of KM-tools for knowledge creation and their relation to intranets, and serve a useful base for future research.

3. Key factors for creativity

One very distinctive aspect of true creativity is that it tends to show up where it is least expected. Sure, 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. On the other hand, how often do we not get great ideas while doing the dishes, taking a walk in the park, or while playing golf?

Creativity incorporates a large element of surprise and most creative acts are totally unplanned. Kanter (1988) states that the opportunity to innovate and the source of innovation are uncertain and unpredictable. It is therefore impossible to know 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.

This principle is fundamental to creativity and not being able to appreciate it may result in unnecessary limitations to corporate creativity. Robinson & Stern (1997) refer to the above insight as the "No-Preconceptions Principle" and I will use their apt expression from here on.

Unpredictable as it may be, creativity can still be promoted. 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 identify those factors.

3.1 A case of alignment?

Alignment or intention is about assuring that all employees in the company are aware of, and working towards, the same set of key goals. This alignment also helps the organisation to judge the value or truthfulness of any given piece of knowledge. It has been claimed that though organisations can function with poor alignment, they cannot sustain long-term creativity unless strongly aligned or having an organisational intention (Nonaka & Takeuchi 1995, Robinson & Stern 1997).

As an example of weak alignment Robinson and Stern report from the former Soviet Union, where quotas were used to measure almost every activity, including creativity. Factory directors were each month required to report a certain amount of proposals, and therefore managers often had to fabricate ideas to meet their targets, for example by duplicating previously submitted proposals. The authors claim that this is an example of how a misalignment problem destroys creativity.

However, having a strong organisational intention or being aligned is not entirely unproblematic. Even those speaking in favour of strong alignment admit it being a double-edged sword that may also *limit* creativity (Robinson & Stern 1997). Being too focused on one particular objective may hamper creativity since employees may fail to pursue ideas that go in the "wrong" direction. When discussing how preconceptions may limit corporate creativity, Robinson and Stern (1997) tell the story of how G. D. Searle and Co. – a pharmaceutical company – by a series of fortunate events in their laboratory came to discover NutraSweet. While working on a new drug, the company stumbled over what would come to be the perhaps most profitable product in the firm's history – a sweetener. A strongly aligned company would have reacted as one of the senior managers did when he heard of the discovery: "*So what? We're a drug company, not a food company*" (*ibid.*, p.37). However, the company proceeded with the sweetener and ended up as a very profitable food company. Here, when the authors indeed present an example of misalignment, the company in question is successful.

It seems that the problem is not related to intention or alignment itself. The goal for the Soviet managers was to meet a quota and they were very much aware of this goal. In that sense, the directors *were* aligned. The real issue, I claim, is not whether you are aligned – it is whether you recognise the Non-Preconception Principle. In the Soviet Union, as described above, the goals were formulated in a way that violated the Non-Preconception Principle. By establishing quotas for creativity, Moscow assumed that it could be predicted who would be creative - and when - and this is what caused the failure. In the case of Searle and Co., the

company did not try to predict anything, but when a fortunate accident happened they acted and were successful.

The first success factor for creativity is thus the Non-Preconception Principle.

3.2 Skunk works

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 often are the result of user initiatives. Every unanticipated activity begins as an unofficial task (Robinson & Stern 1997), and very often, if not always, these unanticipated and unofficial activities are indeed also user initiated. User interests rather than official job descriptions is what triggers such activities (Stenmark 1999b).

However, corporate settings with deadlines and resource constraints 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 company's behalf to set free the desire that already exists within most people to initiate creative acts.

The expression "Skunk Works" was coined during the second World War by the aircraft manufacturer Lockheed Martins to describe a situation where a small group of technicians were allowed to work outside the established bureaucracy and with minimal management control. It has been shown that creativity and innovation is aided by low formalisation and large degrees of freedom, especially during the initial stages (Kanter 1988). It is also 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 company 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 *really* effective, however, a system that promotes such entrepreneurship must not be restricted to any particular group, as was the case at Lockheed, but reach everyone in the organisation, since, again, it cannot be determined in beforehand who will be creative.

The second success factor is thus to encourage skunk work.

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". The original, richer meaning of the word is more helpful when it comes to understand creativity (Robinson & Stern 1997). 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. Such 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 1997): 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. By doing experiments in the real world and interacting in the running processes, people expose themselves to situation where fortunate accidents are likely to occur.

Secondly, increase the awareness of the accidents that do happen. Serendipitous events happen more often than most people realise. By paying attention to the un-expected and carefully examine exceptions to accepted schemes and inconsistencies within established theories we may detect fortunate accidents. This have been recognised as useful sources for creativity in both scientific and non-scientific fields (Bawden 1986).

Thirdly, 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)

Exceptions in existing knowledge are also potential areas for knowledge creation and information technology able to detect such areas would probably be very useful. Other cases more difficult to detect are *gaps* in existing knowledge, since it is hard to keep track of what is not known. A related track that seems more feasible to pursuit 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.

To intentionally create what Nonaka and Takeuchi (1995) call a “creative chaos” is a way to create or intensify the tensions that exists within the organisation in order to upset and question the prevailing routines and premises upon which the organisation rests. When done skilfully, and when providing enough time for reflection, such provocation can spark creativity.

A third success factor for corporate creativity is thus to increase serendipity.

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 (push) stimuli to the employees will therefore only have a limited effect on creativity. 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 at some other time. The organisation should therefore help its members to get (pull) stimuli while doing their ordinary work, and facilitate the sharing of such stimuli. This may be achieved by allowing cross-functional meetings, customer contacts, visitors, and 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 apt expression “kaleidoscopic thinking” to describe the cross-fertilising process behind creativity, since a kaleidoscope allows people to shake the fragmented reality into new patterns. It seems clear that the cross-disciplinary aspect of information dissemination must be considered when designing information technology 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).

On the web, there is also what may be labelled “false knowledge”. False knowledge 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.

Peripheral and speculative information in general is important for creativity. It is clear that information technology within a research or otherwise creative setting should provide as information-rich an environment as possible. This kind of information might however be better suited for informal channels, capable of offering a higher degree of interaction.

The fourth success factor is the access to diverse stimuli.

3.5 Within-company communication and co-operation

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. 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 1997).

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. All employees should also have equal access to corporate information, Nonaka and Takeuchi (1995) argue. Further, by being aware of ongoing activities each employee gains sufficient understanding of the capacity of the organisation and is 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. This, for example, implies that internal debiting should be abandoned since it only creates unnecessary overhead and administration and a reluctance to ask for help.

Within-company communication is thus the fifth success factor.

3.6 Trust and reciprocity

Several commentators have argued that trust is an important prerequisite for co-operative activities such as knowledge creation. As von Krogh (1998) concludes, effective know-ledge

creation requires mutual trust, active empathy, access to help, lenience to judgement, and courage. He claims that the notion of care encompasses these forms of behaviour and their interplay, and that a change of perspective from self-commitment to other-commitment is necessary. To achieve this, management must explicitly state that trust and openness are prioritised values. As noted by von Hippel (1988), informal know-how trading often occurs *between* companies – sometimes even between direct competitors. Fundamental to such networks are the unspoken, but yet strong, obligation to return a favour.

It has also been claimed that such co-operation cannot be achieved without establishing a personal relationship, preferably face to face, but it has actually been shown that trust and co-operation can be achieved and sustained not only between strangers but in fact also between enemies at war (Allies and Germans on the Western front in World War I) or between creatures unable to appreciate the consequences of their own behaviour (bacteria) (Axelrod 1984). Fundamental to the establishing of trust is instead the principle of reciprocity and the likelihood of meeting - and recognising - the same individual again in the future. Knowing (or assuming that the probability is high) that we will meet again gives me a chance to get even, which enables me to risk trusting the other part – and vice versa. Though I would not normally lend 20 dollars to a perfect stranger, I would do so if he or she was presented as a newly hired department colleague. The fact that we have never met and that I have no knowledge of his or her loan history is compensated for by the retaliation factor. Thus, if the future is sufficiently important relative to the present, mutual co-operation can be established. Reciprocity can thus act as a proxy for trust and enable knowledge sharing in an otherwise competitive environment.

Trust and reciprocity is the sixth success factor.

3.7 The role of 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. Findings in line with these helped Amabile (1983) form what would become the cornerstone of the social psychology of creativity – *the intrinsic motivation hypothesis*. Her latter book (Amabile *et al.* 1996), supported by overwhelming empirical evidence, upgraded this initial hypothesis to a general law of human behaviour – *the intrinsic motivation principle*. Also Robinson and Stern (1997) stress the importance of intrinsic motivation and point to the strong correlation between the 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 pursue 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 2000a). 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. 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.

The seventh success factor for corporate creativity is intrinsic motivation.

3.8 Rich information provision

Though implicitly dealt with throughout the above text, the role of information and information systems in creativity work deserves to be spelled out, since surprisingly little attention has been paid to the particular aspects of information provision for invention and knowledge creation. 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 in Bawden's vocabulary means the unstructured reading of various sources of information in order to receive inspiration or accidentally run into new pieces of information. Though the importance of browsing in creative work seems to be recognised, its nature remains unclear.

Browsing, according to Bawden (1986), 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). 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.

In addition to browsing there is also a need for more traditional information retrieval (IR) techniques, however modified and improved. Bawden argues that while free-text searching is more useful to non-IR professionals, it has the drawbacks of being too imprecise, and he suggests that the future tools should be capable of combining free-text with more controlled searching, giving the end-user the best of both worlds. Coupled to the balance between broad and imprecise information on the one hand, and targeted and focused information on the other, is the discussion of information overload. Though redundancy of information helps creativity, it also increases the risk of being flooded with useless information (Nonaka & Takeuchi 1995).

Visualisation of graphics and symbols has been identified as important, as the ability to present information in forms other than plain text can effectively stimulate the creativity of the users. IR tools have often poor support for image retrieval. Further, the personal nature of creativity must be supported by an equally personal approach to information retrieval. The power of future IR tools must, according to Bawden, 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. Having direct access to the media also enables informal contacts between the end-users, and informal and unofficial communication, such as personal contacts, meetings, and spontaneous mingling, have been shown to play an important part in the literature of creativity.

Rich information provision is thus the eighth and final factor for successful corporate creativity.

4. Characteristics of the World-Wide Web

The web is, as most people now probably are aware of, an internet-based distributed hypermedia system, developed by Tim Berners-Lee to be "a pool of human knowledge, which would allow collaborators in remote sites to share their ideas..." (Berners-Lee 1994). The combination of the Internet computer network with its open protocols and standards and the hypertext structure on top has resulted in a seamless interface to information regardless of platforms, which has led to the use of the web as a middleware (Lyytinen *et al.* 1998). This integrating capacity that the web incorporates has led to the incredible popularisation of the Internet that we have witnessed over the last decade. The web differs in many aspects from the information systems that reigned prior to 1990. The characteristics that best describe the web in general are that it is *hyperlinked*, *networked*, and *open*. In addition, the intranet is also *organisational restricted*. Now, let us examine these characteristics.

4.1 Hyperlinked

The ability to create hyperlinks to other resources is perhaps the most significant feature of the web and something that allows it to transcend printed media. 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. The hyperlinks also allows individual users to create their own collections of useful resources.

Unlike email, TV, or radio the web does not push information to the passively receiving users. Instead, Damsgaard and Sheepers (1999) claim, the web is entirely user-driven. The users must actively pull (i.e. search for or browse to) the information desired. The user may visit sites and pages in any desired order, and interact with scripts and forms as he or she chooses. Users may also create new web pages, reorganising existing information by providing their own collection of links and texts.

The web was initially invented to allow scientists and researchers to communicate, collaborate, and exchange information in a transparent way. The web is by orders of magnitude the media with the highest ratio of production-access to audience-access. Nowhere else can so many people reach so many other people with such ease.

4.2 Networked

The web is obviously highly networked. The client/server architecture and the Uniform Resource Locator (URL) allow information to be placed at anywhere in the network. The web is designed to make physical whereabouts of data transparent to the user. There is no central management or predefined hierarchy structure, meaning that anyone can publish. 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.

The web, being distributed and not relying on a single focal point, is always available (though individual servers may be temporarily off-line).

4.3 Open

The web is a bottom-up technology based entirely on open and accessible standards arrived at by system of consensus. The access mechanism of the HTTP protocol allows also proprietary formats to be used without having to standardise. A web page does not restrict the type or the amount of information presented. The openness also guarantees adaptiveness and access to formats and types not yet available, which guarantees information richness.

The Internet technology is multi-purpose, unlike many other IS solutions such as e.g. payroll systems (Damsgaard & Sheepers 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 and the availability of free-to-use software for both servers and clients paired with the relatively low training requirements also makes the web cheap to implement.

4.4 Organisational restricted

Being a subset of the Internet, intranets have all of the above characteristics. In addition, they contain only users from within the own organisation or company, thus providing a minimal level of coherence that is otherwise absent on the web. People on an intranet may further be presumed to share certain objectives and subscribe to the same set of values and beliefs.

5. Connecting Creativity and Web Technology

From the accounts in section 3 can be derived eight distinct factors that have a decisive influence on corporate creativity: (1) honouring the non-preconception principle, (2) allowing skunk work, (3) stimulate serendipity, (4) provide diverse stimuli, (5) enable within-company communication, (6) foster reciprocity, (7) rely on intrinsic motivation, and (8) cater for rich information provision.

Section 4 lined out the main characteristics of the intranet as being (1) hyperlinked, (2) networked, (3) open, and (4) organisational restricted. Table 1 below integrates these two aspects, indicating what characteristics of a corporate intranet affects what creativity-enhancing factor. The relationships indicated in Table 1 are explained in more detail in the following discussion.

It seems that skunk work and intrinsic motivation are factors not directly related to technology. However, much of what is discussed in this article requires a certain level of redundancy not often found in today's lean organisation. As pointed out by Nonaka and Takeuchi (1995) redundancy conflicts with the Western idea of efficiency. Nevertheless, without motivation and self-initiated activities (which are strongly interconnected) not much knowledge will be created.

Table 1: **Eight critical factors for corporate creativity, sources of theoretical support, and to what (if any) characteristics of the web they are related.**

<i>Factors</i>	<i>Sources</i>	<i>Intranet</i>
1. Non-preconception principle	Robinson & Stern	2, 3, 4
2. Skunk works	Robinson & Stern Nonaka & Takeuchi	n/a
3. Serendipity	Robinson & Stern Nonaka & Takeuchi Bawden	1, 2
4. Diverse stimuli	Robinson & Stern Bawden	1, 2, 3, 4
5. Within-company communication	Robinson & Stern Nonaka & Takeuchi Bawden	1, 2, 4
6. Reciprocity	van Krogh Axelrod	4
7. Intrinsic motivation	Amabile Robinson & Stern	n/a
8. Rich information provision	Nonaka & Takeuchi Bawden	3

5.1 The non-preconception principle

Since it cannot be known in advance who will be involved in a creative act, the non-preconception principle implies that stimuli in form of the broadest variety of information should be made available to all employees on a corporate-wide basis. To achieve this, Nonaka and Takeuchi (1995) stress the importance of being interlinked with an information network. A corporate intranet is a good candidate for such a network due to several reasons: It is *networked*. The distributed nature of the web ensures maximum availability and does not restrict creativity to business hours or time zones. It is also *open*, i.e. device independent and therefore capable of connecting PC-, Mac-, or UNIX-users alike. The relatively low start-up cost makes it also feasible to implement in most organisations. Finally, it is *organisational restricted*. Allowing access to organisational members only the intranet enables otherwise sensitive information to be distributed freely, thus adding to the variety of stimuli.

5.2 Skunk works

Self-initiated activities and unofficial work are not directly related to the use of web technology.

5.3 Serendipity

Serendipity, and the chances of the “happy accident” to occur, can be increased with a technology such as the web. The *hyperlinked* concept of the web enables the sort of casual browsing that Bawden suggests give the user easy access to cross-disciplinary and seemingly unrelated information. Because the information is not being fed to the users in a predefined or

centrally controlled manner, users may interactively seek whatever information they may require. Being *networked*, i.e. distributed and non-hierarchical, the web enables anyone to publish and thereby reach a potentially very large audience.

In today's anorectic organisations, however, undirected "surfing" has little room – a fact that may seriously hamper creativity. Further, traditional IR tools have focused on high precision and exact Boolean matching, thereby not allowing the degrees of freedom required for casual browsing. Recent work on agent-based retrieval tools and recommender systems have showed promising results in their ability to find related information without relying on exact keyword-matching (Stenmark 1999b).

5.4 Diverse stimuli

The *hyperlinked* nature of the web provides at-your-fingertips accessibility to a variety of information, which makes it an ideal source of diverse stimuli, peripheral activities, and speculative information. Being *networked*, the web spans (and that an intranet also may span) geographical borders, allowing input from different cultures to mix and add to the variety of possible stimuli. Its reliance on *open* standards gives the web the ability to provide media richness. Inter-cultural and cross-disciplinary contacts may, as stated earlier, be problematic, but on an *organisational restricted* intranet, where what Boland and Tenkasi (1995) refer to as 'perspective making' has matured and the members can be expected to have a more common language, this is likely to be less of a problem.

Suggestions and ideas currently neither supported by experimental evidence nor by theoretical frameworks are usually difficult to disseminate using formal communication channels. The web's bottom-up design allows it to lend itself to all sorts of horizontal and informal interaction. Since all users may be both providers and consumers, the hierarchically communication structure is side-stepped in favour of a peer-to-peer or everyone-to-everyone model. In such an environment hypothesis may be published for discussion rather than as proven facts. The web-based forum dedicated to open discussions about embryo ideas and tentative solutions as outlined by Stenmark (1999a, 2000b) is an example of this.

5.5 Within-company communication

Since the intranet by definition is *organisational restricted* and shielded from the outside world, corporate communication can flow unrestrictedly. 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. Bawden predicted that future IT systems would help blurring the boundaries between formal and informal communication by offering support for lateral or horizontal information systems such as email and tele-conferencing. Such systems would be particularly interesting from a cross-disciplinary point of view.

Because the web not only allows reading but also enables decentralised information posting, any user may publish information and thus simultaneously communicate both vertically and horizontally. When used on an intranet the information published is often not categorised as either formal or informal – it is simply information made available to a large audience via hyperlinks. Users with similar interests may thus find each other, possibly aided by technology

(cf. Stenmark 1999b, 2000a), and engage in interactions.

5.6 Reciprocity

On the web, text is not just a form of communication – it is also a means for self-presentation (Donath 1999). There is great difference in how a seemingly stable domain address such as `www.ibm.com` and a seemingly ephemeral one such as `131.97.121.87` are experienced. As names in the real world, domain names, and indeed also user signatures, bring to mind many associations. The ability to recognise the other player (or at least his or her affiliation) from past interactions is necessary to sustain co-operation. On an *organisational restricted* intranet, all players are known to be company employees and can thus be expected to be around also in the near future. The incentive to engage in co-operation is therefore higher.

5.7 Intrinsic motivation

Intrinsic motivation does not seem to be related to web technology.

5.8 Rich information provision

Rich information provision can be successfully implemented using web-based technology due to the media's capability of distributing both text, sound, and image via standards and open interfaces. However, to support awareness of users with particular interests or expertise and facilitate collaboration between these users, new tools are needed. It has for example been suggested that IR tools have the potential of providing these services but that this potential is not currently exploited (Stenmark 2000c). Tools not only based on Boolean logic, but rather on similarity between items would support creative work by facilitating the finding of analogies and more loosely related material. Recommender systems, based either on peer recommendations or on previous user activities, are now working examples of IT artefacts that provide loosely related information as part of the users everyday web activities (Stenmark 1999b).

6. Summary

The contributions of this paper are two: (1) Departing from the work of Robinson and Stern, this paper examines the enabling conditions for, and the factors that has the strongest influence on, corporate creativity and organisational knowledge creation. It presents a theoretical framework for organisational knowledge creation, where eight key factors are identified and explained, and: (2) Based on practical experiences of a reflective practitioner the paper outlines the characteristics of the web in general and of a corporate intranet in particular. By integrating web technology with the suggested framework, the role of the intranet as a facilitator for organisational knowledge creation is better under-stood.

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