KNOWNET 384402

State of the Art for use of Social Network Software in enterprise environments.

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Contents

Introduction

In today's competitive global economy, organizations have been forced to seek out innovative approaches to knowledge and information exchange amongst staff and their supply chains. Continued technical enhancements and internet technologies, together with a raft of collaborative software has given rise towards an increasing trend in social networking for exchanging information and sharing knowledge.

There are many definitions of social networks, one of the best is given by boyd and Ellison in their paper "Social Network Sites: Definition, History, and Scholarship" (boyd & Ellison, 2007)

"*Web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system.*" (boyd & Ellison, 2007)

The definition does not itemise possible services provided by web sites or groups of websites. It defines the subset of functionality necessary to identify a service as a Social Network. This subset is what enables and reinforces social interaction, allows creation and updates of different relational ties. Specialised Social Networks provide services and content tailored to a particular type of interaction, content type, service type, or niche.

The KNOWNET project is interested in the application of Social Networking Technologies in the enterprise, especially within the supply chain. A Supplier Social Network is a specialised Social Network that provides services for the Supply Chain in an enterprise environment. There can be different goals such as to improve communication, knowledge management, project management, sales, marketing, team building, but in all cases it is a tool to reinforce and augment already existing social structures and business processes. The main difference of the applications of social networking technologies in a supplier network to those in an enterprise is that of organisational scale, as such there are more nuanced risks and challenges, as discussed in the relevant section of this paper.

Organisational adoption of Social Networking technologies is driven by issues like employee expectations about using new communication channels, improving and enhancing organisational sustainability, internal development through knowledge sharing. It is recommended that to achieve evolvement through the use of information communica-

tion technology (ICT), organisations must concentrate on the learning aspects of ICT. (Baxter, et al., 2010)

With the development of new tools and wider availability of data within modern enterprises, it is now possible to enhance the learning with more day do day aspects like project management, process support, etc… They are usually intended to supplement and enhance, rather than substitute existing tools and collaboration practices.

Organisational learning

A learning organization is the term often given to a company that facilitates the learning of its members and continuously transforms itself. (Pedler, et al., 1997) Its evolution as a learning entity demonstrates conscious interactions across employees through education and as a result of experience (Honey & Mumford, 1992).Furthermore, the learning organization is a complex evolving concept encompassing collectivity of individual learning within the organization (Preston, et al., 1999) that engages in interaction between individuals, as well as between the organization as an entity and the organization and its contexts (Wang & Ahmed, 2003).

Ortenbald (2002) suggests organisational learning encompasses three main dimensions - functionalistic perspective, the interpretive perspective and organisational memory.

The functionalistic organisational learning understands that learning although directed by an organisation starts with the individuals within – "individuals learn as agents of the organisation". According to the interpretive perspective learning in organisations is mostly relationship based and is carried through social interaction. The classification and retention of knowledge within an organisation is the concern of the "organisational memory" dimension of organisational learning. (Ortenblad, 2002)

The use of social networking software in the enterprise is naturally centred on the interpretive perspective, although strong relations exist with both organisational memory and the functionalistic approach. It can be argued that the learning needs of an organisation, supported by social networking software, are carried by the evolving organisational social networks, enabling more efficient knowledge discovery, retention and dissemination, and enhancing the career prospects of individual employees by increasing their social capital. (Ortenblad, 2002)

For example, the HP Watercooler project (Brzozowski, 2009) (see also case studies), can be seen as an example of exploiting the synergy of the three dimensions of organi-

sational learning. It is an experiment in social content aggregation and filtering. The content of blogs, wikis and other websites was aggregated using RSS, tagged with keywords, both from context and explicitly by users. Interestingly Individual users could be associated with tags as well. This relatively simple structure has improved knowledge discovery and retention within HP by concentrating different sources and enabling collaborative filtering. The user profiles allowed building of the social capital of individual employees. During the course of the project, they discovered improvement in communications, improved internal service and knowledge discovery, indications for positive implications for team building.

A different example would be the use of wikis in DrKW. (McAfee, 2006) (McAfee & Sjoman, 2006) (SocialText, 2006)(see also case studies). This case demonstrates not only the organisational memory dimension, through the long term storage of documents and interaction, but the interpretative one through the collaboration on wiki page creation and editing. The functionalistic dimension can be observed through the individual visits to different wiki pages.

Another example demonstrating the use of social networking tools for organisational learning is Dell's Employee Storm, an innovative forum where the employees can communicate their suggestions and discuss and vote on major topics via social sites such like Digg. (Ong, 2009) It could be argued, that the brainstorming-like online environment reflects all three dimensions, as it encourages collaboration, communication and discussion of new ideas, personal improvement and idea recall.

A number of studies have been conducted that illustrate how specific web based tools were implemented within organisations with learning objectives. Baxter et al(2010) found that the implementation of a blogging solution did not appear to be facilitating organisational learning as intended, although the barriers experienced may have been a result of the implementation strategy adopted as opposed to the technology itself. In a similar way Siemens – who had implemented a web based knowledge management system, found that the addition of microblogging functionality proved to be successful in its support of encouraging community discussion and knowledge transfer. The web based solution was implemented within a particular division of Siemens in order to facilitate learning from successfully implemented projects by the company's global sales force. This in turn was intended to support the division's sales performance in a highly competitive environment (Müller & Stocker, 2011).

Baxter and Connely (2007) suggest microblogging is an accommodating tool that can be applied in organizations to support organizational learning. Indeed, applied to web based technology they can support team building and facilitate communities of practice.

With the increasing adoption of web based technologies within organisations for organizational learning and knowledge sharing, a number of vendors are now developing enterprise-specific solutions that make use of a number of these web based tools. However, businesses are often still unsure as to how to implement solutions, encourage adoption, provide compelling and tangible business objectives, and reconcile the open behaviour encouraged by these tools with the regulation required by businesses. As found by Baxter et al., this illustrates the fact that deploying web based tools within a business is not enough to ensure success (Baxter, et al., 2010).

Knowledge Management

Knowledge management (KM) technology can provide the network of links between geographically dispersed groups and individuals that enables effective knowledge sharing. This privileges an information processing view, where knowledge is seen as inputs which can be transferred and processed using technological networks to produce certain outputs. Knowledge is isomorphic to the skills and abilities of individuals and assumes that its transfer through networks to be as unproblematic. This approach to KM typically fails to take into account the pre-existing organizational structures, norms and cultural values that lead different groups to have divergent, possibly even irreconcilable, interpretations of what needs to be done and how best to do it (Inkpen & Tsang, 2005). It unrealistically assumes that building networks that provide structural links between these different groups will somehow automatically produce knowledge creation and sharing. (Swan, et al., 1999).

Another perspective, views knowledge as embedded in, and constructed from and through social relationships and interactions, forming a community network. Knowledge, unlike information, cannot simply be processed; rather it must be continuously re-created through dynamic, interactive and social networking activity (Swan, et al., 1999). This view recognises that knowledge has to be continuously negotiated through interactive social networking processes. Thus the community model emphasises dialogue occurring through active and systematic networking (which may be IT-enabled) rather than linear information flows. (Inkpen & Tsang, 2005)

Both approaches can be supported via social networking tools, although the community model is a natural fit, requiring less explicit structure. Of high importance are both the overall network structure and actors (individual people, organisational units and ad-hoc group) position in the network. By occupying a central network position, an actor is more likely to access useful knowledge from other actors (Tsai, 2001).

Social software is flexible enough to support how people work currently, and to allow for new, innovative uses inspired by practice. Unlike classic KM systems, social software applications do not require either employees or organisations to radically change their practices. They are flexible enough to allow adaptation to existing practices, allowing for organic growth and development (Richter, et al., 2011).

Richter et al (2011) reviews, summarises and compares the goals of Knowledge Management (KM) and Social Software(SS) projects based on a number of historical studies. Table 1 illustrates the overlap of project goals, closely related goals were rephrased in order to reduce redundancy.

Goal	KM	SS
Create, protect, use, share and discover knowledge	x	x
Manage knowledge as an asset	x	
Implementing decision support	x	
Creating a network of knowledge workers	x	x
Mapping sources of internal expertise	x	x
Launching knowledge based products or services		
Developing knowledge processes, process owners and government structures	x	
Train newly recruited employees	x	x
Improving innovation	x	x
Reducing costs	x	x
Efficient, goal-oriented employee communication		x

Goal	KM	SS
Avoidance of information overload		x
Efficient knowledge transfer	x	x
Participation of employees and creation of open corporate culture		x
Increased awareness and transparency		x
Secure the future viability of the enterprise		x

Table 1Comparison of Knowledge Management(KM) and Social Software (SS) goals

Levi et al introduce the term "co-opetition" into the debate, blending cooperation and competition, to show that they can happen at the same time. It includes knowledge transfer to achieve competitive advantages by using the knowledge gained by cooperation to compete in the market. (Levy, et al., 2003)

Further, Capo´-Vicedo et al. show that establishing these inter-organizational relationships into networks leads to knowledge exchange among the companies under study, and to the creation of new specific knowledge by promoting confidence and motivation and by establishing alliances, team spirit and better coordination and communication among the enterprises involved. It implies a higher degree of innovation, fewer losses, improved efficiency in transactions and in production itself, and to increased competitiveness among the companies concerned. (Capó-Vicedo, et al., 2011)

The HP Watercooler project (Brzozowski, 2009) demonstrates the value of social media tools for knowledge management. The exploration of the organisationally and geographically dispersed content and people information encouraged the forging of new relations and the discovery of otherwise inaccessible knowledge.

The Vistaprint case study (Dolezalek, 2009) shows employees using wiki software to increase employee knowledge production, reduce on boarding time, and improve market research productivity.

Of increased importance to the social networking debate is the capturing and preservation of implicit (tacit), and explicit knowledge. By its nature, capturing content and surrounding it by conversation in a social context, social network software enables the preservation and exploration of implicit and tacit knowledge (Panahi, et al., 2013). It

helps in preserving the continuity of knowledge on both short and long term timescales, while encouraging the reinterpretation through online conversation and collaboration. Additionally, it helps diminish the loss of knowledge through employee turnover. (Lam, 2000) (Nahapiet & Ghoshal, 1998). Social web technology has been viewed as one of the recent enablers of sharing tacit knowledge. (Panahi, et al., 2013) The ease of use, informality, openness, multimedia orientation, and the community-based features of social web platforms may create shared context for social interactions and hence increase the chance of tacit knowledge being shared among knowledge seekers.

The use and optimisation of IT, particularly moving to research and possibly the use of social web tools, is essential in facilitating tacit knowledge sharing in the new business models of the information age (Panahi, et al., 2013). Table 2 shows a comparison of mechanisms and technologies for knowledge creating and sharing between face to face and online contexts and the interactions of tacit and explicit knowledge. (Panahi, et al., 2013)

	Socialisation (tacit to tacit)	Externalisation (tacit to explicit)	Combination (explicit to explicit)	Internalisation (explicit to tacit)
Face to face	Team meetings Discussions Interpersonal interactions Apprenticeship Participation Observation	Dialog with team Answering questions Storytelling Metaphors and/or analogies	Learning by doing Books Reports Presentations Lectures, etc.	Books Papers Reports Presentations Indexes, etc.

Online	Online real-time meetings Synchronous communication (chat) Online community of practice Groupware systems Social media	Answering questions Annotations Blogs/wikis Discussion forums Collaborative systems Groupware systems Phone/video/web conferencing	All forms of technologies Text search Document categorisation Podcast/vodcast Blogs/wikis RSS Mashups	Visualization Video/audio presentations Online learning E-mail Web page

Table 2 Comparison of mechanisms and technologies for knowledge creating and sharing between face to face and online contexts (Panahi, et al., 2013)

Knowledge management by social software changes the way employees and organisations create and distribute data, information, and knowledge, raising important questions from a strategic perspective. For example, how to protect local knowledge from spilling over to competitors and other economic actors with knowledge management by social software? Or, how to ensure the value of the firm's internal knowledge when social software enables content from outside the firm to be used in an increasingly costless and flexible manner? (Von Krogh, 2012)

Standing and Kiniti(2011) look into the how organisations can use wiki software to support innovation. They study four case studies, which highlight how organisations can use wikis for knowledge management, collaboration in different stages of innovation from idea generation to commercialisation. They propose a model that explains how wikis require a clear purpose for their use, a culture of collaboration, and integration within a formal innovation process.

Of increasing importance is the interaction of knowledge management and social networking in organisations. Recent research (Maurer, et al., 2011) indicates knowledge transfer mediates between organization members' intra-organizational social capital and organizational performance outcomes of growth and innovation performance.

Social capital

Social capital can be defined as the ‘expected collective or economic benefits derived from the preferential treatment and cooperation between individuals and groups, a reflection of the idea that social networks have value (Coleman, 1988). The idea presumes that analogously to other forms of capital, social contacts affect the both individual and group productivity (Nahapiet & Ghoshal, 1998), (Tsai & Ghoshal, 1998).

Narrowly the concept can be seen as a measure of influence of an individual in a group. Digital social networks enable transparent and convenient accumulation and exploitation of social capital – enabling or facilitating reach out, knowledge discovery and exploitation, and team building among many other applications (DiMicco, et al., 2009), (Robert et al 2008).

Social capital can be seen as providing dual benefits, both for employees and the enterprise itself. On one hand building one’s social capital can be beneficial for the career development of individual employees. (Seibert, et al., 2001). By building their social capital, employees become more recognisable, can be perceived as stronger authorities in their field of expertise and interest. The increased transparency, allows them to compare themselves to their peers, which provides tacit encouragement to their personal development, and initiative.

On another, social capital measures can be used to provide insight into team and company communication, organisational and interpersonal dynamics and be used for improvement and validation of human resources and management practices. Social capital provides another measure for evaluating employee performance and value to the organisation. (Nahapiet & Ghoshal, 1998)

The central proposition of social capital theory is that networks of relationships constitute a valuable resource for the conduct of social affairs, providing their members with credentials, social status or reputation. Social capital can be derived from feelings of gratitude or obligation, respect and friendship, from membership in a family, class or school. Social capital can be accrued from membership in restricted networks like private clubs, etc (Nahapiet & Ghoshal, 1998).

Social capital encompasses many dimensions of a social context, like social ties, trust relations, and value systems that facilitate actions of individuals within that context. These different dimensions of social context can be classified into structural, relational, and cognitive (Tsai & Ghoshal, 1998).

The structural dimension of social capital includes social interaction. The location of an actor's contacts in a social structure of interactions provides certain advantages for the

actor. People can use their personal contacts to get jobs, to obtain information, or to access specific resources. The relational dimension of social capital refers to assets that are rooted in these relationships, such as trust and trustworthiness (Tsai & Ghoshal, 1998). Trust is an attribute of a relationship, but trustworthiness is an attribute of an individual actor involved in the relationship. Since trust can induce joint efforts, a trustworthy is likely to get other actors' support for achieving goals to an extent that would not be possible in a situation where trust did not exist (Tsai & Ghoshal, 1998). The cognitive dimension is embodied in attributes like a shared code, values or a shared paradigm that facilitates a common understanding of collective goals and proper ways of acting in a social system. Inside an organisation, a shared vision and a set of common values help develop this dimension of social capital, which in turn facilitates individual and group actions for the benefit of the organisation as a whole (Tsai & Ghoshal, 1998)

Of particular relevance to Supplier Social Networks (SSN) is the study of Inkpen and Tsang (Inkpen & Tsang, 2005) on how social capital dimensions of networks affect the transfer of knowledge between network members. They distinguish among three common network types: intra-corporate networks, strategic alliances, and industrial districts. Using a social capital framework, they identify structural, cognitive, and relational dimensions for the three network types. Table 3 provides a summary of the properties of the social capital dimensions across the different network types. (Inkpen & Tsang, 2005). Although online social networks may introduce changes, their study provides a useful framework for analysing social capital in SSN.

Social capital dimensions	Corporate network	Strategic alliance	Industrial district
Structural			
Network ties	Fuzzy distinction between intra-member and inter-member ties	Inter-member ties determining social ties within an alliance	Social ties as a foundation for intermember ties
Network configuration	Hierarchical, easy to establish connectivity between network members	Non-hierarchical, possibility of exploiting structural hole positions	Non-hierarchical and dense networks in a geographical region

Social capital dimensions	Corporate network	Strategic alliance	Industrial district
Network stability	Stable membership	High rate of instability	Dynamic, with members joining and leaving the district
Cognitive			
Shared goals	Members working toward a common goal set by headquarters	Compatible but rarely common goals	Non-hierarchical and dense networks in a geographical region
Shared culture	Overarching corporate culture	Cultural compromise/conflict among members	Industry recipe
Relational			
Trust	Little risk of opportunism, institutional-based trust	Significant risk of opportunism, behavioural based trust	Process-based personal trust

Table 3 Social Capital Dimensions Across Network Types (Inkpen & Tsang, 2005)

To some degree social capital can be quantified using social network analysis methods, for example measures like rank, betweenness, and closeness of individual actors, or using other artificial measures. For example, the slashdot karma system provides a measure of the trustworthiness of a user. It comprises of three factors. If a user comments are moderated up or down, they gain or lose a point of karma. If a story is submitted and accepted, the user gains point. Meta-moderation can also affect karma (Poor, 2005)

Another good example is the StackOverflow (SO) reputation system. Contributors are recognized by reputation scores. Earning a high reputation score requires technical expertise and sustained effort. (Bosu, et al., 2013) The reputation score goes up when others user's questions, answers and edits. Earning reputation is important, as higher reputation unlocks new privileges like the ability to vote, comment, and even edit other people's posts. At the highest levels, people have access to special moderation tools. They

are able to work alongside SO's community moderators to keep the site focused and helpful.

Social media tools

There are many different types of social media tools which can be used in enterprise environment. We will list the some of the most important ones, ordered by increasing cognitive effort of contributions or contribution size. (See Table 4)

Tool type	Content size	Cognitive effort	Time relevance
social bookmarking	small	low	medium-long
microblog	small	low	short
blog	small-long	medium	short-long
wiki	small-long	medium-high	medium-long

Table 4 Social software tools properties summary

1. SOCIAL BOOKMARKING (Lund, et al., 2005) – is a centralized online service which enables users to add, annotate, edit, and share bookmarks of web documents. Examples include Delicious, Reddit, Digg, StumbleUpon…
2. MICROBLOGGING – for example twitter, yammer, identica, laconica, etc… It is a broadcast medium similar to, but different from a traditional blog in that its content is typically smaller in both actual and aggregated file size. Microblogs allow users to exchange small messages, like sentences, images, links. Micro-blogging exploits the scarcity of attention and optimises interaction with those few that matter and that reciprocate their attention. (Huberman, et al., 2008) (Zhang, et al., 2010) (Zhao & Rosson, 2009) Studies suggest that micro-blogging, allows transparent communication on equal terms across hierarchical levels and a new form of self-presentation. It remains to be seen to what extent a deep organizational change process is needed, given that the openness of micro-blogging allows flexible adaptation to different situations. (Riemer, et al., 2010)
3. BLOG – a discussion or informational site published on the World Wide Web, consisting of discrete posts, typically displayed in reverse chronological order, sometimes referred to as river of news. Each blog post is typically written by an individual, often soliciting conversation on a topic of interest. Blogs could be written by in-

dividuals or groups of people with common interests. There are blog services (SAAS) like wordpress.com, blogger, live journal and blog software like wordpress, or could be part of a fully blown content management system like Drupal, typo3, plone, etc… (Baxter, et al., 2010) (DiMicco, et al., 2008) (Holtzblatt, et al., 2010) Contrary to a Wiki, where the opinion of the individual user disappears in favour of a more impartial 'collective intelligence', a weblog is author-cantered, expressing the author's subjective point of view. This particular property of weblogs played a fundamental role for the popularity weblogs gained for making implicit knowledge explicit in an unsolicited, self-organized way. (Stocker & Tochtermann, 2008)

4. WIKI –is a web site which allows people to collaboratively add, modify, or delete. Text is usually written using a simplified mark-up language or rich text editor. It differs from a blog or other CMS in that the content is created without any defined owner or leader, little implicit structure, allowing structure to emerge according to the needs of the users. (Bean & Hott, 2005) (Braun & Schmidt, 2007) (McAfee & Sjoman, 2006) (Poole & Grudin, 2010)

The semi-structured nature of social networking tools enables their use in a variety of different contexts. (Riemer, et al., 2010). Table 5 illustrates some use practices with examples. The applications of the tools have to be found through experimentation and sense-making by its users, a process that takes time. The outcomes of the process are open, in that the emergence of particular ways of usage can be predicted only to a limited extent. The potential of such platforms manifests itself when people make sense of and incorporate them into their day-to-day work. (Stocker & Tochtermann, 2011)

It is important to note the importance dynamics of content living in different types of social networking software. Individual pieces of content maintain their importance on different time scales by design and intent. Micro-posts are of a relatively short term importance. Blog posts, are personal, usually of immediate importance and the relevancy time interval is longer than that of a microblog. Wiki pages, by their nature, tend to be of a long term nature, their content evolving with time to reflect the change in environment.

Practice	Description	Examples	Tool types

Practice	Description	Examples	Tool types
Task coordination	Team members delegate pending tasks to others, post lists of pending tasks, report on finishing tasks or enquire about task status.	"Pricing for building work #pending" "@bbl is the house ready for clients to move	microblog, wiki
Problem statement	A team member posts a problem statement post, describing the problem, possible benefits, risks, etc…	Time compression techniques and approaches to providing house insurance	blog, wiki
Problem solving	Team members ask work-related questions, point out problems or post guidelines and "how tos".	"Solved #houseoccupancy problem. Have to find new #surveyor"	microblog, wiki, blog
Event updates	Team members report on events outside the immediate team (e.g., on contracts, phone calls, meetings) and notify others of upcoming events.	"Date for dehumidification moved to 21/03/2014 @crisM @jjl"	microblog
Ideas and information input	Team offer ideas for discussion.	"@mnm idea: Why not use CJK construction for valuation. . ."	microblog
Information references	Team members post URLs to interesting websites	"http://workflow.net/public/examples.html has great examples of #pm workflows"	Microblog Social bookmarking

Practice	Description	Examples	Tool types
Documenting and/or organizing work, organisational units, etc…	Team members document their work, practices, solutions, organisational units, and processes	"Composing grammars for web-content filters" "Who is who in the London office"	Blog, wiki

Table 5 Social media tools use practices and examples (Riemer, et al., 2010) (Baxter, et al., 2010) (Baxter & Connolly, 2013) (Bean & Hott, 2005)

When deploying social networking systems in enterprise environment, it is important to take into account the system content dynamics, in order to match the requirements of the enterprise. Often systems evolve as a blend or mashup of several types of social media software.

Additional tools and services include collaborative classification and tagging, scoring and review, content aggregation, profile management or a mix of features.

For example reddit (http://reddit.com), a service, with an open source codebase, mixes social bookmarking, discussions, topic classification with content and reputation scoring.

The mostly unstructured nature of social media tools is both a blessing and a curse. On a positive note it allows to evolve the content macro-structures that fit right within the organisational context. Organisational units, ad-hoc groups of interest and tend to emerge naturally within the content structure. The system administration effort for maintaining the right structures is usually reduced. On the negative side, the very same unstructured nature of these types of systems can be confusing, hard to bootstrap –there is a need to provide initial content, starting resources and training. (Brzozowski, 2009) (Baxter & Connolly, 2013) (Corso, et al., 2008) (Danis & Singer, 2008) (McAfee, 2006) Depending on context, building the intuition how to use the social networking tools can be a lengthy process.

Benefits for companies

It is becoming increasingly important for companies to provide internal social software tools, even if only to breach the generation gap – digital natives are used to social type software as a dominant communication means. (DiMicco, et al., 2008)

The benefits go beyond generation change. Improving and blending the organisational memory with person to person communication. The improved discovery, recall and creation of knowledge within the network, enables the preservation and propagation of tacit knowledge in environments with high employee turnover. (Lam, 2000) (Nahapiet & Ghoshal, 1998)

By keeping control of social tools inside the enterprise the associated data is available, achievable, and providing new sources of information for understanding the people and their interactions within the company or even the whole supply chain. The tools not provided in house may be found outside, which results in a number of different security concerns. (Brzozowski, 2009) (DiMicco, et al., 2008)

Studies indicate that social networking tools trend to strengthen and intensify weak ties, indirect, friend of a friend type of connections. (Brzozowski, 2009) (DiMicco, et al., 2008). The result of closer relations between distant parts within the network enables and make more likely communication patterns are not plausible before the introduction of such technology. Social networking software brings close both organisationally and geographically distant parts of the enterprise.

The reduced importance of physical, face to face contact, improves support for telecommuting work practices, with implications on employee satisfaction and quality of life. (Hoang, et al., 2008)

There are indications that knowledge worker productivity increases with the introduction of social networking technology, which should result in higher return on investment (ROI). As it is hard to measure productivity increases and ROI other measures, like return on contribution (ROC), are being proposed. (Muller, et al., 2009) They can be used to measure collaboration, performance of social media tools, information useful to employees, managers, and system administrators.

The social networking tools help people find information and guidance quickly, reduces duplication of work. They open up innovations process to more people. They harness collective intelligence and the wisdom of crowds to obtain accurate answers to tough questions. They allow executives to realize the dream of creating a repository of everything an organization knows. Underlying all these benefits is a style of interaction and collaboration that isn't defined by hierarchy and is relatively unconstrained by it. (McAfee, 2009)

Social networking tools, and enterprise microblogging in particular, has the potential to support team and project work in addition to being used as a communication medium

for teamwork coordination (Riemer, et al., 2010). It has also been stated that enterprise microblogging could act as a useful tool for managing projects by keeping management up-to-date on project deliverables and the overall progression of the project's life-cycle. (Schöndienst, et al., 2011) It can also be used to facilitate team discussions, to assist project members to locate expertise, and find answers to work-related problems (Riemer, et al., 2010) (Baxter & Connolly, 2014)

The report on collaboration, sponsored by Cisco systems (EIU, 2007) highlights a number of case studies demonstrating tangible benefits of collaboration to enterprises.

For example, the Chinese insurer Tianping has developed an online platform for car insurance claimants to file reports and evidence. This has helped reduce the necessity of the middleman, lowered fraud and reduced the cost of claims processing, with G&A expenses being half of those of the industry. (Bughin, 2008)

Proctor and Gamble has managed to reduce R & D costs by more than 30 per cent in a few years by harnessing cooperation with researchers on new products via its collaborative technology platform. At the same time they doubled their innovation rate via this platform, with more than one-third of its innovation throughput involving external collaboration. (Bughin, 2008) (EIU, 2007)

Risks and challenges

Most frequently risks related to legal, privacy and security, intellectual property, misuse and abuse, employee resistance issues are observed in enterprise deployments. Even assuming secure, bug free software architecture, all of these groups of risks are still present. The first three are related to user generated content. The latter two are social network risks. Scope of access should be carefully considered, for example, different risks arise in internal social networks, those integrating the supply chain, or those targeting company employees and customers. (Turban, et al., 2011)

The legal risks arise from existing general or industry specific regulatory frameworks and the implications of employee created content. They are related to most of the other risks, for example all of leaking customer personal or financial details, copyright violations, or abusive language can result in legal challenges. Improper language, not obtaining permission, false information, collection of personal information and profiling based on race, ethnicity, medical conditions, regulatory compliance violations are some examples of activities which may lead to legal challenges. (Turban, et al., 2011)

Security risks stem from opportunities of intentional or unintentional disclosure of sensitive information or introduction of malicious code on internal system either by external or internal, but not authorised, parties. There is an ever increasing catalogue of threats and exploits. (CERT, 2014) Care should be taken to keep software up-to date, have stringent security policies and practices.

A significant legal liability comes from unauthorised intellectual property and copyright violations, for example failure to obtain appropriate permissions for use from individuals and organisations, prior to creating content.

Perceived benefit	Perceived risk
Up to date contact information linked to user maintained profiles.	Potential source of information which can be used in social engineering attacks.
Identification of experts, opportunities and potential business partners.	Spammers and virus-writers can set up false profiles.
Increased productivity and workflow efficiency.	Decreased productivity caused by employees spending too much time networking and posting entries on blogs and wiki's.
Increased staff motivation and sense of community through the accumulation of a digital reputation.	
Retention of cumulative organisational knowledge and experience in a fully searchable format.	User generated content can be unreliable.
	Potential loss of confidential or sensitive information.
More effective, appropriate and efficient use of computer mediated communication technologies.	Resource waste with regards to bandwidth, server and network utilisation.

Table 6 Perceived benefits vs risks comparison (van Zyl, 2009)

Employee reluctance to use enterprise social networks can be a serious barrier for successful deployment. User training, resource availability, and support skills, initial content seeding should be considered in the social network planning and implementation stages.

Social networking may lead to the misuse and abuse of Internet resources. Areas of concern include the misuse or waste of time or money, harassment, and the hogging network resources.

There are a number of mitigation mechanisms; the following shortlist highlights some of the more important ones to consider:

1. GOVERNANCE AND POLICY – formal governance structure and well defined policies for permissible content, usage, procedures for making contributions
2. EDUCATION AND TRAINING – sufficient end-user education to reduce resistance to use
3. ACCESS CONTROL – well defined access control and layered security measures that utilize reputation-based filtering, intent and behaviour analysis, and signature scanning must be considered in order to reduce systematic security risks from unintentional disclosure of information. (Steinhart, 2009)
4. MONITORING AND FILTERING – a combination of human and technology based solutions to monitor content creation, updating and usage to determine or enforce compliance with corporate policies and ethics

Conclusions

Social networking technologies can provide a number of benefits to the modern enterprise and its supply chain. They are well suited to track information exchange structures in the current fast-paced market constantly evolving market conditions. (McAffee, 2009)

They provide technological support for organisational learning and knowledge management, by encouraging and supporting evolving, dynamic communities of practice, information and knowledge creation, propagation, exploration and exploitation.

Social networking technologies can provide the tools suitable for a multi-scale time intervals content and knowledge relevance, as well as reflecting organisational unit size – from individual, through teams and groups, to the organisation and its supply chain.

The benefits to individual employees range from improved career planning and visibility within the organisation, through social capital building, improved productivity, to potentially better quality of life through telecommuting.

The risks to adoption must be considered before deployment. To be successful social networking implementations must have management backing and sufficient technical support resources.

Appendices

Case studies

HP Watercooler project

The WaterCooler (Brzozowski, et al., 2009), is a tool that aggregates shared internal social media and cross-references it with an organization's directory.

WaterCooler used RSS (Rich Site Summary) to aggregate posts from different bolgs, wikis and other websites from the HP's internal network. It associated posts with timestamps, author, and inferred keywords. It mapped employees' names to entries in the company LDAP directory, getting data on their organization, location, management chain, job function,... The hierarchy and attributes provided in the directory allowed the bootstrapping of a social network, automatically providing ways for users to identify people like them.

The advantages to this approach were twofold

- It was generic enough to encapsulate any content with a temporal component (publish or modification date), so any server that provided RSS feeds can be integrated.
- It could be done relatively efficiently, since RSS is a lightweight representation of the content; servers supporting HTTP conditional GET could report that nothing has changed since the last poll, saving bandwidth.

Later the WaterCooler team introduced user tagging, micro-blogging, and a fully documented application programming interface API, which lead to experiments with distributed team formation, user experiments, unsolicited third party applications, and more.

Although it lacked complete social functionality, HP observed that it changed users' perceptions of their workplace, made them feel more connected to each other and the company, and redistributed users' attention outside their own business groups.

The team which deployed WaterColler describe some key design implications for enterprise implementations:

1. MANAGERS ARE KEY INFLUENCERS. In any large organization, management leads by example. While manager involvement doesn't guarantee success, it can inspire participation.

2. PERCEIVED IT SUPPORT IS CRUCIAL. Employees are wary of investing time in projects perceived as unofficial, unsupported, or likely to disappear. This poses a problem for establishing a large user base in the duration of a research project.
3. OPEN DATA ACCESS PROMOTES INNOVATION. Providing a simple, intuitive API and helping developers and users use it can help expand the reach of social software tools, just as APIs have transformed Facebook from a mere service into a platform.

Dresdner Kleinwort Wasserstein (DrKW)

Dresdner Kleinwort Wasserstein (DrKW) is an investment bank headquartered in London and Frankfurt. With 6,000 employees, it has offices in New York, Paris, Luxembourg, Tokyo, Singapore and Hong Kong.

In 2005, in order to improve communications, collaboration and publication of key information, DrKW installed a Socialtext wiki. They wanted to get business people on board to enhance collaboration and communication between IT and the business. (McAfee, 2006) (McAfee & Sjoman, 2006) (SocialText, 2006)

Roll-out was staged, with the wiki pre-populated with relevant content in order to engage with a wider audience. They used a low-key strategy to adoption, allowing organic growth through word of mouth.

Popular uses of the wiki include:

1. MANAGING MEETINGS. Many people use the wiki to compile agendas, update staff on recent events, and record and distribute meeting minutes. Using the wiki decreases the amount of email needed to collate items for the agenda, provides a forum for people to update each other prior to the meeting, and an allows for the easy dissemination of minutes afterwards.

2. BRAINSTORMING AND PUBLISHING. The wiki has also proved useful for collating ideas and developing documentation: users starting off with a page of random ideas that, over time, develops into a firm document. They are also using the wiki to publish information and documentation.

3. CREATING PRESENTATIONS. Rapidly creating compelling presentations is difficult in PowerPoint, but the wiki made it easy by allowing users to focus on the content, not the look of the slides.

"We had to move away from a static, dead intranet," says Myrto Lazopoulou. "The wiki has allowed us to improve collaboration, communication and publication. We can cross time zones, improve the way teams works, reduce email and increase transparency." (SocialText, 2006)

IBM Beehive (Social Blue) project

Beehive (later called SocialBlue) was an internal social networking site deployed within IBM's intranet. The site was designed to help employees make new connections, track friends and co-workers, and renew contacts with people they have worked with. The research focused on understanding motivations for using the site, impact on organizational social capital, and design of incentives to encourage participation. The site ran live inside of IBM from 2007 through 2011, with over 65,000 employees joining site. (DiMicco, et al., 2009) (DiMicco, et al., 2008)

"[A] social network site inside the enterprise can play an important role in helping employees maintain and develop connections within the company, support networking and career goals, and potentially increase employee social capital". (DiMicco, et al., 2008)

Vistaprint

As an example of preserving organisational memory - Vistaprint implemented MediaWiki to improve knowledge capture in a rapidly changing environment. Benefits from the implementation include a significant reduction in onboarding time for engineers and an improvement in market research productivity. Knowledge and context were preserved, improving the usefulness of information. (Dolezalek, 2009)

"By comparison, our old blogging-based system had approximately 6,000 articles in it, and half of it was junk. Within six months, we had more articles in the wiki than the blog ever had, and it was all business-critical information." (Daniel Barrett, Senior Software Engineering Manager)

Dell

In order to increase transparency and reduce email traffic Dell introduced internal blogs and the Employee Storm to their employees. (Ong, 2009)

BLOGS: Internal blog zones were created, which were based on initial blogs situated externally of Dell. Gradually they became the main source of interaction internally

EMPLOYEE STORM: Modelled after the successful *Idea Storm*. Employee Storm is an innovative forum, where the employees can communicate their suggestions and discuss

and vote on major topics via social sites such like Digg. Employee Storm has received over 4,100 ideas with 225,000 votes and 18,500 comments. (Ong, 2009)

Treehouse – Convoy

TREEHOUSE, a small company, 50+ employees, whose mission is "is to bring affordable Technology education to people everywhere". Recently they developed and deployed al reddit-clone, called Convoy, in order to improve internal communications. The rationale and experience was reported by the Treehouse CEO on his blog (Carson, 2013)

Their usage guidelines state that "*If it's not actionable or urgent, post it to Convoy"* (Carson, 2013):

1. PHONE OR GOOGLE HANGOUT: Need an answer immediately
2. IM: Need an answer in the next hour
3. EMAIL: Need an answer in next day or two
4. CONVOY: No answer required

In other words, the team has "*has a chance to discuss non-urgent/non-actionable topics or just offer encouragement or distraction"* (Carson, 2013)

Carson reports that the company internal communications have improved and became more targeted:

"We're more connected and everyone is having a chance to weigh in on discussions. Previously, you'd see these huge email threads about topics that may or may not interest you. Now email is less noisy and a lot of the discussions are happening in Convoy. Email is preserved for actionable items…" (Carson, 2013)

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