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Kuang-Yuan Huang
Department of Informatics, College of Computing and Information, University at Albany, SUNY, kh799292@albany.edu

Namjoo Choi
Department of Informatics, College of Computing and Information, University at Albany, SUNY, nc236879@albany.edu

Lenore Horowitz
Department of Informatics, College of Computing and Information, University at Albany, SUNY, lh266266@albany.edu

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Kuang-Yuan Huang
Department of Informatics,
College of Computing and Information,
University at Albany, SUNY
kh799292@albany.edu

Namjoo Choi
Department of Informatics,
College of Computing and Information,
University at Albany, SUNY
nc236879@albany.edu

Lenore Horowitz
Department of Informatics,
College of Computing and Information,
University at Albany, SUNY
lh266266@albany.edu

ABSTRACT

Over the last several years, a variety of Web 2.0 applications has been widely adopted by individual users and recently has received great attention from organizations. While an increasing number of organizations have started utilizing Web 2.0 applications in hopes of boosting collaboration and driving innovations, only a small number of different theoretical perspectives are available in the literature that facilitate a further understanding of the phenomenon of organizational adoption of Web 2.0 to drive innovation. In this paper, we propose a theoretical model explicating this phenomenon from the perspective that Web 2.0 use enhances knowledge transfer by fostering the emergence of informal networks, weak ties, boundary spanners and social capital. This model conceptualizes the process through which organizations drive innovations by utilizing Web 2.0 applications. Based on this perspective, suggestions for organizations to facilitate this process are also provided.

Keywords

Web 2.0, informal network, boundary spanner, weak tie, social capital, knowledge transfer, innovation.

INTRODUCTION

Over the last several years, a variety of Web 2.0 applications has been widely adopted by individual users and recently has also received great attention from organizations due to their promising potential to boost creativity, knowledge sharing, collaboration, and ultimately to drive innovations (O'Reilly, 2005; Tredinnick, 2006). This trend of increasing organizational interests in utilizing Web 2.0 applications has been mounting. For example, Americas Conference on Information Systems (AMCIS) has a minitrack "Social Networking and Web 2.0 in the Workplace". Blog World Expo, the world's largest Weblog conference, hosts a track called "Business of Blogging." Some highly referred management journals have published a series of "Enterprise 2.0" articles to guide organizational adoption of Web 2.0 applications (e.g., Brynjolfsson and McAfee, 2007; McAfee, 2006). Despite growing interests, only a few different theoretical perspectives are available in the literature that will facilitate a deeper understanding of organizational use of Web 2.0 driving innovation (e.g., Boateng, Malik and Mbarika, 2009; Chatti, Klamma, Jarke and Naeve, 2007). In this article, a theoretical model explicating this phenomenon is proposed.

In the era of knowledge economy, knowledge is regarded as an important strategic asset to drive organizational innovation and to sustain organizational competitive advantages (Cohen and Levinthal, 1990; Nonaka, 1994; Nonaka and Takeuchi 1995; Wasko and Faraj 2000). As pointed out by Reagans and McEvily (2003), the ability to transfer knowledge is a distinct source of competitive advantage in organizations, thus encouraging organizations to constantly search for ways to better facilitate their knowledge transfer processes and to ultimately drive innovations. Regarded as social software, Web 2.0 applications enable the formation of virtual groups that connect users with different backgrounds from various locations beyond formal and physical boundaries (Shirky, 2003; Swisher, 2004). Likewise, in the organizational context, the utilization

of Web 2.0 applications is expected to lead to the emergence of informal networks among organizational subunits. The emergent informal networks involve the enactment of boundary spanners who maintain weak ties and generate social capital. Communications, through informal networks characterized by boundary spanners, weak ties and increased social capital, are then expected to facilitate knowledge transfer across organizational subunits. When knowledge is freely transferred within an organization, it is more likely to drive organizational innovations.

The objective of this paper is to enlighten the phenomenon of organizational innovation led by Web 2.0 use. This article will first discuss enablers of knowledge transfer, that is, informal networks, boundary spanners, weak ties, and social capital. A theoretical model depicting organizations' use of Web 2.0 leading to these knowledge transfer enablers, ultimately driving innovation, will then be presented. Lastly, conclusions with suggestions for organizations and future research directions will be discussed.

ENABLERS OF KNOWLEDGE TRANSFER

Resource theory posits that in order to sustain a competitive advantage, organizations are required to be in control of resources that are valuable, rare, imperfectly imitable, and of low substitutability (Barney, 1991; Grant, 1996; Penrose, 1959). Recognizing that knowledge is a resource demonstrating these characteristics, organizations seek to "know more" and differentiate their knowledge from their competitors in order to make correct decisions, provide better services, and innovate to sustain a competitive advantage (Davenport and Prusak, 1998). To achieve this goal, organizations need to acquire the ability to efficiently and effectively manage organizational knowledge (Alavi and Leidner, 2001). In the study of knowledge management, there is an issue on managing efficient knowledge transfer (Alavi and Leidner, 2001; Ko, Kirsch and King, 2005). In this section, studies on enablers of knowledge transfer will be discussed. Specifically, informal networks, weak ties, boundary spanners and social capital increase the quality and quantity of knowledge transfer.

Informal Networks

Informal networks are defined as "networks where individuals are connected based on their social or personal relationships rather than work or task related relationships" (Awazu, 2004). Informal networks play a crucial role in organizations, as Cross and Prusak (2002) pointed out, "the real work in most companies is done informally, through personal contacts" (p. 105). Informal social relationships supplement formal networks by enabling individuals' access to different knowledge sources and the ability to locate knowledgeable expertises. Desouza (2003) found that informal networks foster the exchange of tacit knowledge – knowledge that is highly practical and personalized, difficult to codify and plays a critical role in organizational innovation (Alavi and Leidner, 2001; Grant, 1996; Nonaka, 1994; Polanyi 1967). This informal transmission of know-how "accelerate(s) and broaden(s) the traditional knowledge sharing" (Davenport, DeLong and Beers, 1998).

Informal networks can also contribute to knowledge transfer by making this process easier. Focusing on the relationships between the structure of informal networks and knowledge transfer, Reagans and McEvily (2003) suggested that the informal network range (i.e. the extent to which an informal network crosses different communities) is positively associated with the ease of knowledge transfer and found that the more diverse the knowledge and one's informal network span, the easier it was for them to interpret transferred knowledge. In such an environment, one is more likely to acquire useful knowledge when needed and furthermore knowledge transfer becomes easier and more efficient (Tushman and Scanlan, 1981).

Boundary Spanners

Boundary spanners are members of a community who connect to an external environment (Awazu, 2004; Cross and Prusak, 2002; Tushman and Scanlan, 1981). Within a boundary, its members share similar characteristics in terms of culture, language, norms, values, and knowledge, which not only differentiate them from other communities but also limit their ability to transfer knowledge between their community and external environment and to adapt environmental changes (Aldrich and Herker, 1977; Tushman and Scanlan, 1981). The issue is exacerbated by a dynamic competitive environment faced by organizations nowadays. Through boundary spanners, knowledge outside the community can be identified, collected, filtered, and disseminated to the members (Aldrich and Herker, 1977). As Gopal and Gosein (2009) pointed out, boundary spanners are "responsible for ensuring that the required knowledge is able to flow across the boundaries" (p. 5). According to Cross and Prusak (2002: p. 109), "boundary spanners serve as the group's eyes and ears in the wider world". Tushman and Scanlan (1981) also mentioned that boundary spanners with informal networks can help communicate timely information. Boundary spanners thus contribute to "viable organizations" (Aldrich and Herker, 1977) which are characterized by "an increase in the ability to learn and to perform according to changing contingencies in the environment" (Terryberry, 1968: p. 660). Without boundary spanners, a group is isolated and constrained by their local experiences and knowledge, and consequently their performance and innovation capabilities are hampered (Cohen and Levinthal, 1990).

Weak Ties

The concepts of weak and strong ties were proposed by Granovetter (1973) who said that strong tie relationships connect those who communicate frequently, express higher emotional intensity and mutual confidence, and share a norm of reciprocity. Strong ties are normally characterized in intimate relationships such as family members, close friends and co-workers in the same project. Weak ties, on the other hand, are maintained by those who communicate less frequently, with low emotional intensity and mutual confidence, and do not share the norm of reciprocity. While strong ties are good at providing social and emotional support and solving conflict (Hansen, 1999), weak ties facilitate information transfer (Granovetter, 1973).

Weak ties become more important when they connect individuals belonging to different communities (Granovetter, 1973). When different communities are connected through weak ties as links, information acquired will be more diverse, useful and less redundant (Hansen, 1999). Kavanaugh, Reese, Carroll and Rosson (2003) also indicated that weak ties are more instrumental than strong ties in terms of providing useful information. With weak ties, socially distant ideas, influences, or information become more reachable, and those who maintain weak ties will be more likely to acquire new information (Ganovetter 1973).

Social Capital

When people start to interact with each other, social capital is developed and increased among them (Nahapiet and Ghoshal, 1998).

Bourdieu (1985) defines social capital as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition" (p. 248). To Nahapiet and Ghoshal (1998), social capital is "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" (p. 243). It can be identified from the above definitions that two essential elements of the social capital concept are social networks and embedded resources. The embedded resources within social networks enhanced by social capital include trust, engagement, and norms of reciprocity (Blanchard and Horan, 1998; Putnam, 1995). By treating knowledge as a strategic organizational resource, Nahapiet and Ghoshal (1998) claimed that with social capital embedded in social networks in an organization, knowledge creation is facilitated through the transfer and integration process. Chiu, Hsu and Wang (2006) demonstrated that social capital increases the quality and quantity of knowledge transfer. Inkpen and Tsang (2005) also mentioned that in an organization, the benefits of social capital can include privileged access to knowledge and information. As a result, through constant social interaction, social capital is acquired and enhanced among members of social networks and knowledge embedded in these social networks will become readily available with increasing quality and quantity.

From the discussions above on informal networks, boundary spanners, weak ties, and social capital, it becomes clear that when it comes to knowledge transfer, these concepts are quite interrelated. It is suggested that when an informal network is formed connecting different communities, weak tie relationships are established and boundary spanners emerge and expose a diverse knowledge base, the entire social network is brought to a structural state that facilitates knowledge transfer. Through social interaction, among network members, social capital is gradually acquired, increased, and embedded, which supports and increases the transfer of quality, diverse knowledge. Organizations encouraging and supporting this environment are positioned in a state of "innovation ready" (Fichman and Kemerer, 1997) and will ultimately innovate.

In the next section, a model depicting organizational use of Web 2.0 driving innovation will be proposed. It is argued that organizational use of Web 2.0 applications will foster and support the above mentioned "innovation ready" environment. By facilitating the emergence of informal networks, weak ties, and boundary spanners, along with increased social capital through interaction, organizational use of Web 2.0 applications will foster knowledge transfer among organizational subunits, leading to the readiness of innovation.

WEB 2.0 USE, ENHANCED KNOWLEDGE TRANSFER AND INNOVATION

Web 2.0, engaged by principles such as "the web as platform", "harnessing collective intelligence", and "rich user experiences" (O'Reilly, 2005), signifies its social nature. Tredinnick (2006) indicates that Web 2.0 is a "process of ceding control over applications to users, enabling users to extract information and data and reuse that information and data in a flexible way" (p. 229). Alexander (2007) says "the label 'Web 2.0' is far less important than the concepts, projects, and practices included in the scope" (p. 33). Web 2.0 therefore is not just an application type or a collection of tools, but also a concept, a perspective, a paradigm, or an attitude (Davis, 2005). Generally speaking, Web 2.0 can be thought of as a concept that with the web as a platform, and through users' collaboration over the content generation, which leads to the creation of

virtual communities where information, and knowledge are generated and shared. In Levine (2008), it was reported that 32% of companies surveyed said they are currently using or will be using Web 2.0 applications within 12 months. Along with this growing trend in industry, academic research on organizational use of Web 2.0 is also expanding.

Skeels and Grudin (2009) studied employees' use of social networking sites (SNS) such as Facebook and LinkedIn at Microsoft and found that corporate SNS use helps build social capital. Additionally it supports information sharing and resources locating. The authors concluded that the main benefit of employees' using SNS is the "creation, maintenance, and strengthening of weak ties among colleagues" (p. 102). Similar findings on benefits of corporate SNS are also mentioned by DiMicco, Millen and Geyer (2008) on studying IBM's adoption of SNS. In their study, they found the main motivation of users using internal social networking is to "build stronger bonds with their weak ties and to reach out to employees they do not know" (p. 711).

Damianos, Cuomo, Griffith, Hirst and Smallwood (2007) studied a high-tech organization's deployment of a social bookmarking system – Onomi. They found that employees benefited through knowledge contribution, new resource discoveries, the formation and support of social networks, and locating experts. Another study conducted by Millen, Feinberg and Kerr (2006) on Dogear, a social bookmarking system deployed in IBM, found similar results of enhanced communities of interest and facilitated finding and sharing of information, organizational resources, and knowledgeable experts.

Jackson, Yates and Orlikowski (2007) studied corporate blog use in a large scale IT company. They analyzed corporate blog users' usage patterns and found that informal social networks are formed among corporate blog users and weak ties relating blog users are maintained. It was also found that a corporate blog facilitates communication and knowledge transfer among employees from diverse subunits such as marketing, sales, and engineering. Still another study on corporate blog use in IBM (Huh, Jones, Erickson, Kellogg, Bellamy and Thomas, 2007) found that blog use makes it easier to access to experts, and to transfer tacit knowledge and resources across communities.

Majchrzak, Wagner and Yates (2006) found corporate wiki use builds social networks, promotes knowledge circulation and increases collaboration efficiency. One interesting finding is that for those who consider their current work requiring new ideas and solutions, and when this work requires others' inputs, they felt corporate wiki use a great benefit. It signifies that corporate wiki use facilitates knowledge transfer and drives organizational innovation.

As can be seen in the above mentioned studies of Web 2.0 use in organizations, irrespective of using Wikis, Blogs, social networking sites or social bookmarking systems, all primarily benefit from increased diverse knowledge transfer among social networks spanning multiple organizational subunits. Besides, concepts such as weak ties and social capital enabled through Web 2.0 use are also highlighted. By identifying these key benefits of organizational use of Web 2.0 from the literature, a model depicting organizational use of Web 2.0 driving innovation is presented. The model is presented in Figure 1, illustrating that Web 2.0 applications as a platform facilitate the building of informal networks among organizational subunits, the maintenance of weak tie relationships and the enactment of boundary spanning roles – the structural configuration that facilitates knowledge transfer. When users of Web 2.0 applications interact through such structural settings, social capital is emerged and increased, resulting in facilitated and enhanced knowledge transfer, leading organizations to an innovation-ready state, which ultimately drives organizational innovation. Below, we further describe each concept in the model to explicate how Web 2.0 use contributes to organizational innovation through them.

Web 2.0 Use Fosters Informal Network Building

As social software aims to connect people informally, Web 2.0 applications make it possible for users to not only connect to those belonging to their own community, but also to distant members accumulating different perspectives and knowledge (Chatti et al., 2007). In organizations, Web 2.0 applications transcend formal bureaucratic hierarchies and create informal communities to foster communications among employees from different organizational subunits. This further helps individuals access knowledge sources and identify experts, thus fostering knowledge transfer.

Web 2.0 Use Fosters Weak Tie Building

When Web 2.0 applications connect employees of different subunits, weak tie relationships emerge. Compared to co-workers of the same subunit, employees from different subunits connected through Web 2.0 applications are less likely to have frequent, emotional intensive, confident communications. It is also more difficult for them to construct the norm of reciprocity, although it can be improved through increasing social capital by constant interactions. The maintenance of weak tie relationships among Web 2.0 users is also indicated by Jackson et al. (2007) regarding corporate blog use. Therefore, with Web 2.0 use, weak ties as relationships spanning across organizational subunits are maintained, aiding in expediting the flow and reach of diverse knowledge (Hansen, 1999; Kavanaugh, 2003).
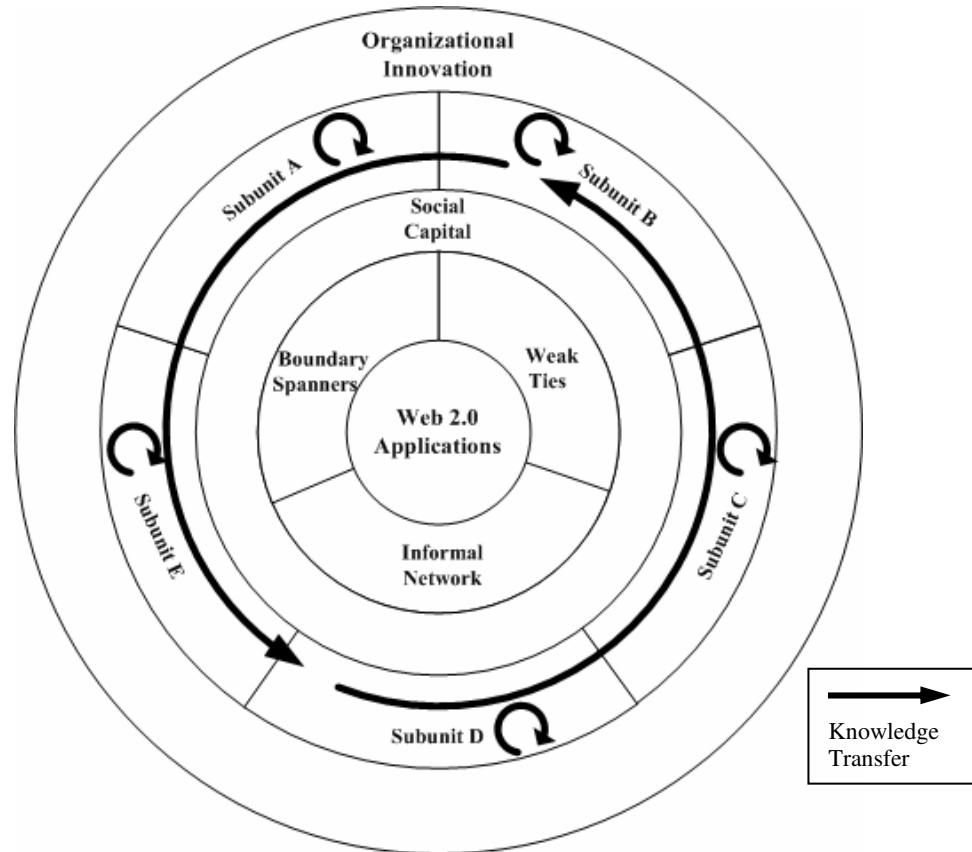
Figure 1. Organizational use of Web 2.0 to drive innovation.

Web 2.0 Use Enacts Boundary Spanning Roles

Employees use Web 2.0 applications to locate knowledge sources and identify experts outside their local communities in order to acquire perspectives and solve project problems. This is identical to the role of the boundary spanner as defined earlier in this article. As a result, users of Web 2.0 applications will enact boundary spanning roles to monitor the outside world and ensure that "the required knowledge is able to flow across the boundaries" (Gopal and Gosain, 2009: p. 5), which leads to what Aldrich and Herker (1977) mentioned as a "viable organization" (p. 218).

Web 2.0 Use Fosters Social Capital Building

When employees start to use Web 2.0 applications to build up social networks, interaction opportunities characterized by informal connections and weak ties are created among different organizational subunits. The creation of these new relationships by employee users as boundary spanners among different subunits, together with their constant interaction leads to the generation and accumulation of social capital. Elements of social capital such as trust and norm of reciprocity are thus also enhanced through interaction (Kavanaugh et al., 2003). Furthermore, by citing Putnam's work (Putnam, 1995), Kavanaugh indicates that weak ties in the network contribute more to social capital than do strong ties. In addition, Blanchard and Horan (1998) mentioned that dispersed social networks are more likely to attract members because it is easier to locate useful information and resources through dispersed weak ties, which would have a positive effect on social capital in virtual communities. Consequently, by fostering communication across organizational subunits, Web 2.0 use will enhance the building of social networks, trust, and norms of reciprocity thereby enhancing social capital.

Web 2.0 Use Fosters Knowledge Transfer

Informal networks, weak ties, boundary spanners and social capital are catalysts of knowledge transfer, and their effects reach the highest when one's network spans multiple communities with diverse knowledge bases. In organizations, Web 2.0 as a platform provides the building of informal connections across subunits, with the formation of weak tie relationships, and the enactment of boundary spanners – a knowledge transfer enabling network structure. Through constant interaction, social

capital is also increased. It is the interplay and inter-augmenting of these features of Web 2.0 applications which fosters organizational knowledge transfer, leading to organizational innovation.

From Utilizing Web 2.0 to Innovation

Web 2.0 applications facilitate communication channels among organizational subunits characterized by informal networks, weak ties and boundary spanners. Knowledge transfer is fostered through increased social capital by interacting via these informal channels. Fichman and Kemerer (1997) argued that when employees have access to greater, diverse knowledge, the innovation knowledge barrier should be lower. This idea is also mentioned in Leonard and Sensiper (1998). For them, it is more likely that new ideas are generated and identified out of interactions among diverse knowledge – the so-called "creative abrasion" process. Cohen and Levinthal (1990) pointed out that the exposure of boundary spanners to diverse knowledge and experts increases organizations' absorptive capacity to make novel linkages and associations among diverse knowledge, leading to the generation of new ideas. Organizational use of Web 2.0 applications thus will drive organizational innovation through constant transfer of diverse knowledge facilitated by the interplay of informal networks, weak ties, boundary spanners and social capital.

IMPLICATIONS AND CONCLUSIONS

In this article, a model is proposed in order to provide insights of how organizational use of Web 2.0 applications drives organizational innovation. Facilitators of knowledge transfer – informal networks, weak ties, boundary spanners and social capital, are identified as keys to this process. It is through Web 2.0 use by which the quality and quantity of diverse knowledge transferred within organizations is enhanced, which in turn stimulates the generation of new ideas and ultimately drives organizational innovation. This model offers organizational managers an impetus to adopt Web 2.0 applications with optimistic expectation. However, Web 2.0 is not a panacea to drive organizational success; different considerations need to be taken before achieving what this model envisions.

First, managers need to understand that not all Web 2.0 applications are suitable for every organization. Organizations should consider which Web 2.0 applications best fit their strategic requirements. Categorization of Web 2.0 applications based on features of communicative, collaborative, documentative, generative or interactive (McGee and Diaz, 2007) can be a good foundation to make the right choice. Future studies should also be considered to match business strategies with different Web 2.0 application choices and analyze the outcomes. In addition, managers should understand the adoption of Web 2.0 applications doesn't necessarily mean employees will use them (Ardichvili, Page and Wentling, 2003; Wasko and Faraj, 2000). Organizations need to support the culture of democratic knowledge sharing with Web 2.0 use, and encourage employees' contribution on Web 2.0 applications through external rewards (Davenport, et al., 1998), shared organizational vision (Chiu, et al., 2006) and promoting the idea that knowledge is a shared good (Ardichvili, et al., 2003). Only when employees start to use Web 2.0 applications in their daily practices can benefits of Web 2.0 use given by this model be achieved.

This model provides a perspective to see how Web 2.0 use affects organizational communicative structure leading to innovation. However, organizational innovation does not only happen behind a wall, it also happens with the involvement of customers or organizational allies (Chesbrough, 2003). For future study, not only should research be performed to understand how Web 2.0 users' practices create informal networks, maintain weak ties, enact boundary spanners and generate social capital, but we should also consider studying whether this innovation-driving model still holds true with the involvement of customers and other organizations through Web 2.0 use.

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