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Davison, Robert M.; Ou, Carol Xiaojuan; Martinsons, Maris G.; Hua, Xiaoqing; Zhao, Angela Y.; Du, Rong

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**The Communicative Ecology of Web 2.0 @ Work:
Social Networking in the Workspace**

ABSTRACT

Digital media have transformed social interactions and may now transform workplace communications. In this exploratory study that is premised on the communication ecology framework, we investigate how employees use and get value from a variety of social networking technologies. The research context is four software firms located in China. Notwithstanding differences in corporate attitudes towards social networking, we identify common themes in how Web 2.0 technologies are leveraged and value is created by employees at all levels. We inductively develop five propositions that describe how social networking technologies contribute directly to horizontal and vertical communication in organizations, and ultimately to individual, team and organizational performance. Implications for research and practice are discussed.

INTRODUCTION

The Web 2.0 revolution has taken online relationships by storm, with a wide variety of applications offering interlocutors a myriad of communication opportunities. Communication has now been liberated “from the confinement of time and space” (Chang and Ian, 2012). McLuhan’s (1964: 248) hyperbolic remark that “the simultaneity of electronic communication ... makes each of us present and accessible to every other person in the world” has never been more true. As McLuhan (ibid.) recognised, this is a global phenomenon, yet the extent to which these same social computing applications are accepted as supporting work is a matter of controversy

(Isaacs, Walendowski, Whittaker, Schiano & Kamm, 2002). While some accept the legitimacy of Web 2.0 applications in the workplace (e.g. Davison, Ou & Martinsons, 2013; McKinsey, 2009), others are more sceptical, since these interactive applications are typically associated with social functions such as chatting (Chui, Miller & Roberts, 2009).

Recent evidence (e.g., Ou and Davison, 2011) suggests that by strengthening social networks in the workspace, Web 2.0 applications can enhance coordination and collaboration, knowledge sharing and problem solving. McKinsey (2009) found that most managers in a global survey were satisfied with the use of Web 2.0 in their companies. Nevertheless, a third of the respondents reported that they had either not yet achieved business benefits, or not yet learned how to measure these benefits, or not yet utilized Web2.0 at all. Interestingly, McKinsey (2009) also suggested that while 41% of Chinese respondents reported that their organisations are utilizing Web 2.0 for work with *external* partners and suppliers, only 54% indicated that they use Web 2.0 for *internal* purposes, the lowest score among all countries studied.

In this paper, we undertake an exploratory investigation into the use of Web 2.0 applications in professional service firms. The cultural context of our research is China, where online social relationships have become ubiquitous, even as popular Western platforms such as Facebook and Twitter are blocked by censors. Despite a climate of media censorship (Yu, 2006) and an espoused culture of highly controlled corporate governance (Bai, Liu, Lu, Song & Zhang, 2004), Web 2.0 applications are increasingly encountered in Chinese organizations. Although McKinsey's global survey provides some insights into the potential benefits that companies may reap from Web 2.0, detailed analyses of how companies have leveraged specific Web 2.0 tools for work advantage are rare. This led to our primary research question: How do Chinese professional service firms use Web 2.0 technologies in order to create value at work?

In order to answer this question, we study and compare the experiences of four software firms where Web 2.0 applications are used regularly. These firms exhibit a rich array of corporate cultures and choices of Web 2.0 applications (see Appendix). Our research methods are primarily qualitative. Mini cases of the firms draw on data obtained from interviews, participant observations and corporate documents/websites. Our cross-case analysis was theoretically informed by the communicative ecology framework (CEF) (Foth and Hearn, 2007). CEF provides a scaffold for our discussions and the development of a research model that encapsulates the phenomenon of Web 2.0 utilization in organizational contexts.

This paper is organized as follows. Following the introduction, we further describe the theoretical lens that we apply to the research and briefly review the literature on Web 2.0. We introduce our research methods and present our four mini cases of Web 2.0 use in Chinese software development firms. Our analysis identifies common themes across the cases in order to demonstrate more and less successful examples of Web 2.0 practice and links these themes to the theoretical lens of CEF. We conclude the paper with a proposed research model and an assessment of the contributions, recommendations for both research and practice and a final set of conclusions.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The Communicative Ecology Framework (CEF)

Communicative ecology is a conceptual framework used in the domain of media and communication research to represent and analyze the relationships among social groups, interaction and communication media. The concept of communicative ecology can be traced back to McLuhan's (1962) research on media ecology, which demonstrates that new media and

technology can influence communicative content, and also highlights the symbolic interactionist perspective of communication as embedded in context (Barnlund, 1979). Based on these works, Altheide (1994, 1995) further developed the concept of an “ecology of communication” in order to examine the mutually influential relationships between information technology, communication formats and social activities, within the context of people’s social and physical environments. In recent research in this domain, Foth and Hearn (2007: 9) formally define the term ‘communicative ecology’ as “the context in which communication processes occur”.

The CEF contains three layers: technological, social and discursive. The *technological layer* describes the communication media and technologies used for interaction, covering traditional media such as telephone networks, face-to-face modes and also new media such as instant messaging and social networking. The *social layer* consists of people and various social structures ranging from individuals and groups of friends to managers and employees in formal organizations. The *discursive layer* refers to the content of communication. It is important to note that these three layers are intricately interwoven and mutually constitutive (Foth and Hearn, 2007). In the context of communicative ecology, multiple media are often used because it is beneficial for individual interlocutors to take advantage of different tools in different situations (cf. Dennis, Fuller & Valacich, 2008). Therefore, communication is described as “processes that involve a mix of media, organised in specific ways, through which people connect with their social networks” (Tacchi, Slater & Hearn, 2003: 17).

The triple-layered nature of the CEF provides a sophisticated theoretical lens to investigate not only the phenomena associated with the media preferences of individuals, groups and organizations, but also the interplay between these preferences and associated relationships, as well as the changes in communication content that occur within these relationships. For

example, Button and Partridge (2007) adopted the CEF in their analysis of the similarities and differences between twelve diverse neighbourhood websites in terms of their social, discursive and technological features. More recently, Smith, Nguyen, Lai, Leshed & Baumer (2012) suggest that new university students rely on a constellation of technologies to communicate with their parents, consistent with what has been described as a communicative ecology. Similarly, Ben-Harush (2010) employed the CEF to analyze the social networks of Australian women.

Focusing on the recent application of new media in corporate communications, Hearn, Foth & Gray (2009) employed the CEF to explore mobile media, Web 2.0, Blogs, Wikis, Virtual Worlds (e.g., SecondLife), Digital Storytelling Communities and Chat in organizations from the technological, social and discursive perspectives. In parallel with this conceptual work in the communications discipline, a related stream of empirical work in the information systems (IS) discipline has investigated the use of Web 2.0, as reviewed in the following sub-section.

Web 2.0 Applications

Organisational communications has changed dramatically with the advent and spread of computer-mediated communication (CMC) technologies. The Internet and CMC have co-evolved in response to technological innovations and customer demands. The emergence of Web 2.0 applications (a term coined by O'Reilly Media, 2005) has enabled users to interact and collaborate in a virtual community. Both the use and impact of these social networking applications have increased dramatically over time (Turner, Qvarfordt, Biehl, Golovchinsky & Back, 2010). User-generated content is a key characteristic of Web 2.0, with applications including self-publishing, editing, sharing and commenting on content (Boulos and Wheeler, 2007).

Existing Web 2.0 research can be grouped into several categories. The first type of study emphasizes how a new medium is adopted and used. For example, Java, Song, Finin & Tseng (2006) identified several categories of intention to use Twitter, including daily chatter, sharing information or URLs, reporting news, and conversation. The second type of study emphasizes the specific aspects of media use, such as motivations or barriers. Wagner and Majchrzak (2007) studied the customer-centricity of wikis and presented six characteristics that affect customer engagement. Allowing multiple layers of participation to emerge and be maintained in a wiki leads to more constructive customer engagement. The third type of study focuses on Web 2.0 applications in such contexts as: social activism, e.g. anti-government protests; political campaigns (Cetina, 2009); crisis communications and disaster response (Acar and Muraki, 2011; Qu, Huang, Zhang & Zhang, 2011); and education (Ebner, Kickmeier-Rust, & Holzinger, 2008).

A related but distinct fourth type of study has examined Web 2.0 applications as an organizational tool for facilitating and managing communication and collaboration. Many of these activities occur within the boundaries of a single organization. However, some cut across those boundaries, such as marketing communications and inter-organizational collaboration on new product development. We now look in more detail at specific Web 2.0 applications.

Microblogging

Microblogging applications, such as Twitter, Yammer and Weibo, enable users to exchange micro-quantities of content, typically up to 140 alphabetical letters or pictographic characters. These can include text, images and links to external sites. Microblogging has been found to improve the speed and quality of communications while increasing transparency and accountability (Günther, Krasnova, Riehle & Schöndienst, 2009).

Microblogging is not restricted to social contexts. Both internal and external collaboration, relationship marketing and knowledge sharing are popular business applications of microblogs. For instance, Twitter has been used in organizations to share business information and personal updates with colleagues in real time, and as “personal RSS feeds” to monitor trusted external sources for news and links (Zhao and Rosson, 2009). Corporate microblogging applications, such as Yammer, have supported awareness creation and team/task coordination (Riemer, Richter & Seltsikas, 2010) and facilitated e-marketing by increasing brand awareness and highlighting other marketing goals (Jansen, Zhang, Sobel & Chowdury, 2009). Microblogging facilitates electronic word-of-mouth (eWoM) behaviour by consumers who can share their opinions concerning brands. Given these precedents, microblogging is a viable medium for improving brand awareness and brand image, managing customer relationships, collecting customer feedback and influencing eWoM practices.

Key issues and concerns associated with the adoption of microblogging at work relate to privacy, communication benefits, signal-to-noise ratios and codification effort. Each of these has been independently demonstrated to influence adoption success (Günther et al., 2009).

In China, research into the organisational applications of microblogging is very limited. Zhang (2011) explores the application of Sina Weibo to viral marketing, drawing on a case study of Vancl, a B2C retailer in China, while Li, Cao, Jiang, Li, & Yao (2011) explore 22 official brand microblogs in an investigation of their commercial potential. The world’s most popular microblogging service, Sina Weibo, constitutes a virtual public space. It had 380 million users by the end of 2012, with about 100 million messages posted daily. It is used by well over 30% of Chinese Internet users (Wikipedia, 2012).

Instant Messengers (IM)

IM applications, such as MSN Messenger, Windows Live Messenger, G-Talk, QQ, Real Time eXchange (RTX), WangWang are designed to enable near-instantaneous text-based communication between interacting parties. More advanced IM applications such as Skype offer voice and video, hyperlinks to other media, and file sharing. IM-type applications have existed since the 1960s and as such have been researched for several decades. Web-based IM applications are now almost ubiquitous in organisations, often replacing email altogether between some groups of employees. IMs typically operate over the public Internet, but they can be configured to run off internal corporate servers with enhanced data security.

IM tools have been extensively researched in the Western literature. IM is often used to compensate for the lack of face-to-face interaction in situations such as “quick questions and clarifications, coordination and scheduling, to discussions of complex work” (Avrahami and Hudson, 2006: 505), as well as emerging issues (McKinsey, 2009). IM thus provides a complementary communication channel in the workplace, especially when employees are distributed. IM applications are widely used by people who need to maintain real-time contact with colleagues, no matter where they are located. Most IM users indicate their online availability, which means that they are open to contact and interruption (Garrett and Danziger, 2007). A core theme in IM research relates to the negative impacts associated with work interruption (Nardi, Whittaker & Bradner, 2000).

The use and impact of IM applications in the workplace in China have been investigated by Ou, Davison, Zhong & Liang (2010). QQ is an application of particular interest because it is used by over 600 million people (Wikipedia, 2012). As in the Western context, IM use was found to increase work interruption and disturbance. Paradoxically, it simultaneously led to

improvements in communication quality and levels of trust between colleagues, which in turn enhanced group outcomes. The explanation of the paradox is that work itself is accompanied by continuous interruption; interruption is normal and not particularly disturbing. Chang and Ian (2012) also focused on IM interruption at work. In the work place, IM can provide a channel for information sharing, instant connection and other new forms of collaboration. Thus, even though there are interruptions, the use of IM at work enhances personal awareness, interpersonal connectedness and the opportunity for knowledge sharing (Ou et al., 2010; Davison et al., 2013).

Wikis

Wikis are conversational technologies, which facilitate knowledge management processes from knowledge creation and storage to knowledge use and refinement (Wagner, 2004, Wagner and Bolloju, 2005). Standing and Kiniti (2011) explore how wikis can be used in different stages of innovation. They suggest that wikis need to be adopted and used within a structured environment that provides both a strategic and a top down framework. Majchrzak et al. (2006) identified three primary types of benefits from the use of corporate wikis: enhanced reputation, facilitated work, and helping the organization to improve its processes. These benefits were more likely to occur when the wiki was used for tasks requiring novel solutions and the information posted was from credible sources. Meloche, Hasan, Willis, Pfaff & Qi (2009) investigated employee attitudes in contributing to corporate wikis in order to suggest interventions that might improve employee involvement. They suggested that managers should take a discretionary approach in terms of rewarding participation, productivity, quality articles and good ideas.

Corporate concerns about Web 2.0

Despite the potential that these Web 2.0 technologies may bring to the work place, there are still many concerns and restrictions that may impede their implementation. Executives fear that these applications will facilitate non-productive activities such as chatting (Nardi et al., 2000). Günther et al. (2009) point out that a low signal-to-noise ratio will ultimately lead to the failure of enterprise microblogging, since insufficient useful content will be shared. There is also a concern that Web 2.0 applications will prove nothing more than a passing fad (Pfaff and Hasan, 2006), though their rapidly growing popularity during the past decade suggests that this concern is misplaced. A variety of other concerns, such as a reluctance to engage in power sharing, the risk of cyber vandalism, uncertainties over quality control and evaluation, and the absence of an appropriate organizational culture, may all lead to the still-birth, early abandonment or outright rejection of corporate wikis. The issue of organizational culture should not be overlooked. It is important that the primary purpose of establishing a corporate wiki should be embedded into the culture. If there is no clear purpose, or if the wiki is not focused on a specific business issue, then a wiki initiative is most unlikely to be successful (Chui et al., 2009).

METHODS

Given that the literature to date about Web 2.0 use in Chinese organisations has been rather limited, we decided that a case based exploratory study would be very helpful to understand how Chinese organisations use Web 2.0 applications. An open-minded qualitative approach was deemed necessary to discover where, how and why Web 2.0 was being used. We made contact with four organisations in a single industry within the professional services sector: software developers. The four firms had very different management styles, but their key activities all

involved substantial amounts of internal and external communication. Thus, there was considerable commonality of purpose across these firms in the use of Web 2.0 applications.

The four firms were located in Beijing (2), Chengdu and Xi'an. Our interview protocols involved asking how employees used Web 2.0 applications, what value those applications brought, and why they preferred some applications to others. In each firm, we typically interviewed 10-15 people ranging from senior managers to front-line staff, either individually or in small groups. Interviews lasting between 20 and 60 minutes were usually recorded with interviewees' permission and later transcribed.

MINI CASES

In this section, we present brief accounts of the way in which Web 2.0 applications are used in four Chinese software firms. Software firms are a type of professional service firms that tend to have high levels of knowledge intensity, a highly professionalised workforce and low levels of capital intensity (Nordenflycht, 2010). Knowledge workers in these firms commonly have a high degree of work autonomy, and hence are rarely directed into activities in which they have little interest (*ibid.*). Our accounts are deliberately written as mini-cases rather than as complete case studies, in order to illustrate the breadth and depth of Web 2.0 application.

Mercury

Mercury is a large software firm with over 12,000 employees. It is headquartered in Beijing and serves both domestic and international clients. Mercury has a restricted set of IT policies with respect to Web 2.0 applications. The exact restrictions depend on employee grade and department. Senior people have fewer restrictions than junior employees while the IT department

faces fewer restrictions than administrative departments like Human Resources and Finance. Employees who handle sensitive data, such as financial accounts and salaries, do not have access to any Web 2.0 applications. We found no evidence of wikis being used.

IM applications (MSN Messenger (MSN) and to a lesser extent QQ) are used by some employees. Microblogging is used for work by a few people in the Marketing or Communication departments (Weibo) and in IT (Yammer). QQ is completely forbidden for junior employees because of concerns about security leaks and malware, according to the IT Manager. However, senior people have more discretion and do use QQ, notably for the transfer of large files, as email attachments are limited to 10MB. MSN is used more widely, not only internally but also to communicate with former colleagues, industry experts and executive/personnel search agencies, when identifying new employees. MSN use is tolerated but not officially sanctioned. There is no official list of corporate MSN contacts. Each person must develop his/her own contact list.

Weibo is actively used by the marketing and communication departments. At the time of our interview (July, 2012), the total number of followers was around 500. However, most of these were internal employees and most of the content was social. The Marketing & Communication Director indicated an interest to extend this to clients and other external parties through a short term strategic plan built around connections with fans, topics and industry channels. The VP of Marketing suggested that current employees should use Weibo to promote Mercury to their friends who may be interested in working for the firm.

The IT Manager admitted that the current IT infrastructure and enterprise architecture lag behind corporate development. This is partly due to concerns about security loopholes associated with Web 2.0 applications. The current platform supports the existing 12,000 employees, but it cannot support the projected 30,000 to 50,000 that are expected within three years. There is an

intention to develop an internal platform for social networking by 2015. This platform would include a video-sharing hub that could be used to push information to employees. If this internal platform is successful, they may consider selling it as a regular product.

Beech

Beech is a large software firm with over 10,000 employees. It is headquartered in Beijing and primarily serves the domestic market. Compared with Mercury, the policies at Beech reflect a more relaxed attitude towards Web 2.0 applications. Only a few social networking platforms, like Kaixin and RenRen, and the video-sharing site Youku, are blocked. Wikis, IMs and Microblogs are all used actively. Employees reported using Web 2.0 applications primarily for functional and shallow communication. They complement the face-to-face interactions that are preferred for more serious discussion. However, the variety of Web 2.0 communication tools that are available is appreciated by many Beech employees. This enables different tools to be used for different purposes,

Beech operates a wiki called Xin Gan Xian (XGX). As a Product Manager explained: “XGX is a platform that has been online since 2007, and provides a variety of services to external clients (such as after sales service, online updates, e-marketing, and discussion forums)”. Clients are encouraged to join this wiki, to contact and share with each other, and so to build up a knowledge sharing culture that will help both them and Beech as a whole. A separate internal wiki for knowledge sharing and problem solving has been developed, but is used infrequently. Employees reported that there are simply too many applications to use. There is no management policy that demands usage of any particular application.

IM applications are widely used internally by Beech employees. Beech maintains an internal IM platform, where each employee has an account. The manager of the Research Centre told us: “This internal IM is often used to find phone numbers, check status information, communicate privately in situations where the telephone is not suitable, and solve problems. Normally we don't use it to support group discussion”. Employees also access public IM applications like QQ, which is particularly useful when communicating with external contacts such as clients, engaging in group discussions and transferring files. Many clients prefer to use QQ, so there is strong corporate support for QQ use by employees.

Most employees use Weibo as a social media tool within the company, e.g. in relation to corporate events. Only one interviewee, an employee in the Research Centre, mentioned use of Weibo to follow industry leaders. Its use for digital-marketing is a new development. Seven product lines had official Weibo accounts. However, it appeared that this was a pilot project that had yet to be evaluated for its impact on product awareness or sales.

Silver

Silver is a medium-sized software firm with over 800 employees. It is headquartered in Chengdu and primarily serves state-owned clients with social insurance applications in the hospital and military sectors. Most work is undertaken on long term contracts, which means that there is little need to contact new clients. The organisational culture at Silver is the most relaxed of the software companies. Any IT application can be used at any time, yet in practice only 1 or 2 applications are used with any regularity. However, there are strict rules about not discussing corporate information outside the firm.

An internal wiki for knowledge sharing exists, but it is controlled tightly and used infrequently. An R&D employee claimed: “We do write experience-based articles for the wiki, but these must be vetted by our managers and cannot be commented by others”. The HR Department uses the wiki to disseminate corporate and government policy information to employees. It thus acts as a static document repository, rather than being used for dynamic discussions. Weibo is scarcely used by anyone except for social purposes. However, a Sales employee said: “we would like to develop more new, non-state-sector clients, and envisage using Weibo for digital marketing in that context”.

The most popular social networking application at Silver runs on RTX (Real Time eXchange), a platform that was developed by TenCent (who also developed QQ) and is designed to provide a wide range of Web 2.0 functions. Employees in the Engineering Centre explained that “...apart from an IM (which can be used to contact internal employees and external clients), RTX also keeps details of experts in specific topic areas, telephone numbers, email addresses. RTX has better archiving functions than typical IM applications”. It can thus serve as a form of corporate memory, and also enable asynchronous work.

Silver does not permit the use of pseudonyms in RTX – all names are real. When a user is logged in to RTX, his/her online status is visible to all others who are online. RTX facilitates communications between the Chengdu headquarters, Silver sales teams located throughout China, and employees who are physically located in client offices. This leaves little need to use QQ, except to: contact ‘friends’ who are not on the RTX network; transfer large files; access corporate information when travelling. QQ and email can be accessed through cell phones, but RTX cannot. This is seen as a significant limitation by Sales people who need to travel regularly to branch sales offices and client sites. The Human Resource team is an active user of QQ

because they participate in an external HR group (200 members) in Chengdu and RTX does not support such interactions with outsiders.

Parana

Parana is a global software development company. Around 80 of its 300 China-based employees work in the Xi'an office. Reflecting the influence from a global mix of societal cultures, Parana has a generally open and relaxed attitude towards Web 2.0 and other communication technologies. In essence, any technology can be used if it facilitates productivity.

The primary corporate applications at Parana are Google-based, such as G-Talk, G-Mail, Google Groups, Google Apps and Docs. Skype is used extensively for remote video conferencing. MSN and QQ can be enabled if a client prefers to use these applications, but these IM tools are rarely used for internal communication due to security concerns. Weibo is used at the corporate level to promote products, but not for e-marketing. Individual employees often maintain Weibo accounts for thought leadership purposes, i.e. to track other industry thought leaders and to speak out as thought leaders themselves.

Web 2.0 applications are primarily used for horizontal communication in Parana. This flattened organization has very little vertical communication. In contrast to the traditional hierarchy found in Chinese businesses (Martinsons and Hempel, 1995), the global CEO of Parana occasionally sends emails to all employees and maintains a blog that anyone can comment on. Each product development team maintains near constant communication with its clients via Skype connections. Skype is left running continuously in many cases, albeit with microphones turned off. Skype provides a strong sense of presence (Damian, Lanubile & Mallardo, 2008) to both clients and providers, who can gain video and audio access at any time.

ANALYSIS

Following the CEF, we analyze our qualitative data according to the technological, organizational (social in the CEF) and discursive layers. Based on both our literature review and mini-cases, we propose that the use of Web2.0 applications such as IM, Microblogs and Wikis can enhance organizational communication and its outcomes. This process is contingent on external factors such as organizational support and a partner's media choice. Subsequently, such Web2.0-supported communication can improve individual, term and organizational performance as positive communication outcomes. We justify this Web 2.0 and organizational communication model (abbreviated as W2OC model, as shown in Figure 1) in the following section.

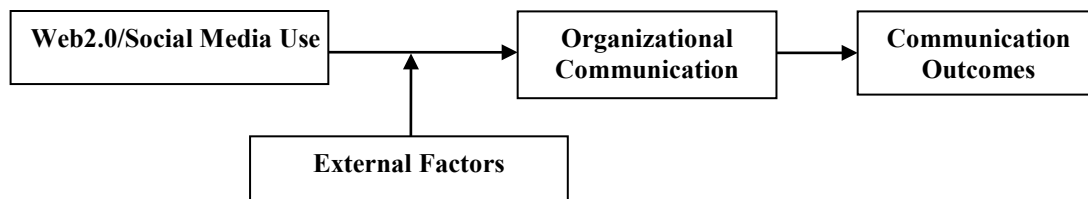


Figure 1. The Overview of Web 2.0 and Organizational Communication (W2OC) Model

(Based on the Communicative Ecology Framework)

The Technological and Discursive Layers in Web2.0-Supported Communication

The technological, discursive and social layers of the CEF are dynamically interwoven (Foth and Hearn, 2007). In the four mini-cases presented above, we illustrate this interweaving through Web 2.0 applications that enable a new world of networked, interactive communication. This communication encompasses knowledge sharing, digital marketing, interactive broadcasting, and social contacts. The technology supporting Web 2.0 applications is thus instrumental in facilitating the full richness of discursive content. Unlike the pre-Web2.0 era, when most organizational communication followed a hierarchical (vertical) structure (Hearn et al., 2009),

our mini-cases reveal that Web2.0 applications primarily support horizontal communication. The full proposed research model is presented in Figure 2 at the end of this section.

Supporting vertical communication

Vertical communication occurs between people at different levels of authority within a company, while horizontal communication occurs between people with the same level of authority (cf. Simpson, 1959). We adapt these communication norms slightly, and define *vertical communication* as top-down communication across the different levels of authority, while *horizontal communication* refers to the communication among peers, colleagues, suppliers, clients and customers in a broader sense irrespective of organizational hierarchical arrangements. Typical examples of vertical communications are senior executives involved in command/control efforts or norm creation and enforcement, internal marketing and information dissemination.

Based on our minicases, we argue that microblogging and IM applications in particular can help establish and strengthen corporate norms. Weibo is a powerful application with various multimedia functions that can reach both internal and external stakeholders. Using a top-down broadcasting approach, organizations like Mercury utilize Weibo to enhance the image of the company and products, publish company news, and connect different stakeholders including employees, current and potential customers, and suppliers. Weibo can also be used for disseminating personal status information to team members. Other than Weibo, IM tools such as MSN and QQ, are also widely used for managerial control and communication purposes. They have replacing email and other more traditional applications almost entirely. IM tools usefully provide a grouping function that can connect people virtually. This is particularly valuable when managing distributed teams. Through these various channels, information can be easily

disseminated to employees, who can use the same interactive applications to react or provide other information back to their managers. Since both Microblogging and IM applications can facilitate the fast turnover of ideas and discussion, which in turn can contribute to the establishment and strengthening of corporate norms, we propose:

Proposition 1: The use of Web 2.0 applications can enhance vertical communication in organizations with internal and external stakeholders, thereby establishing and strengthening corporate norms.

Supporting horizontal communication

Microblogging applications such as Weibo serve as a platform for information dissemination. Previously, companies needed to use magazines, press releases or conferences, newspapers or television to manage their public relations and brand image. Companies can now use social media to engage with their current and potential customers by sharing content, insights, opinions, profiles, hyperlinks and experiences. These same customers can also interact directly with the company through Weibo and re-broadcast selected information to contacts. Microblogging tools thus help customers to acquire product knowledge and make purchase decisions, thus serving as a powerful marketing tool. For instance, Mercury uses Weibo to attract potential employees, Beech uses it to attract new clients, and Silver plans to use Weibo for digital marketing.

Weibo is used so extensively in China that one's contacts may include: friends, colleagues, customers, and product experts. When initiating, eliciting or participating in a Weibo conversation, knowledge can be communicated and social relationships can be established among the various interlocutors. Consequently, microblogging is used increasingly by working professionals to share resources, ask questions of colleagues and peers, raise visibility of web

resources, and obtain both primary news and secondary commentaries and opinions. Employees at Mercury, Beech and Silver all reported relying on Weibo to follow opinion leaders in their industry. Given its interactive nature, Weibo is also useful to test concepts, exchange knowledge or opinions, and locate potential sources of knowledge and information. With the use of hashtags “#”, working professionals can read all messages with a shared tag, thus gleaning broader knowledge of an issue from different sources.

Instant Messengers can empower employees especially in their work-related horizontal communication. Ou et al. (2010) provided empirical evidence on the use of IMs to facilitate knowledge sharing and social relationships in Chinese organizations. An IM can emulate the sense of presence more commonly associated with face-to-face interactions. Pop-up message dialogue windows can stimulate an instant reaction. This bi-lateral, near-synchronous form of communication closely resembles the openness and transparency of non-mediated interactions. Instant interactions are inherently beneficial for distributed team members who work across geographical and temporal boundaries. By using IMs at work, collaborators can build up their common knowledge by quickly exchanging documents, referring to transcripts, and correcting misunderstandings as they interact. At the same time, IM has been among the fastest-growing technologies used to connect people and maintain interpersonal relationships (Li, Chau & Lo, 2005). IM is thus not only an effective social networking tool, but is also useful for sharing, transferring and documenting knowledge (Cho, Trier & Kim, 2005; Ou et al., 2010). We documented extensive use of IM tools for horizontal communication among peers and colleagues. In the software firms, MSN and QQ were both reported to be widely used for informal knowledge seeking and sharing, primarily inside the firm, as was RTX, an intranet-based IM, for information and knowledge exchange and social relationship maintenance.

Wiki applications enable employees to create, edit, update and publish content collaboratively. Consistent with previous research (Wagner, 2004, Wagner & Bolloju, 2005), we found that wikis were critical throughout the knowledge management process in Beech, from creation, through refinement and storage, to retrieval. Beech created a formal knowledge wiki in order to manage interactions with customers who can locate relevant information about specific software products, as well as undertake simple troubleshooting searches. The wiki is maintained by a dedicated team within Beech. In Silver, a wiki was used as an internal knowledge repository, but the right of users to edit or update content was removed. Consequently, the Silver wiki became more of a static knowledge repository than an interactive discussion space, and was little used. Within the organizational environment, our data suggest that wikis may be valuable for project and design collaboration, organizing a work team around a written project via exchanging participants' knowledge in wiki. If managed appropriately, wikis can be used to create, store, update and share organizational knowledge and information. Thus, we propose:

Proposition 2: The use of Web 2.0 applications can enhance horizontal communication for a variety of internal and external purposes related to: (1) internal communication: problem solving, knowledge exchange, social relationship; (2) external communication: marketing, thought leadership, recruiting, brand management, after sales service.

The Social Layer – Contingent Roles of Organizational and External Factors

The social layer of the CEF considers the roles of people, communities and organizations. In corporate and work-related communication, organizational factors play a critical role. There has been a widespread belief, especially among older and more senior managers, that Web 2.0 applications such as Weibo and IM are used primarily for social purposes, not work (Chui et al.,

2009). This belief was *not* very evident in our mini-cases. Many organizations have also routinely blocked Web 2.0 applications due to security concerns. An IT manager at Mercury mentioned deep concerns about the potential for malware such as viruses and Trojan horses to be transmitted through QQ. Nevertheless, management was supportive to some degree in each mini-case, thus enabling the successful adoption of selected Web 2.0 applications.

Mercury has applied a selectively restrictive policy to Web 2.0 applications. For junior employees, as well as those working in more sensitive functions, the restrictions are quite tight – QQ is blocked altogether. MSN is seen as being more secure, and so its use is permitted. Mercury is also evaluating Yammer as a microblogging tool for personal productivity. Meanwhile, both corporate management and individual managers use Weibo to communicate vertically with subordinates and team members. At Beech, Silver and Parana, corporate restrictions are less severe. All the Web 2.0 applications reviewed in this paper are permitted in each case. However, others such as Kaixin and Renren have been blocked because these too are seen as being primarily for social interaction, not work. Silver preferred to use an intranet-based IM tool – RTX – that is restricted to internal employees. If there is a need to contact external parties, and this is permitted, then QQ or MSN can be used. Parana made extensive use of video Skype to enable communication with distant clients. They also made use of a variety of Google applications such as Google Talk, Google +, Google Docs.

Another important influence on technology in the social layer is the ‘partner’s medium of choice’. Essentially, this recognizes that Web 2.0 applications are interactive, and require the participation of third parties. Thus, the technology preferences of outside parties – business partners, suppliers, customers, guests, even competitors – can influence an organization’s technology choices. Internal communications are less affected by these contingencies, since

employees normally use a common set of tools. However, senior managers who are not Web 2.0 literate, may prefer other IT applications, like email, or traditional face-to-face communications. External communications depend more on individual choice – or indeed mandate. Thus, a client or supplier might prefer to use QQ, yet internal policies may preclude this, unless exceptions are made. In Silver, most employees used RTX for internal communications, but had to switch to other channels (such as MSN and email) for external communication, as RTX was restricted to internal employees. In Parana, corporate policy meant that any application could be used if the client requested it. Therefore, we propose:

Proposition 3: The effects of Web 2.0 applications on enhancing vertical and horizontal communication are contingent on a) management support and b) the media preferences of partners, suggesting their moderating role in Web 2.0-supported communication processes.

Communication Outcomes

Vertical communication

Corporate norms are critical regulators of the way employees behave. Over time, these norms coalesce into an established set of working practices and the underlying values – a corporate culture. In our mini-cases, we saw evidence of these norms in various ways. In Silver, there were strict rules about sharing information beyond the corporate boundary. Reminders about these rules, as well as other ‘instructions’ relating to government regulations, were regularly disseminated through RTX (internal IM) by the HR office of the firm. Some of these norms were formally codified into a static database, but discussion and enactment of these codified norms took place in the Web 2.0 space inhabited by all employees.

In Parana, the corporate norms were global in scope and took on a strong ethical slant. Global senior management provided clear guidance regarding the kinds of work and the kinds of clients that were acceptable. The ethical values focused on sustainability and quality. Here, Weibo was used to enable thought leadership by senior managers throughout Parana's ecosystem, as well as beyond it. Consequently, Parana has become well known within the industry for its ethical position. When vertical communication is effective, corporate norms and culture can be easily transmitted to and assimilated by employees. This should exert a positive influence on communication outcomes, at the organizational, team and individual levels. Examples of communication outcomes include corporate performance and consistency, team satisfaction and efficacy, individual productivity and efficacy. Therefore, we propose:

Proposition 4: The vertical communication of corporate norms will exert a positive influence on work-related processes at the corporate, team and individual levels.

Horizontal communication

The horizontal communications described in this paper relate to work-related activities such as knowledge exchange, digital marketing and the establishment of work-related social relationships. Web 2.0 applications can facilitate each of these in different ways, moderated by the effects of managerial support and third-party media preferences. Knowledge exchange primarily takes place between individuals, who also establish relationships with one another. Digital marketing is more commonly seen at the corporate level, but can occur at any level – teams can engage in marketing and individuals can encourage (e.g. through Weibo) their friends to consider applying for jobs. However, irrespective of the level where the communication takes place, the effects can be felt at all levels. Individual and team productivity can certainly be

enhanced, satisfaction can be increased, and the organisation as a whole can benefit from these interactions. Akin to the Balanced Scorecard (cf. Martinsons, Davison & Tse, 1999), employee level activities cascade upwards to influence the performance of the team, which in turn cascades up to the corporate level. Thus we propose:

Proposition 5: The engagement in such horizontal communication activities as knowledge exchange, digital marketing and social relationship building will exert a positive influence on work-related processes at the corporate, team and individual levels.

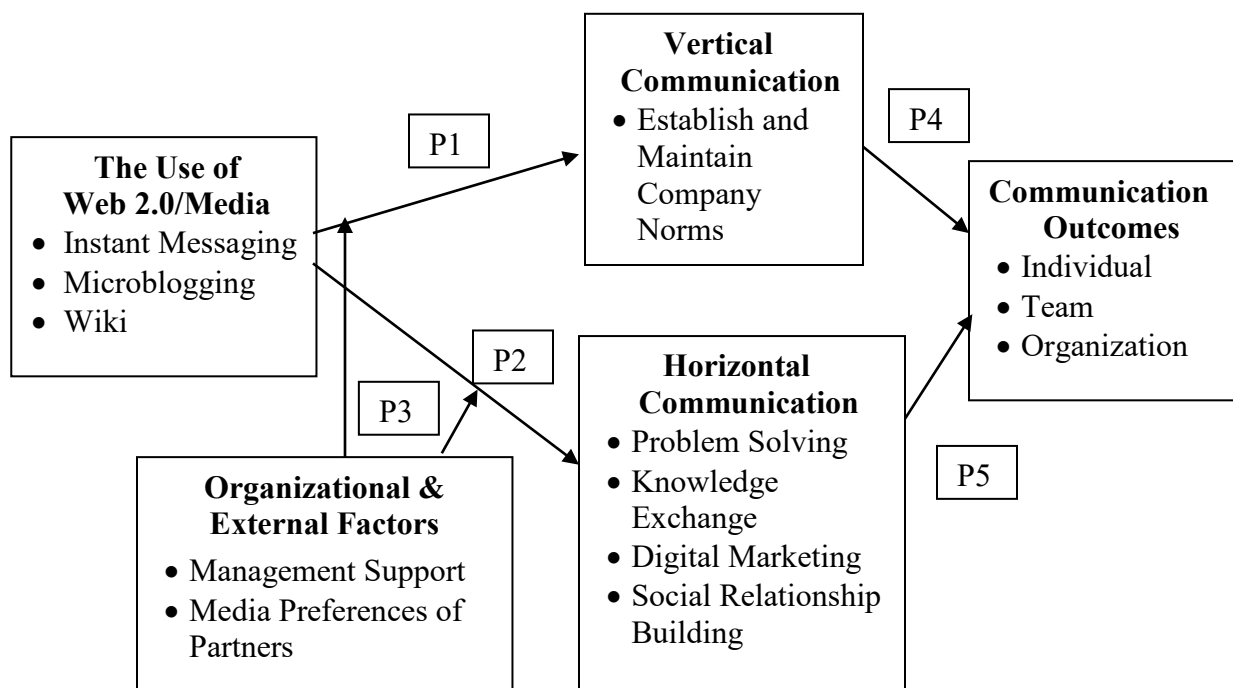


Figure 2. The Expanded W2OC Model

DISCUSSION

The Communicative Ecology Framework (CEF) has not, to the best of our knowledge, been used previously to study Web 2.0 technologies and their applications in organisational contexts. The CEF's separation of organisational communication into the technological, social and discursive layers helped us structure our analysis of Web 2.0 use in the four Chinese software development firms. From this data, we have developed five propositions that describe how Web 2.0 technologies facilitate horizontal and vertical communication processes in organisations, as well as the consequent outcomes of this communication.

We found that nearly every manager that we interviewed was keenly interested in the business value that can be created through social networking in the workplace. Our mini-cases indicate that based on the aim of creating such value, social networking tools are commonly adapted to the work networking context. Instant messengers, wikis, blogs, microblogs and other tools are all now encountered in the workplace. However, the extent to which these tools are accepted and used – by employees and especially managers – varies. Moreover, different tools are used for different purposes. This suggests a need to adopt a portfolio of Web 2.0 applications.

Management support for and championing of social media applications is critical, just as it has been with earlier IS applications (Martinsons, 1993). Many Web 2.0 projects have been terminated before being completed by suspicious or sceptical executives (Chui et al., 2009). Importantly, those in charge of IS budgets tend to rely on hard facts instead of personal or even crowdsourced opinions when making key management decisions. Thus, studies to determine when, where and how Web 2.0 applications enhance productivity may help to reduce managerial scepticism and generate the required support. Senior executives would then more likely to stimulate the adoption of these IT applications by serving as role models or providing informal

leadership (Martinsons, 1993). Remarkably, we did not find any evidence of such a study being undertaken by any of the four firms.

Within traditional Chinese organizations, managers at the top of the hierarchy may be expected to have a comparatively high degree of fear about losing control, but are also likely to have a disproportionate amount of authority to influence IT adoption decisions. The bottom-up nature of most IT applications that facilitate social networking conflicts with the tradition of top-down Chinese management. The high degree of horizontal communications enabled by Web 2.0 applications represents a specific challenge to the Chinese business hierarchy. Our mini-cases reveal that some organizations have responded to this challenge more progressively than others.

In more conservative organisations, Web 2.0 technologies have yet to be widely adopted. This can be related to two different layers of the CEF. At the technological layer, there are concerns about security and privacy. At the social layer, management fears that they will lose their discretionary power and control. The development of a customized Web 2.0 platform, such as RTX at Silver, reflects one response to these concerns and fears. The requirements or preferences of business partners may also be important. Significant pressure from a client or customer to communicate using Web 2.0 technology can encourage its adoption, even if on a selective basis.

In the more liberal organisations, Web 2.0 technologies are used already for both vertical and horizontal communication. They are particularly suited to horizontal communication between colleagues and peers, both inside and outside the organisation. Web 2.0 may also be appropriated by senior managers who recognise their communicative power and affinity with a younger generation of employees for whom social networking is second nature. The adoption of Web 2.0 rarely raised concerns about censorship or content restrictions, but security is a major

concern. It is well recognised that some Web 2.0 technologies (e.g. QQ) are inherently open to attack by malware and other bugs.

The use of Web 2.0 technologies in the workplace should ideally be analysed in conjunction with non-Web 2.0 technologies, and indeed non-technology based solutions as well. The communication ecology framework appears to be useful for structuring such an analysis

In some of our mini-cases, Web 2.0 technologies have almost completely replaced other communication and collaboration tools or media. In other cases, Web 2.0 technologies are used in conjunction with email and other communication platforms. For instance, we noted a strong preference in Parana for face-to-face meetings over mediated communications. Yet when such meetings are not possible, various forms of Web 2.0 based communication, as well as email, are used comfortably. An Australian client of Parana noted:

“We use chatroom software constantly as well as Skype. Text based chat is good for quick exchanges of information – especially technical stuff where oral chat can be ambiguous. Quite often we will switch backwards and forwards between a Skype chat with video (perhaps with screen sharing to demonstrate something) and text chat – depending on the context. If we've had a very technical chat about something where confusion may be likely, then we follow up with an email summarising the conversation to ensure that we have it right”.

This interview data, together with material in the Appendix, provide strong support for the proposed W2OC model, suggesting the interweaving of the technology, social layers and communication performance.

CONTRIBUTIONS, FUTURE RESEARCH AND CONCLUSIONS

The primary contributions of this study come from our analysis of the Web 2.0 applications used for vertical and horizontal communication by Chinese software firms. The W2OC model (Figure 2) is grounded on the data collected from our interviews and observations. It extends the original Communicative Ecology Framework (CEF) by articulating its key components. This W2OC model provides a logical framework for both researchers and managers to analyze their use of IT applications, the impact of those applications on communications, and sequentially the impact on organizational performance.

Practically speaking, we found a wide variety of work practices in the Chinese software firms. Although none of the firms that we studied have conducted a systematic evaluation of the impact of their Web 2.0 applications on key performance indicators, we observed clear and consistent advantages conferred by these same technologies. The benefits were most obvious in situations where people are separated in space and time. We found that some employees were “living online”, having developed a near symbiotic relationship with the Web 2.0 technologies. Their reliance was such that life without Web 2.0 is hard to imagine (cf. Schultze and Mason, 2012). The Web 2.0 technologies were actively used in the workplace. However, their business benefits of social media will only be realized when their use fits with the organizational cultures and is supported by top management.

We also observed some tensions between the adoption of Web 2.0 applications and the traditional top-down hierarchy of Chinese management. This may reflect the inherent nature of Web 2.0 technology. With more traditional IT applications such ERP systems, compliance is mandated from the top. In contrast, the success of IT-mediated social networking depends on

individual contributions that are difficult to mandate. Personal information needs and egos may be more important to motivate participation than monetary rewards or other tangible incentives.

Remarkably, the firm with the most globalized operations and culture (Parana) had made more progress with Web 2.0 applications than its more traditional Chinese business counterparts. We found that Parana had a comparatively more open and relaxed attitude towards Web 2.0 in general. Organizational members could use any IT that facilitated productivity. This not only encouraged the extensive use of Web 2.0 applications for periodic communication and collaboration, but also provided the basis for building more permanent online communities. The high intensity of horizontal communication together with the rarity of vertical communication distinguished Parana from the other three firms. Flattened organizations such as Parana may portend a Web 2.0-induced trend among businesses in China and other hierarchical societies.

In addition to the above theoretical and practical contributions, this study also opens up various research opportunities. The natural next step is to validate our five propositions. This would ideally be done by surveying a large number of employees in different industries. Initially we will restrict this survey population to the professional services sector, but ultimately we expect to collect data from other industries as well. Through this process, we hope to develop a better understanding of how Web 2.0 applications can significantly influence horizontal and vertical communication in Chinese firms. This will then enable us to provide strong guidance to managers, as well as make theoretical contributions aligned with the CEF.

We also suggest that the dynamic interaction between Web 2.0 technologies, other Internet-based technologies and non-technological communication patterns be investigated carefully. This is not a topic that we have explored carefully in this paper, but we do see evidence to suggest that this interaction is significant. A piecemeal analysis of different

technologies is at best artificial, and at worst misleading, since in reality managers and workers use many different technologies and interaction styles. Solid recommendations for practice need to be based on the entirety of that practice, not simply a portion of it in isolation. Thus, more holistic, context-based and intensive research methods seem to be appropriate.

Our focus was on software development firms. They can be classified as belonging to the professional services sector. Clearly many firms do not involve professional services. Even within the professional services sector, there are many different types of firms that may operate in very different ways. For instance, banks and other financial institutions may have very different communication patterns than software developers given greater concerns about information systems security and the confidentiality of personal and financial data. These may preclude the use of certain technologies that are perceived to be less secure. We thus encourage researchers to collect more extensive evidence from a broad population of organizations in future.

In conclusion, we recommend that other researchers examine the applicability of the CEF. We agree with Foth and Hearn's (2007) implicit arguments that communication practices, and the underlying technologies, constitute an ecosystem that is worthy of investigation. Thorough analysis of these ecosystems should reveal findings that are of significant value not only to researchers of organizations and their management, but also to practitioners. The latter include employees at all levels in organisations, not just managers. Indeed, while we found extreme forms of Web 2.0 use, with employees engaging in multiple parallel chats on IM, we also observed more balanced behaviours, with assorted technologies being dynamically blended in support of a complex set of knowledge-based work-related goals.

REFERENCES

- Acar, A. & Muraki, Y. 2011. Twitter for crisis communication: Lessons learned from Japan's tsunami disaster. *International Journal of Web Based Communications*, 7: 392-402.
- Altheide, D.L. 1994. An ecology of communication: Toward a mapping of the effective environment. *The Sociological Quarterly*, 35: 665-683.
- Altheide, D.L. 1995 *An ecology of communication: Cultural formats of control*. New York: Aldine de Gruyter.
- Avrahami, D. & Hudson, S.E. 2006. *Communication characteristics of instant messaging: Effects and predictions of interpersonal relationships*, in Proceedings of the 20th Conference on Computer Supported Cooperative Work. New York, NY, 505-514.
- Bai, C.E., Liu, Q., Lu, J., Song, F.M. & Zhang, J.X. 2004. Corporate governance and market valuation in China. *Journal of Comparative Economics*, 32: 599-616.
- Barnlund, D. 1979. A transactional model of communication. In C. D. Mortensen (Ed.), **Basic Readings in Communication Theory**. 47-57. New York: Harper and Row.
- Ben-Harush, O. 2010. Communication patterns within social networks: A case study of Australian women, *PLATFORM: Journal of Media and Communication*, April, 6-22.
- Björkstén, J. 2007. Personal communication, March 2.
- Boulos, M. & Wheeler, S. 2007. The emerging Web 2.0 social software: An enabling suite of sociable technologies in health and health care education. *Health Information and Libraries Journal*, 24: 2-23.
- Button, A.J. & Partridge, H.L. 2007. Community networks today: Analysing new media for local social networking and community engagement. In L. Stillman & G. Johanson (Eds.) *Communities and Action*: CIRN Conference, November 5-7, Prato, Italy.

- Cetina, K.K. 2009. What is a pipe? Obama and the sociological imagination. *Theory, Culture and Society* 26(5): 129-140.
- Chang, H.J. & Ian, W.Z. 2012. Instant messaging and interruption in organizational settings: A Social Presence's Perspective. *First Monday*, 17(3):
<http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/3741/3180>
- Cho, H.K., Trier, M. & Kim, E. 2005. The use of instant messaging in working relationship development: A Case Study. *Journal of Computer-Mediated Communication*, 10, 4.
- Chui, M., Miller, A. & Roberts, R.P. 2009. Six ways to make Web 2.0 work. *McKinsey Quarterly*, http://www.mckinseyquarterly.com/Six_ways_to_make_Web_2_0_work_2294
- Damian, D., Lanubile, F. & Mallardo, T. 2008. On the need for mixed media in distributed requirements negotiations. *Journal of Transactions of Software Engineering*, 34: 116-132.
- Davison, R.M., Ou, C.X.J. & Martinsons, M.G. 2013. Information technology to support informal knowledge sharing. *Information Systems Journal*, 23: 89-109.
- Dennis, A.R., Fuller, R.M. & Valacich, J.S. 2008. Media, tasks, and communication processes: A theory of media synchronicity. *MIS Quarterly*, 32: 575-600.
- Ebner, M., Kickmeier-Rust, M. & Holzinger, A. 2008. Utilizing wiki-systems in higher education classes: A chance for universal access? *Universal Access in the Information Society*, 7: 199-207.
- Foth, M. & Hearn, G. 2007. Networked individualism of urban residents: Discovering the communicative ecology in inner-city apartment buildings. *Information, Communication and Society*, 10: 749-772.

- Garrett, R.K. & Danziger, J.N. 2007. IM = Interruption management? Instant messaging and disruption in the workplace. *Journal of Computer-Mediated Communication*, 13(1): <http://jcmc.indiana.edu/vol13/issue1/garrett.html>.
- Günther, O., Krasnova, H., Riehle, D. & Schöndienst, V. 2009. **Modeling microblogging adoption in the enterprise**, Proceedings of the 15th AMCIS, San Francisco, August 6-9.
- Hearn, G.N., Foth, M. & Gray, H.L. 2009. Applications and implementations of new media in corporate communications: An action research approach. *Corporate Communications*, 14: 49-61.
- Isaacs, E., Walendowski, A., Whittaker, S., Schiano, D. & Kamm, C. 2002. The character, functions, and styles of instant messaging in the workplace. **Proceedings of the ACM Conference on Computer Supported Cooperative Work**, New Orleans, USA, 11-20.
- Jansen, B.J., Zhang, M., Sobel, K. & Chowdury, A. 2009. Twitter power: Tweets as electronic word of mouth. *Journal of the American Society for Information Science*, 60: 2169-2188.
- Jarvenpaa, S.L. & Majchrzak, A. 2008. Knowledge collaboration among professionals protecting national security: Role of transactive memories in ego-centred knowledge networks. *Organization Science*, 19: 260-276.
- Java, A., Song, X.D., Finin, T. & Tseng, B. 2007. *Why we Twitter: Understanding microblogging usage and communities*, Joint 9th WEBKDD and 1st SNA-KDD Workshop, August 12, San Jose, CA.
- Li, D., Chau, P.Y.K. & Lou, H. (2005) Understanding individual adoption of instant messaging: An empirical investigation. *The Journal of the Association for Information Systems*, 6(4): 102-129.

- Li, G.Y., Cao, J.P., Jiang, J., Li, Q. & Yao, L. 2011. **Brand tweets: How to popularize the enterprise microblogs**, 6th International Information Technology and Artificial Intelligence Conference, 136-139
- Majchrzak, A., Wagner, J.C. & Yates, D. 2006. *Corporate wiki users: Results of a survey*. Proceedings of WikiSym 2006, 99-104.
- Martinsons, M.G. (1993) Cultivating the champions for strategic information systems. *Journal of Systems Management*, 44(8): 31-34.
- Martinsons, M.G., Davison, R.M. & Tse, D.S.K. 1999. The balanced scorecard: A foundation for the strategic management of information systems. *Decision Support Systems*, 25: 71-88.
- Martinsons, M.G. & Hempel, P.S. (1995). Chinese management systems: Historical and cross-cultural perspectives, *Journal of Management Systems*, 7(1), 1-11.
- McKinsey 2009. *McKinsey Global Survey Results, How companies are benefiting from Web 2.0*, https://www.mckinseyquarterly.com/How_companies_are_benefiting_from_Web_20_McKinsey_Global_Survey_Results_2432
- McLuhan, M. 1962. *The Gutenberg galaxy: The making of typographic man*. London: Routledge and Kegan Paul.
- McLuhan, M. 1964. *Understanding media: The extensions of men*. New York: McGraw-Hill.
- Meloche, J. A., Hasan, H. M., Willis, D., Pfaff, C. & Qi, Y. 2009. Co-creating corporate knowledge with a wiki. *International Journal of Knowledge Management*, 5(2): 33-50.
- Nardi, B., Whittaker, S. & Bradner, E. 2000. **Interaction and outreaction: Instant messaging in action**. In Proceedings of the ACM Conference on Computer Supported Cooperative Work, Philadelphia, USA, 79-88.

- Nordenflycht, A. von 2010. What is a professional service firm? Toward a theory and taxonomy of knowledge-intensive firms. *Academy of Management Review*, 35: 155-174.
- O'Reilly, T. (2005) **What is Web 2.0: Design patterns and business models for the next generation of software**. O'Reilly Media, <http://www.oreillynet.com/lpt/a/6228/>
- Ou, C.X.J. & Davison, R.M. 2011 Interactive or interruptive: Instant messaging at work. *Decision Support Systems*, 52: 61-72.
- Ou, C.X.J., Davison, R.M., Zhong, X.P. & Liang, Y. 2010. Empowering employees through instant messaging. *Information Technology and People*, 23: 193-211.
- Pfaff, C.C. & Hasan, H. 2006. **Overcoming organizational resistance to using wiki technology for knowledge management**. Proceedings of the 10th Pacific Asia Conference on Information Systems, July.
- Qu, Y., Huang, C., Zhang, P. & Zhang, J. 2011. **Microblogging after a major disaster in China: A case study of the 2010 Yushu Earthquake**, Proceedings of the Conference on Computer Supported Cooperative Work, Hangzhou, China, 25-34.
- Riemer, K., Richter, A. & Behringer, M. 2010. Enterprise microblogging: Procrastination or productive use? *Business Information Systems Engineering*, 2: 391-394.
- Schultze, U. & Mason, R.O. 2012. Studying cyborgs: Re-examining Internet studies as human subjects research. *Journal of Information Technology*, 27: 301-312.
- Simpson, R.L. 1959. Vertical and horizontal communication in formal organizations. *Administrative Science Quarterly*, 4: 188-196.
- Smith, M. E., Nguyen, D., Lai, C., Leshed, G. & Baumer, E.P. 2012. Going to college and staying connected: Communication between college freshmen and their parents. In

- Proceedings of the Conference on Computer Supported Cooperative Work. February 11-15, Seattle, WA.
- Standing, C. & Kiniti, S. 2011. How can organizations use wikis for innovation? *Technovation*, 31(7): 287-295.
- Tacchi, J., Slater, D. & Hearn, G. 2003. *Ethnographic action research: A user's handbook*. New Delhi: UNESCO.
- Turner, T., Qvarfordt, P., Biehl, J.Y., Golovchinsky, G. & Back, M. 2010. *Exploring the workplace communication ecology*. Proceedings of the Conference on Computer Human Interaction, 841-850.
- Wagner, C. & Majchrzak, A. 2007. Enabling customer-centricity using wikis and the wiki way. *Journal of Management Information Systems*, 23(3): 17-43.
- Wagner, C. 2004. Wiki: A technology for conversational knowledge management and group collaboration. *Communications of the AIS*, 13(9): 265-289.
- Wagner, C. & Bolloju, N. 2005. Supporting knowledge management in organizations with conversational technologies: Discussion forums, weblogs, and wikis. *Journal of Database Management*, 16(2): 1-16.
- Yu, H.Q. 2006. From active audience to media citizenship: The case of post-Mao China. *Social Semiotics*, 16: 303-326.
- Zhang, H.C. 2011. *Microblog marketing in China*, Master of Science Thesis in Media Technology, Royal Institute of Technology, Stockholm, Sweden.
- Zhao, D.J. & Rosson, M.B. 2009. *How and why people Twitter: The role that microblogging plays in informal communication at work*. Proceedings of the GROUP 2009 Conference, May 10-13, Sanibel Island, Florida, USA, 243-252.

Appendix: The Use of Web 2.0 Applications in Four Chinese Software Firms

Company Name	Web 2.0 Application	Examples of Vertical Communication	Examples of Horizontal Communication
Mercury	Weibo	Internal News Distribution Digital Marketing of products Personal Status Updates	Opinion leadership by senior programmers Contacting potential employees Social interaction among employees
	Yammer	Internal News Broadcast to IT staff	Knowledge sharing among IT staff
	MSN	Contact industry experts and executive search agencies	General Discussion by employees
	QQ		Transfer of large files by managers
Beech	Weibo	Product Status Updates (7 product lines have individual Weibo accounts); Digital Marketing	Follow industry leaders' opinions
	MSN		General Discussion by employees
	QQ	Contact with clients who prefer this channel	Internal communication with employees
	Internal IM		Repository for information for all employees

	Wiki-based Client Community (XGX)	Pre- and Post Sales Interaction with clients/customers; Online updates; E-marketing; Discussion forums	
	Internal Wiki		Static Knowledge Repository
Silver	Weibo	Digital Marketing	
	QQ	Group based discussion by people in similar positions across Chengdu	File transfer
	RTX	General corporate resource for all employees	General Discussion by employees
	Wiki	Disseminate corporate and government information	Little used Static Knowledge Repository
Parana	Skype		General Discussion by employees and clients
	Google Talk		Interactive Knowledge Sharing by employees
	Google Groups		Interactive Knowledge Sharing by employees
	Blog	CEO communication to all employees	
	Weibo	Product promotion	Opinion Leadership by Senior Programmers Contacting potential employees