Computer-mediated communication and social networking tools at work

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Abstract

Purpose – Advances in information technology (IT) have resulted in the development of various computer-mediated communication (CMC) and social networking tools. However, quantifying the benefits of utilizing these tools in the organizational context remains a challenge. In this study, the authors aim to investigate the effects of three specific tools, viz. instant messenger, email and knowledge forum, on facilitating the communication and social network at work, and their subsequent influence on individuals' work performance. Together with a social network diagram, the proposed model is validated by a survey of 59 employees of a company which embeds these three CMC and social networking tools in the work process. The key findings, implications and future research are discussed.

Design/methodology/approach – The authors verify the research model with data from the Hong Kong office of an international bank headquartered in London, UK. They also collected the data on the social networks of 59 employees to draw a network diagram of the respondents using the social network analysis software UCINET.

Findings – The research model is fully supported by the survey data. Meanwhile, the social networks analysis also suggests the linkage of using IM at work and the high level of degree and high level of closeness.

Originality/value – This study provided an empirical verification of media performance theories, evidenced by interactive tools such as IM and email. This research also directly linked the elements of social network, viz. degree, closeness and betweenness, with the CMC and social network tools, the communication, interactivity, relationship, and work performance.

Keywords Computer-mediated communication (CMC), Social network tools, Social network analysis, Work performance, Communication, Social networks

Paper type Research paper

1. Introduction

Communication is an important part of human activities. One of the core values of information systems (IS) is the utilization of technologies to facilitate communication in the workplace (Quan-Haase et al., 2005). Accordingly, various computer-mediated-communication (CMC) technologies have been proposed and...
designed to enhance performance through improvements in communication. Under the larger umbrella of CMC technologies, social networking tools are designed to facilitate interlocutors’ communication so as to strengthen their social relationships. Typical tools used in the workplace include instant messenger (IM), e-mail, knowledge sharing forums and company blogs. These CMC and social tools have recently become increasingly recognized as important for the workplace. Specifically, Deloitte (Gandal and Sharma, 2009) predicts that the key technological trend in this decade will be the use of information technology (IT) to shape social networks in organizations and subsequently enhance organizational performance. Social networking tools have gained momentum in practice. However, academic research has rarely investigated the impact of these technologies on the quality of social networks and interaction.

Parallel to the above practitioners’ observations, there is a tradition of academic research focusing on technology adoption. This stream of research, for instance, media richness theory (Daft and Lengel, 1986) and technology adoption model (Davis, 1989), studied the influencing factors for individual or organizational choices with respect to media or technology adoption and use. In contrast to the focus of factors influencing technology adoption, a recent research area emphasizes the media and technology performance, namely, the outcomes of utilizing media or technology. Notably, media synchronicity theory (MST) focuses on the capability of media to support synchronicity, termed as a shared pattern of coordinated behaviour among individuals working together (Dennis et al., 2008). MST also contends that the use of multiple media, either concurrently or consecutively, will lead to better communication and subsequently task performance because media synchronization can provide an ideal combination of media capabilities. MST, as “a theory of communication performance” (p. 579), thus offers a basis for theorizing how the use of CMC tools can spawn high-quality communication among buyers and sellers. Although MST has provided us with a conceptual cornerstone to investigate a technology’s performance in the workplace, its empirical verification and its applications in examining CMC and social networking tools’ performance in the workplace warrants investigation.

In order to address the above-mentioned research gaps, in this research we investigate the effectiveness of CMC and social networking tools on work performance through social network theory (Rogers, 1986) and MST (Dennis et al., 2008). Specifically, we examine three CMC and social networking tools, namely, IM, e-mail and knowledge sharing forums, used in the workplace because of their popularity (cf., Gandal and Sharma, 2009). We argue that these three social networking tools can function as work task-oriented CMC tools. At the same time, these three CMC tools have the capability to shape well-connected social networks for the interlocutors at work, merging the interpersonal and work relationships together with the aid of CMC tools. With the utilization of these tools, quality communication process, interactivity and relationship networks among interlocutors can be established and strengthened, subsequently leading to enhanced individual work performance.

In the next section, we provide the theoretical justification for these arguments and develop corresponding hypotheses. We then describe the research context and the survey method, focusing on a work team covering 59 team members in a bank. Following the structural equation modelling and social network analyses, we summarize the findings and suggestions for the research. We conclude the chapter with implications and contributions.
2. Theoretical development

We rely on social network theory (Rogers, 1986) and MST (Dennis et al., 2008) to develop the research model. Specially, Rogers (1986) defined communication as “a process in which participants create and share information with one another in order to reach a mutual understanding” and therefore a communication network is described as “the interpersonal linkages created by the sharing of information in the interpersonal communication structure, that is, the network”. MST (Dennis et al., 2008) focuses on the ability of media to support synchronicity, a shared pattern of coordinated behaviour among individuals as they work together. CMC tools used at work are designed to enhance the communication which may subsequently influence the work performance (cf., Quan-Haase et al., 2005). Following these three streams of conceptual discussions, we propose that three specific CMC and social networking tools, namely, IM, e-mail and knowledge forums, have the potential to enhance individual employees’ work performance by facilitating their communication process, enabling interactivity and building relationship networks in the workplace. The theoretical model is summarized in Figure 1. We detail the justifications to the hypotheses below.

2.1 The effects of IM used at work

IM as a communication tool has been described as a technology that allows “users to set up a list of partners who will be able to receive notes that pop up on their screens the moment one of them writes and hits the send button” (Castelluccio, 1999, p. 35). As a prominent CMC tool, IM can stimulate an instant reaction via a near-synchronous form of communication that closely resembles the openness and transparency associated with face-to-face interaction (Ou et al., 2010). Scholars had suggested IM is impactful in enhancing active control (Nardi et al., 2000), two-way communication (Li et al., 2005) and synchronicity (Li et al., 2005; Nardi et al., 2000) which are building blocks of interactivity (Liu, 2003; Teo et al., 2003). IM is thus considered as an impactful CMC tool to enhance communication quality. Although contradicting effects have been found in IM’s effects on work interruption (Cameron and Webster, 2005), the positive influence of using IM in communication and enhanced team satisfaction is evident (Ou and Davison, 2011).

In the social context, scholars have highlighted IM’s ease of use (Li et al., 2005) and effects on developing friendships (Hu et al., 2004). In the workplace context, Cho and his colleagues (Cho et al., 2005) have provided the evidence, via a case study, for establishing a social network with IM. IM enhances mutual understanding of

![Figure 1. The proposed research model](image-url)
individuals and thus promotes collaboration exchange. Employees can ask for, share and exchange knowledge with their contacts easily by using IM (Ou et al., 2010). Through knowledge sharing in IM, people maintain a stable work relation with their contacts and hence guanxi networks can be formed. Integrating the above arguments, we thus propose that:

\( H1a. \) The use of IM at work has a positive effect on communication process.

\( H1b. \) The use of IM at work has a positive effect on interactivity.

\( H1c. \) The use of IM at work has a positive effect on relationship network.

2.2 The effects of e-mail used at work

In the past two decades, e-mail has become more and more popular in the workplace. Researchers have attempted to explain the effects of e-mail using different theories. For example, media richness theory (Daft and Lengel, 1986) suggests that e-mail is a leaner medium due to the text based and asynchronous nature of e-mail. However, a passive receiver of e-mail messages can act as an active participant by creating valuable meanings based on the text messages and create rich contents in the e-mail (DeSanctis and Poole, 1994; Lee, 1994; Ngwenyama and Lee, 1997). There is also evidence that communication richness depended on the interaction between the medium and its users rather than the medium itself. On the one hand, e-mail allows near-synchronous transfer of information. From this perspective, the use of e-mail at work has simplified the communication route by facilitating prompt responses between interlocutors, thus enhancing the interactivity and communication process. On the other hand, e-mail also allows interlocutors more time, especially in the work context, to organize their thoughts before putting them into the responses. From this perspective, e-mail is considered as a suitable CMC tool for equivocal communication tasks, even for establishing business strategies (Markus, 1994; Lee, 1994; Ngwenyama and Lee, 1997). Meanwhile, a single e-mail can be sent to the whole work team or relevant people in the company, easily reaching the whole work network and eliminating the spatial barriers. Therefore, we propose that:

\( H2a. \) The use of e-mail at work has a positive effect on communication process.

\( H2b. \) The use of e-mail at work has a positive effect on interactivity.

\( H2c. \) The use of e-mail has a positive effect on relationship networks.

2.3 The effects of knowledge forum used at work

Typical knowledge forums are the corporate portals providing organizations a workspace to generate and exchange knowledge based on rich and complex information. Most portals or knowledge forums enable content publishing in the workplace and the personalization of the interface. Publishing supports content creation, authorization, inclusion and includes the ability to render or publish documents, information and knowledge in the forum. Personalization allows users to modify their own interface. For instance, Microsoft SharePoint Design bundled with the Microsoft Office Professional is used to customize SharePoint portals. Personalization also enables the system (knowledge forum in this study) to dynamically deliver the most relevant information to
users in order to perform their job (Benbya et al., 2004). Such a process can dramatically facilitate the communication process by embedding knowledge sharing in the work process. With the knowledge sharing forum, a company can provide employees with in-time relevant information they need to perform their duties and make efficient business decisions. For example, Voelpel and Han (2005) documented how Siemens’s corporate knowledge sharing forum, namely ShareNet, supported tens of thousands of users and contributed to the employees’ collaboration, even across the teams. The corporate knowledge from employees can be stored, retrieved and reused for achieving work objectives. During the exchange process, knowledge can be amplified and expanded, as evident in the case of ShareNet (Voelpel and Han, 2005). In spite of physical and geographical restrictions of employees, a knowledge forum provides a company with a huge relationship network to facilitate employees’ sharing in a structured and digital environment. We therefore propose that:

$H3a$. The use of a knowledge forum at work has a positive effect on communication process.

$H3b$. The use of a knowledge forum at work has a positive effect on interactivity.

$H3c$. The use of a knowledge forum has a positive effect on relationship networks.

2.4 Shaping work performance with communication, interactivity and relationship network

According to Rogers (1986), communication is a process in which participants create and share information with one another in order to reach a mutual understanding, and therefore a communication network is described as “the interpersonal linkages created by the sharing of information in the interpersonal communication structure, that is, the network”. Based on this concept of social network, Borzel (1998, p. 262) further suggested that “networks are based on communication and trust”. Considering social networks represent the webs of personal relationships (Buckley et al., 2006), we argue that communication between employees in a well-connected social network encourages employees to share information about business problems and processes. This is likely to improve the work performance of each individual in an organization (Mohr and Sohi, 1995). Interactivity captures the degree to which participants can modify the form and the content of a mediated environment with more active controls in a real time of dialogues (Steuer, 1992; Teo et al., 2003; Liu, 2003). In the work environment, individual performance is improved if employees can ask questions and seek help from others through accurate, timely and effective communication (Mohr and Sohi, 1995; Rodwell et al., 1998). This view is consistent with MST’s (Dennis et al., 2008) conceptual arguments that synchronicity (one dimension of interactivity in this study) contributes to the mutual understanding of interlocutors. We argue that socially networked teams and individuals can benefit from a harmonious atmosphere for collaborative work. More importantly, a relationship network functions as an enabler of knowledge sharing by reducing the search costs of receivers and assuring the quality of knowledge (Ou et al., 2010), thereby allowing employees to achieve higher levels of outcomes by enhancing work quality. We therefore propose:

$H4$. Communication process has a positive effect on work performance.
**H5.** Interactivity has a positive effect on work performance.

**H6.** Relationship network has a positive effect on work performance.

### 3. Methodology

We operationalize the constructs based on the literature. The independent variables, IM, e-mail and knowledge forum used at work were measured based on the conceptualization provided by Kraut *et al.* (1992). We followed Dennis *et al.*’s (2008) conceptualization of MST to operationalize communication process as conveyance and convergence processes. The measures of interactivity covered active control, two-way communication and synchronicity, following (Liu, 2003; Lowry *et al.*, 2009). Relationship network captured the basic elements of the web of personal relationships, following Buckley *et al.* (2006). We measured the dependent variable – work performance – in terms of an employee’s work standard, work quality and work performance level, using the scales from Rodwell *et al.* (1998).

We verify the above research model with organizational data. Global Bank (a pseudonym), an international bank headquartered in London, UK, is the focal point of this research. Global Bank emphasizes providing localized services to globally-distributed customers. Currently three CMC and social networking tools are employed in the company, namely IBM SameTime (an IM tool), Microsoft SharePoint portal (a knowledge sharing forum) and corporate Lotus Notes e-mail system. Appendix 1 lists the screen dumps of these three tools used in Global Bank. We selected Global Bank as the research focus because of its utilization of these three specific CMC and social networking tools in the workplace. Meanwhile, one of the authors worked in one major office of Global Bank, the Hong Kong office, with 61 staff in total. In order to verify the research model, he observed and collected survey responses from 59 employees in that office in 2010, yielding a response rate of 96.7 per cent. The data collected from one particular office, but not all branches of Global Bank, allows us to draw a meaningful social network diagram based on a naturally and physically connected workforce. Table I contains the demographic summary of all 59 respondents.

In addition to the structural research model, we also collected the data on the social networks of these 59 employees, intending to draw a network diagram of the respondents using the social network analysis software UCINET.

<table>
<thead>
<tr>
<th>Items</th>
<th>%</th>
<th>Items</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td>Position</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>72.88</td>
<td>Manager</td>
<td>15.25</td>
</tr>
<tr>
<td>Female</td>
<td>27.12</td>
<td>Assistant manager</td>
<td>55.93</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td>Non-management employee</td>
<td>28.81</td>
</tr>
<tr>
<td>Bachelor degree</td>
<td>72.88</td>
<td>Work history at Global Bank</td>
<td></td>
</tr>
<tr>
<td>Master degree or above</td>
<td>27.12</td>
<td>Less than 6 months</td>
<td>1.69</td>
</tr>
<tr>
<td>Department</td>
<td></td>
<td>6 months-1 year</td>
<td>10.17</td>
</tr>
<tr>
<td>Finance</td>
<td>20.34</td>
<td>1-2 years</td>
<td>8.47</td>
</tr>
<tr>
<td>Investment</td>
<td>3.39</td>
<td>2-5 years</td>
<td>71.19</td>
</tr>
<tr>
<td>Information technology</td>
<td>72.88</td>
<td>More than 5 years</td>
<td>8.47</td>
</tr>
<tr>
<td>Global technology</td>
<td>3.39</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** $n = 59$

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*Table I.* Demographic summary
4. Data analysis

4.1 Measurement validation

We first used the Statistical Package for the Social Sciences (SPSS) to verify the validity and reliability of each construct. The convergent and discriminate validity are confirmed by the principal component factor analysis (Appendix 2). The factor loading scores on their expected factors are all above 0.7, where the own loading scores are higher than cross-loading scores. All eigenvalues of the constructs are larger than the suggested value of 1.0. The communality scores are all higher than the suggested value of 0.50. These results validate the reliability of measurements (Hair et al., 1995). Then, the reliability of construct is confirmed by identifying the composite reliability scores which are all above 0.9 (Table II). Moreover, the square roots of the average variance extracted (AVE) are all above 0.87, which are greater than all other cross-correlations, suggesting these constructs capture more construct-related variance than error variance (Hair et al., 1995). Therefore, the convergent and discriminate validity for all constructs in this study are confirmed by these results.

Common method bias is also tested in this study. Podsakoff and Organ (1986) suggested that common method bias exists when the distribution of the variance explained is heavily contributed by one principal factor (i.e. one principal factor counts for the majority of the variance explained). From our factor analysis table, each principal factor explains roughly equal variance (8.278-16.895 per cent). This suggested the lack of substantial evidence for common method bias. Second, another evidence for common method bias is that there are extremely high correlations between constructs \((r > 0.90)\) (Bagozzi et al., 1991). The correlation matrix (Table II) indicates that the highest inter-construct correlations are below 0.57, which indicates common method bias is not a concern. All the above tests suggested that common method bias is not a serious problem in this study.

Finally, collinearity indicators – tolerance values and variance inflation factors – were computed to test for multicollinearity. Diagnosis shows that collinearity indicators are all below the suggested cut-off values (Amoroso and Cheney, 1991; Hair et al., 1995). These indicate that multicollinearity is not a problem in this study.

4.2 Testing the research model

After verifying the reliability and validity, we used partial least squares (PLS) to analyse the structural model. As show in Figure 2, the PLS results show that the model

<table>
<thead>
<tr>
<th>Principal constructs</th>
<th>Mean (SD)</th>
<th>Composite reliability</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM used at work</td>
<td>6.0 (1.0)</td>
<td>0.928</td>
<td>0.875</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge forum used at work</td>
<td>2.5 (1.1)</td>
<td>0.937</td>
<td>-0.163</td>
<td>0.888</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-mail used at work</td>
<td>3.6 (1.5)</td>
<td>0.954</td>
<td>0.051</td>
<td>-0.173</td>
<td>0.917</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication process</td>
<td>5.1 (1.4)</td>
<td>0.954</td>
<td>0.286*</td>
<td>-0.225</td>
<td>0.177</td>
<td>0.934</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactivity</td>
<td>5.4 (1.1)</td>
<td>0.909</td>
<td>0.292*</td>
<td>-0.217</td>
<td>0.221</td>
<td>0.335**</td>
<td>0.876</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship network</td>
<td>5.7 (1.2)</td>
<td>0.982</td>
<td>0.384**</td>
<td>-0.161</td>
<td>0.182</td>
<td>0.364**</td>
<td>0.370**</td>
<td>0.950</td>
<td></td>
</tr>
<tr>
<td>Work performance</td>
<td>5.7 (1.0)</td>
<td>0.973</td>
<td>0.272*</td>
<td>-0.127</td>
<td>0.205</td>
<td>0.387**</td>
<td>0.570**</td>
<td>0.450**</td>
<td>0.937</td>
</tr>
</tbody>
</table>

Table II. Correlation table of principal constructs

Notes: AVE, average variance extracted; diagonal elements are the square roots of the AVE from their indicators. Off-diagonal elements are correlations between the constructs. Correlations significant at \(*p < 0.01, **p < 0.05\) levels, respectively.
is supported by the data, except $H_{3a}$, $H_{3b}$ and $H_{3c}$. The results indicate IM used at work has significant impacts on communication process ($b = 0.31$, $p < 0.01$), interactivity ($b = 0.32$, $p < 0.01$) and relationship network ($b = 0.45$, $p < 0.01$), thus supporting $H_{1a}$, $H_{1b}$ and $H_{1c}$. Also, e-mail used at work has significant impacts on communication process ($b = 0.17$, $p < 0.05$), interactivity ($b = 0.20$, $p < 0.05$) and relationship network ($b = 0.22$, $p < 0.05$), thus supporting $H_{2a}$, $H_{2b}$ and $H_{2c}$. On the other hand, the impacts of knowledge forum used at work on communication process, interactivity and relationship network are insignificant, rejecting $H_{3a}$, $H_{3b}$ and $H_{3c}$. The PLS analysis also indicates communication process, interactivity and relationship network have significant effects on employees’ individual work performance, thus supporting $H_4$ (communication process → work performance: $b = 0.19$, $p < 0.05$), and $H_5$ (interactivity → work performance: $b = 0.42$, $p < 0.01$) and $H_6$ (relationship network → work performance: $b = 0.26$, $p < 0.01$). The variance explained to the dependent variable, work performance, is 44 per cent. The level of variance explained, together with the data support on the whole research model, suggests a sufficient model fit.

4.3 Robustness check of the research model
Our premise of the above research model is that the CMC tools contribute to work performance through social networks, namely, communication process, interactivity and relationship network. An alternative model with direct linkage between CMC tools and work performance was structured and tested in PLS, following the classical testing method for the mediating effect of the mediators suggested by Baron and Kenny (1986). The results showed that IM used at work has a significant direct effect on work performance without any mediator ($b = 0.30$, $p < 0.05$). After communication process, interactivity and guanxi is included in the model, it becomes insignificant. The robustness test supports our contention that social networks fully mediate the path between IM used at work and work performance in the proposed model. Then, the same method is applied to test the mediating effects of the social networks on e-mail and knowledge forum. The results showed that the original significant direct link between e-mail and work performance ($b = 0.25$, $p < 0.05$) becomes insignificant after the addition of social networks. The robustness test supports our contention that social networks fully mediate the path between e-mail used at work and work performance in the proposed model. For knowledge forum, its direct effect on work performance is not significant.
4.4 Social network analysis

We also used UCINET to analyse the data related to the network diagram. 59 survey responses resulted in a social network diagram connecting 73 actors with 509 ties within the whole network (Figure 3). The network analysis indicates the network centralization index is only 10.86 per cent, suggesting the entire network’s centralization is very low (Scott, 1991).

The degree, closeness and betweenness are three central elements of a social network (Wellman and Berkowitz, 1988; Freeman, 2006). Specifically, the degree refers to a node’s (individual) ties to other actors (nodes) in the network, calculated by the number of ties. The betweenness refers to the degree an individual is near all other individuals in a network directly or indirectly, reflecting the ability to access information through the “grapevine” of network members. The closeness means the extent to which a node (individual) lies close to other nodes in the network. In this study, we examine the social networks at Global Bank focusing on these three central network elements, as well as their correlation between the social network elements and the theoretical constructs proposed in the research model. Because we used the asymmetric approach, i.e. allowing network member A to choose B in the network (the “out” arrow is indicated from A to B), but B does not necessarily choose A (the “in” arrow from B to A is not indicated). So the asymmetric matrix can represent unidirectional ties that go from a source to a receiver. We include “in” and “out” analysis in the correlation between the social network elements and the principal constructs shown in the research model (Table III). While betweenness suggests the “nearness” or connectivity of individual with all other individuals in a network directly or indirectly, so the calculation of betweenness considers both “in” and “out” as a link counted in the UCINET and results in only a non-directional connectivity.

As shown in Table III, the correlation analysis indicates that degree and closeness (covering the in- and out-relationships) significantly relates to the IM used at work. The data suggest the use of knowledge forum and e-mail are not related to degree,
closereness and betweenness. The conveyance and convergence communication process are not significantly related to the social network elements. However, the perception of interactivity is significantly related to InDegree ($b = 0.317$, $p < 0.01$) and InCloseness ($b = 0.305$, $p < 0.01$). Similarly, the relationship network is found to be significant related to InDegree ($b = 0.252$, $p < 0.05$) and InCloseness ($b = 0.245$, $p < 0.05$). Work performance is found to be significantly related to OutDegree ($b = -0.281$, $p < 0.05$) and OutCloseness ($b = -0.204$, $p < 0.05$) with negative relationships, but significantly related to InCloseness ($b = 0.175$, $p < 0.10$). We discuss these findings and the corresponding implications in the next section.

5. Key findings, implications and future research

5.1 Key findings
There are several key findings in this study. The effectiveness of CMC and social networking tools on work performance is the central contribution of this study. Evidence is found on the contributions of IM and e-mail to individual work performance through building up social networks in the workplace. The data indicates that the SharePoint portal, namely, the knowledge forum, is yet to be an effective CMC tool in the workplace. We speculate that this is due to the overwhelming effect of IM and e-mail on shaping the communication, interactivity and social network via more private channels instead of the broadcasting format of the knowledge forum. Another speculation relates to SharePoint’s relative ineffectiveness in establishing immediate interactions among employees. These findings suggest that social networks focus on one-to-one relationship building, instead of mass-level (many-to-many) communications. At the same time, interactive tools such as IM and e-mail are better utilized in

<table>
<thead>
<tr>
<th>Correlation tests</th>
<th>OutDegree</th>
<th>InDegree</th>
<th>InCloseness</th>
<th>OutCloseness</th>
<th>Betweenness</th>
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<tbody>
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<td>IM used</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson correlation</td>
<td>0.206*</td>
<td>0.203*</td>
<td>0.209*</td>
<td>0.040</td>
<td>0.147</td>
</tr>
<tr>
<td>Significance ($p$)</td>
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<td>0.061</td>
<td>0.056</td>
<td>0.381</td>
<td>0.133</td>
</tr>
<tr>
<td>Knowledge forum used</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pearson correlation</td>
<td>0.070</td>
<td>-0.035</td>
<td>-0.040</td>
<td>0.002</td>
<td>0.063</td>
</tr>
<tr>
<td>Significance ($p$)</td>
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<td>0.397</td>
<td>0.382</td>
<td>0.493</td>
<td>0.316</td>
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<td>E-mail used</td>
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<td>Pearson correlation</td>
<td>-0.075</td>
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<td>0.115</td>
<td>0.157</td>
<td>-0.054</td>
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<tr>
<td>Significance ($p$)</td>
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<td>0.194</td>
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<td>0.343</td>
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</tr>
<tr>
<td>Pearson correlation</td>
<td>-0.058</td>
<td>0.317**</td>
<td>0.305**</td>
<td>-0.016</td>
<td>0.148</td>
</tr>
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<td>Significance ($p$)</td>
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<td>0.009</td>
<td>0.453</td>
<td>0.131</td>
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<td>Communication process</td>
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<tr>
<td>Pearson correlation</td>
<td>-0.091</td>
<td>-0.012</td>
<td>-0.023</td>
<td>-0.159</td>
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<tr>
<td>Significance ($p$)</td>
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<td>0.464</td>
<td>0.432</td>
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<td>0.439</td>
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<tr>
<td>Pearson correlation</td>
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<td>0.252**</td>
<td>0.245**</td>
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<td>Significance ($p$)</td>
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<td>0.387</td>
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<td>Work performance</td>
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<tr>
<td>Pearson correlation</td>
<td>-0.281**</td>
<td>0.137</td>
<td>0.175*</td>
<td>-0.204*</td>
<td>-0.157</td>
</tr>
<tr>
<td>Significance ($p$)</td>
<td>0.015</td>
<td>0.150</td>
<td>0.093</td>
<td>0.060</td>
<td>0.117</td>
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</tbody>
</table>

Notes: $n = 59$. *$0.01 < p < 0.05$; **$p < 0.01$

Table III. Correlation table of social network elements and the conceptual constructs
organizations for a rapid turnover of communication, at least as evidenced by Global Bank’s Hong Kong office.

Meanwhile, our robustness tests on the research model suggest the full mediating effect of communication process, interactivity and relationship network on the path between the social network tools and work performance. Consistently, our data suggest the centrality of social network, although not directly exerting impacts on employees’ work performance, significantly correlates with the use of CMC tools as well as employees’ communication process, interactivity and relationship networks. So the interaction among employees and the establishment of relationship networks are demonstrated to be the essential factors that lead to improving individual work performance. Such findings imply managerial efforts should be paid to facilitate the communication process, interactivity and relationship network so as to improve the individual work performance.

Consistent with the above findings from SPSS and PLS, the social networks analysis also suggests the linkage of using IM at work and the high level of degree (the number of ties to other actors in the network) and high level of closeness. Although the social network elements did not show a strong correlation with the communication process, their relationships with interactivity and relationship network social network are evident, implying the strong social network can be utilized to improve work performance. Interestingly, both OutDegree and OutCloseness are found to be negatively correlated to work performance. We speculate that outgoing dialogues with other actors in the social network may cause work interruptions and thus negatively correlate to work performance. Contradictory to our original expectation, betweenness of a social network, namely, individual's connectivity to other actors in the network, is found to be insignificantly correlated to all the principal constructs in the research model. We speculate this unexpected result can be explained by the low network centralization index at Global Bank, which is only 10.86 per cent. This implies very low level of centralized access to information or resources in the whole network. In line with the low network centralization index, the insignificant correlation between the betweenness scores and the principal constructs in the research model indicate that the network does not exhibit much control by a few individuals over the access to the other actors, the information, communication or other resources in the network.

5.2 Implications

Intensive research has previously focused on the choice of media, but not media performance. Dennis et al. (2008) contributed a comprehensive conceptual discussion in this respect. Theoretically, this study extends the research on media performance by linking the CMC and social networking tools with work performance and its determinants, namely, communication process, interactivity and relationship network. These three components have shown their significant powers on measuring and predicting the performance of media (i.e. the CMC and social networking tools in this study) at work. Although the MST (Dennis et al., 2008) has suggested that synchronicity can contribute to the mutual understanding among interlocutors, this research has gone beyond MST by articulating the rational behind – the contribution of the social network – in creating employees’ mutual understanding in the workplace.

Practically, this study provided an empirical verification of media performance theories, evidenced by interactive tools such as IM and e-mail. In addition to the structural research model, the social network analysis empirically verified the effectiveness of the CMC and social networks tools in shaping employees’ relationship networks with the evidence of the 509 ties in the network. In addition to the extension
of MST in studying CMC tools, this research also directly linked the elements of social
technology, namely, degree, closeness and betweenness, with the CMC and social network
communication, interactivity, relationship and work performance. To the best
of our knowledge, it is among the few studies empirically examining the social network
elements with conceptual constructs. Together with the structural research model,
social network analysis in this study demonstrates its significance in examining the
media performance at work.

5.3 Future research
In this study, we only examined the positive effects of CMC and social networking tools in
the workplace. Future research on comparing the advantages and disadvantages
of using these CMC and social networking tools and addressing their impacts on
individual performance can enhance the entire study. The current study has employed
the MST, which also argues that communication tools perform differently under
different situations. “Situation” is not considered in this study, which might have an
impact on the “media performance” in the three studied CMC and social networking
tools. Finally, this study only examines three CMC and social networking tools in
workplace. Future studies can expand the study to include other social networking tools
(such as Wiki, Weblogs, Micro-Blogs, Facebook and Twitter) on work performance
to further investigate the potentials of using CMC and social networking tools in
the workplace.

6. Conclusion
Communication is essential in the workplace. Along with the technology
advancement, new CMC and social networking tools have become available to
facilitate the communication and knowledge dissemination in organizational context.
The utilization of such technology as IM, e-mail and knowledge forum has led to an
increasingly mobile but better connected workforce. This study provides a compelling
rationale to embed CMC and social networking tools into the work context. The
implementation of these CMC and social networking tools are necessary for a company
to shape employees’ work performance and therefore remain competitive and agile in
today’s market and in the future. We believe more theoretical research and practical
development will emerge in this field.

References
psychological research – conceptual, strategic, and statistical considerations”, *Journal of
management synchronization”, *International Journal of Information Management*,
Vol. 243 No. 3, pp. 201-220.


Further reading

(The Appendix follows overleaf.)
Appendix 1. Three CMC and social networking tools used in Global Bank

Figure A1.
Chat windows of IBM lotus sametime connect 7.5

Figure A2.
The e-mail function of lotus notes
Appendix 2. Measurement items

SameTime (i.e. the IM) used at work
Lotus Sametime (i.e. the IM) is used in:

1. Scheduled in advance – 7. Unscheduled
2. 1. Arranged Participants – 7. Random participants
3. 1. Present agenda – 7. Unarranged agenda
4. 1. One-way – 7. Interactive

SharePoint (i.e. the Knowledge Forum) used at work
Microsoft SharePoint portal (i.e. the Knowledge forum) is used in:

1. Scheduled in advance – 7. Unscheduled
2. 1. Arranged Participants – 7. Random participants
3. 1. Present agenda – 7. Unarranged agenda

IBM Lotus Notes (i.e. the e-mail) used at work
IBM Lotus Notes (i.e. the e-mail) is used in:

1. Scheduled in advance – 7. Unscheduled
2. 1. Arranged Participants – 7. Random participants
3. 1. Present agenda – 7. Unarranged agenda
4. 1. One-way – 7. Interactive
Communication process

Communication process in my daily work in general can be characterized as with:

1. Low-quality information – 7. High-quality information
2. Specific format – 7. Various format
3. Specific sources – 7. Multiple sources

Interactivity, Scale: Strongly Disagree (1) – Strongly Agree (7)

1. I felt that I had a great deal of control over my communication with colleagues.
2. I can have two-way communication easily with colleagues.
3. My colleagues processed my input very quickly.

Relationship Network, Scale: Strongly Disagree (1) – Strongly Agree (7)

1. My friends at work and I help each other when necessary.
2. I have built a kind of personal relationship network at work.
3. I have a good relationship network for work.
4. People in this company get on with each other harmoniously.
5. I have built a good relationship with my colleagues and supervisors.

Work Performance, Scale: Strongly Disagree (1) – Strongly Agree (7)

1. I am currently working at my best performance level.
2. I am one of the best at the work.
3. I set very high standards for my work.
4. My work is always of high quality.
5. I am proud of my work performance.

<table>
<thead>
<tr>
<th>Questions/ person communicated with</th>
<th>Person 1</th>
<th>Person 2</th>
<th>Person …</th>
<th>Person n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full name (first name + last name)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time known (1: &lt;6 months, 2: 6 months –1 year, 3: 1-2 years, 4: 2-3 years, 5: over 3 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction frequency (1: daily, 2: weekly, monthly, 4: quarterly, 5: less often)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table A1. Items for social network diagram
Appendix 3

About the authors
Carol Xiaojuan Ou is an Assistant Professor of Information Management at Tilburg University. Her research interests include computer-mediated communication, electronic commerce, knowledge management, social networks and website design. Her publications have appeared in such journals as Communications of the ACM, Decision Support Systems, Information Technology & People, Journal of AIS, International Journal of Human-Computer Studies, Information Systems Journal, Journal of IT Management and MIS Quarterly, among others. Carol is serving as a senior editor for three journals in the IS field, as well as being a committee member of various conferences on IS and IT. She is also a Certified IS Auditor and an Academic Advocate of IS Audit and Control Association. Carol Xiaojuan Ou is the corresponding author and can be contacted at: carol.ou@uvt.nl

Choon Ling Sia is Professor at the City University of Hong Kong. He received his PhD degree from the National University of Singapore. He is Director of Center of Social Media Marketing and Business Intelligence at the City University of Hong Kong. He is serving, or has served, on

Table AII. Principal component factor analysis with Varimax rotation

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<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<td>0.127</td>
<td>0.101</td>
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<td>-0.077</td>
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<td>0.852</td>
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<td>-0.153</td>
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<td>11.20</td>
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</table>

CMC and social networking tools at work

Chun Kit Hui is a Bachelor of Computing from the Hong Kong Polytechnic University. His research interests include computer-mediated communication and social network analysis.