

# *Effects of culture, social presence, and group composition on trust in technology-supported decision-making groups*

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**Abstract.** *This study examines trust in technology-supported groups from the perspectives of culture, social presence and group composition. Our results demonstrate that, in culturally homogeneous groups, individualism has a negative impact on the level of interpersonal trust; however, in culturally heterogeneous groups consisting of Chinese and U.S. participants, individualism has a positive impact on interpersonal trust among members. There were also significant differences in the level of trust between homogeneous Chinese groups and heterogeneous groups consisting of Chinese and U.S. participants. In addition, the mediating role of communication quality was identified to explain the effect for trust-of social presence on trust. These findings have important implications on building and communication in global technology-supported decision-making groups.*

**Keywords:** individualism, culture, social presence, virtual groups, interpersonal trust

## INTRODUCTION

The research on information systems (IS) goes far beyond a narrow focus on information technology (IT). IS involves the intersection of people, processes, technology and organizations to improve individual, group and organizational outcomes. Accordingly, IS researchers need to find ways to improve both IT-specific and organization-specific artefacts. Virtual groups are an emerging example of organization artefacts, driven by the prevalence of offshoring and the massive shift towards a digital global economy. Virtual groups *can be* an extension of a networked IT organization; they are physically dispersed, assemble rapidly without rigid boundaries and tend to exist only if needed (Jarvenpaa & Leidner, 1999). However, the

increased use of virtual groups presents its own set of challenges for interpersonal relationships and organizational performance, which need to be addressed by IS research (Kankanhalli *et al.*, 2007). One particular challenge is fostering trust effectively among culturally diverse and dispersed group members.

Despite the increasing importance of understanding cultural diversity and its impact on group processes and outcomes, few studies have attempted to investigate the use of collaborative technology in culturally heterogeneous groups, and even fewer studies have focused on trust or communication in those groups in face-to-face (FtF) and virtual settings (Jarvenpaa & Leidner, 1999; Kankanhalli *et al.*, 2007; Zhang & Lowry, 2008). This paper aims to address these gaps by proposing and testing a theoretical model that explains interpersonal trust in FtF and virtual technology-supported decision-making groups by using *culture*, *social presence* and *group composition* as influential factors.

## THEORETICAL BACKGROUND AND HYPOTHESES

We have thoroughly examined the theoretical foundations of how differences in culture, social presence and group composition may affect interpersonal trust in small groups. For the purposes of this study, our research model is presented in Figure 1.

### Impact of social presence on communication quality

Social presence is 'the degree to which a medium facilitates awareness of the other person and interpersonal relationships during the interaction' (Fulk *et al.*, 1990, p. 118). The influence of social presence on trust is a valuable IS research topic because the degree of

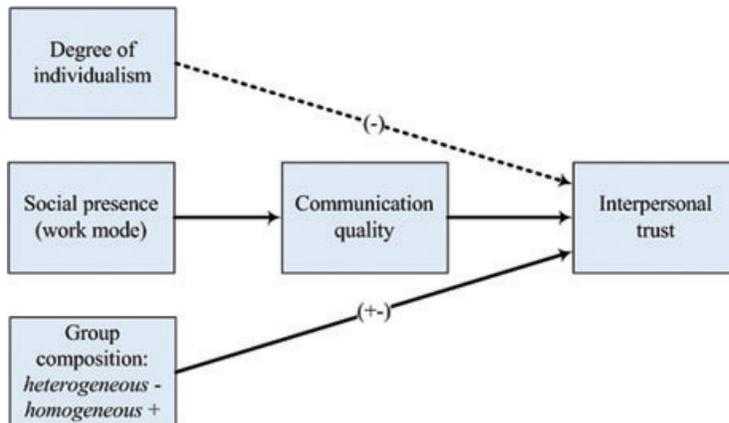


Figure 1. The research model.

social presence differs between FtF communication and distributed computer-supported communication and may influence trust, as we explain later in this section. In addition, research suggests that social presence can be manipulated in technology design (Miranda & Saunders, 2003; Hassanein & Head, 2006). Social Presence Theory (SPT; Short *et al.*, 1976; Miranda & Saunders, 2003) states that media with low social presence may not be suitable for inter-subjective interpretation when interactivity and reciprocity are needed in communication. Although both Media Richness Theory (Daft & Lengel, 1986) and SPT focus on communication media; however the former mainly proposes criteria for media to correspond to collaborative tasks based on reducing uncertainty involved in them, while the latter fits the context of this research by emphasizing the importance of social influence on attitudes toward communication media. Central to the SPT is the belief that 'the presence of the information sender influences recipients' understanding of the message' (Miranda & Saunders, 2003, p. 89). The availability of more social cues in a communication medium generates a higher level of social presence, resulting in higher social pressure and normative influence on group members. Traditional, unmediated, FtF verbal communication has the highest social presence, while computer-supported media have lower levels of social presence (Miranda & Saunders, 2003; Roberts *et al.*, 2006).

Communication quality refers to a group member's perception of the effectiveness of group discussion (Lowry *et al.*, 2006). High-quality group discussion generates multiple perspectives, allows group members to achieve mutual understanding and encourages a successful definition of problems (Lowry *et al.*, 2006).

Based on related studies (Lowry *et al.*, 2006; Roberts *et al.*, 2006), we operationalized social presence in this study by using three communication settings with decreasing levels of social presence: FtF groups without collaborative software (CS) support, FtF CS-supported groups and virtual CS groups. When a group's communication medium exhibits low social presence, it is more difficult for group members to have an interactive and reciprocal discussion. Although it is possible for members of any group to misinterpret the perspectives and behaviours of other group members, this lack of mutual understanding is especially evident when underlying perspectives are different and groups are physically dispersed (Ridings *et al.*, 2002). Communication quality often decreases as the social presence afforded by virtual groups decreases (Roberts *et al.*, 2006). We operationalize communication quality with communication openness and task discussion effectiveness. *Communication openness* is the willingness to be receptive to the communication experience (O'Reilly & Roberts, 1977). *Task discussion effectiveness* reflects the participants' perceptions of the quality of the group discussion (Lowry *et al.*, 2006). Accordingly, our hypothesis is as follows:

H1. Social presence will have a positive impact on communication quality as measured by (a) communication openness and (b) task discussion effectiveness. Specifically, communication quality will be highest in FtF non-CS groups, followed by FtF CS-supported groups and finally, virtual CS-supported groups.

### Impact of communication quality on trust

Interpersonal trust is defined by McAllister as 'the extent to which a person is confident in, and willing to act on the basis of, the words, actions, and decisions of another' (1995, p. 25). Critically, trust requires the presence of uncertainty and risk (McAllister, 1995; McKnight *et al.*, 1998). Additionally, interpersonal trust has both cognitive and affective foundations. *Cognition-based* trust is 'grounded in individual beliefs about peer reliability and dependability' and *affect-based* trust is 'grounded in reciprocated interpersonal care and concern' (McAllister, 1995, p. 25).

Much research on the impact of culture on trust adopts McAllister's trust conceptualization (Doney *et al.*, 1998; Atuahene-Gima & Li, 2002; Huff & Kelley, 2003). We also chose it for several reasons. The antecedents of affect-based trust are based on interpersonal relationships, citizenship and interaction over time, which fit our social decision-making context. Moreover, McAllister's conceptualization of cognitive-based trust fits our theoretical context in that two of the predictive antecedents of cognitive-based trust are credentials and reliable performance. Also, he predicts cultural and ethnic similarity as key predictors of cognitive-based trust.

In our research context, we expect affective- and cognitive-based trust to move in the same direction, and we synthesize these dimensions into *interpersonal trust*. This decision is primarily founded upon five theory-based data collections about the relationship between affective and cognitive elements of interpersonal trust conducted by Dunn & Schweitzer (2005). They use the affect-as-information model to explain and predict that when making cognitive judgments in certain social situations, people will ask themselves how they feel, and such an evaluation will then affect their judgment. The situations in which affect informs judgment are social decision making situations in which judgments are complex, are affective in nature or involve heuristic processing. The less people know about each other, the more likely they are to use heuristic processing to form trust judgments (Dunn & Schweitzer, 2005).

Turning to how communication quality could affect interpersonal trust, a key element of interpersonal trust is the willingness to rely on 'the words, actions, and decisions of another' (McAllister, 1995, p. 25). Lack of trust arises when cognitive or affective judgment is deficient during an interaction, causing difficulties in cooperation and general communication (McAllister, 1995). Because high-quality communication requires interaction and multiple perspectives, it naturally leads to the willingness of a group member to depend on others, which is required by interpersonal trust (Lowry *et al.*, 2006). Conversely, if communication quality decreases and a group resists the cultivation of multiple perspectives, group members will be less willing to depend on each other (Jarvenpaa & Leidner, 1999). Hence, our second hypothesis is as follows:

- H2. Communication quality reflected by (a) communication openness and (b) task discussion effectiveness will have a positive impact on group interpersonal trust.

### Impacts of individualism on trust

Culture is conceptualized as shared symbols, norms and values in a social collective (Hofstede, 1991). One way to clarify the concept of culture is to identify dimensions of cultural variation (Triandis *et al.*, 1986). Hofstede's model is most commonly used when culture is

studied in a technological context (Ford *et al.*, 2003), and it has been validated by more than 140 studies, making it highly generalizable. Therefore, we adopted his model as the theoretical foundation of culture in this research.

Hofstede's model (1991) defines five cultural dimensions based on value orientations that are considered important and shared across cultures, including power-distance, individualism-collectivism (I-C), masculinity-femininity, uncertainty avoidance and Confucian dynamism. We chose the I-C dimension for several reasons. First, Triandis (1989) suggests developing hypotheses concerning the relationship between culture and social behaviour based on I-C, asserting that it is the most relevant dimension and many researchers still support this choice (e.g. Kankanhalli *et al.*, 2007). The I-C dimension can be used to explain and predict differences in interpersonal trust between different cultures because it explains why groups in some countries are more willing to adhere to group norms than those in other countries. We argue that adhering to group norms is simply another form of willingness to depend on or trust others. Second, Hofstede's dimensions do not follow the same direction and thus exist as separate theoretical constructs (Tan *et al.*, 1995; Kankanhalli *et al.*, 2007). As a result, researchers rarely consider all five dimensions together. Third, previous research indicates that the I-C dimension is highly relevant to technology-supported group work (Tan *et al.*, 1998a; Tan *et al.*, 1998b). Fourth, in terms of relevance and practicality of the model, I-C neatly aligns with the national cultures of China (collectivism) and the USA (individualism; Zhang *et al.*, 2007), which allows for clean operationalization of independent variables for our data collection. Finally, given the nature of the task used in this study, group decision-making and the equal status of participants, the potential effect of the other four dimensions of culture on trust can be ignored in this study.

Because of underlying differences in social norms inherent in the I-C dimension of various cultures, we propose that individualists are likely to be less trusting within groups than collectivists, primarily because individualists are less willing to depend on others. In individualistic cultures, ties between people are loose, and task concerns prevail over relationship concerns (Hofstede, 1991). People in such cultures value freedom and individual rights highly. They tend to think or act independently and are largely unconnected with others. Individualists view conformity to group norms as relinquishing autonomy, not being in control and being pushed around. When conflict arises between personal and group goals, it is considered acceptable for individual goals to be placed ahead of collective goals. In fact, adversarial conflict and lack of cooperation are considered normal in individualistic cultures (Chen *et al.*, 1998).

In contrast, collectivists are much more willing to depend on and trust other members in their groups. Collectivists focus on keeping balance and harmony within a group, and relationships among group members prevail over tasks when making group decisions (Hofstede, 1991). Collectivists often hesitate to speak up in a group. They try to coordinate their actions with those of others in order to minimize social friction, and often fear being isolated from their group. They are also more inclined than individualists to modify their own preferences and positions in order to conform to a group, which results in overall cooperation (Chen *et al.*, 1998).

Collectivists depend on information from their groups when evaluating trustee attributes and incentives (Doney *et al.*, 1998). Such willingness to depend on others originates from the collectivist's interdependent definition of self, the importance of aligning personal and communal goals and the emphasis on relationships. The willingness to risk dependence on others is a critical mindset for interpersonal trust development (McAllister, 1995). Conversely, those with independent concepts of self (i.e. individualists) will rely more on their own beliefs and experiences. Therefore, the relative importance of social norms and opinions in influencing a trustor's perceptions of the trustworthiness of a trustee will be stronger for members of collectivistic groups than for members of individualistic groups (Huff & Kelley, 2003). It has been theorized that trust transference is much easier in collectivistic societies than in individualistic societies because of collectivists' tighter social networks (Doney *et al.*, 1998). Therefore, we propose the following third hypothesis:

H3. Interpersonal trust will be greater in collectivistic groups than in individualistic groups.

### Impacts of group composition on trust

We operationalized group composition into two categories: culturally homogeneous groups, whose members were from the same culture, and culturally heterogeneous groups, whose members were from different cultures. With the growth of global work opportunities and offshoring, heterogeneous groups are becoming more prevalent. Understanding how trust is influenced by group composition has practical benefits to team managers because trust influences technology adoption, group efficiency and decision quality (e.g. Komiak & Benbasat, 2006; Wang *et al.*, 2006; Wang & Benbasat, 2007).

Initial research suggests that mixing collectivists and individualists together in a group may create results different from those produced by culturally homogeneous groups (Huff & Kelley, 2003). The theoretical basis that we use for our prediction is the Social Identity Theory (SIT; Kankanhalli *et al.*, 2007).

Social identity is an individual's self-concept derived from perceived membership of social groups (Kankanhalli *et al.*, 2007). It is an individual-based perception of what defines 'us' as associated with any internalized group membership. SIT explains that group membership creates in-group behaviour, or self-categorization, in ways that favour an in-group at the expense of an out-group. The evaluation of one's own group in reference to other groups is determined through social comparisons in terms of value-laden attributes and characteristics. The mere act of individuals categorizing themselves as group members can lead to displays of in-group favouritism. After being categorized as members of a group, individuals seek to achieve positive self-esteem by differentiating their in-group from an out-group on some valued dimensions. This differentiation, as distinguished by SIT, can be extended to explain how people from collectivistic and individualistic cultures differ in their willingness to trust others with different cultural backgrounds.

The basis for our SIT extension is that SIT relies heavily on social evaluation and comparison, and that cultural differences are not immune to evaluation and comparison (Kankanhalli

*et al.*, 2007). Social evaluations and comparisons leading to cultural perceptions of similarity are likely to result in in-group treatment; dissimilarity is likely to result in out-group treatment. This view is supported by McAllister who theorizes that ethnic and social similarities between individuals help foster trust, while heterogeneity, diversity and social differences decrease trust (1995). This relationship between group composition and trust is also supported by Turner's (1982) claim that perceptions of similarity and shared identity lead to cooperation and trust. Williams and O'Reilly (1998) propose that diversity in group membership can make it difficult to form trust. People tend to group themselves according to attributes such as gender, race and ethnicity (Turner, 1982), and such self-categorization tends to influence attitudes towards others (Turner, 1987; McAllister, 1995). People are initially adverse to differences, so they are more likely to distrust group members dissimilar to them (Brewer, 1979). Putnam (2007) shows that even in the USA, the increase of ethnic diversity in communities initially decreases trust and social capital within those communities because of negative evaluations that resulted from perceived dissimilarities. Kankanhalli *et al.* (2007) recently showed that cultural diversity in groups increases conflict, specifically because of the diminished social identity. Hence, in the context of culturally heterogeneous groups without previous working history, negative judgments concerning social differences are more likely to occur, thereby undermining trust.

Intra-group homogeneity is considered to be positively associated with group effectiveness and interpersonal attraction (Earley & Mosakowski, 2000). Members of culturally homogeneous groups, because they share common views and are likely to interpret situational events and management practices in similar ways, generally report stronger affinity for their groups than heterogeneous group members do. Conversely, members from different cultures often do not share the same mental models that enable shared understanding; thus, cultural differences may amplify ambiguity, complexity and confusion in group decision making (Daily & Steiner, 1998). Those differences can cause variations in members' attitudes, values and overall performance, potentially leading to conflicts when group members interact (Oetzel, 2001). Thus, culturally heterogeneous groups exhibit lower levels of integration and cohesion, making it difficult to work towards goals together (Watson *et al.*, 1993).

H4a. Interpersonal trust of collectivistic group members will be greater in homogenous, collectivistic groups than in heterogeneous groups composed of collectivistic and individualistic members.

H4b. Interpersonal trust of individualistic group members will be greater in homogenous, individualistic groups than in heterogeneous groups composed of collectivistic and individualistic group members.

### **Trust in culturally heterogeneous groups**

Although SIT likely applies to all cultures, a given culture's propensity to create and value in-groups could vary, which could impact a group member's propensity to trust other members of their groups. In contrast to the US culture, cognitive and affective use of in-groups and

out-groups is deeply ingrained in Chinese culture. Traditional Chinese culture has a special form of in-group and out-group status: Chinese people traditionally form strong interpersonal social units called *guanxi*, in which reciprocal favours, obligations and face-saving dignity are treated almost as rights (Xin & Pearce, 1996). Outside such a circle, there is 'no tie, no obligation, and no rights' (Lee & Dawes, 2005, p. 29), and little trust exists. Interestingly, these connections are often more utilitarian and favour-oriented than connections based on emotional bonds (Lee & Dawes, 2005). Most Chinese exhibit low trust outside these units, yet interpersonal trust in relationships is far more important in China than in the USA (Atuahene-Gima & Li, 2002).

Based on SIT, although collectivists emphasize relationships, a Chinese group member is more likely to inhibit/lower the trust than a US group member in culturally heterogeneous groups. The key reason for this is collectivists' well-established and very sharp distinction between members of in-groups and out-groups; this distinction is simply not as valued and strong for individualists (Brewer, 1979). These value differences regarding in-groups based on cultural similarities result in the collectivists' poor performance in multicultural organizations when they have to work with individualists (Huff & Kelley, 2003). Research has also shown that individualists might be more trusting and have less negative behaviour than collectivists in multicultural settings (Huff & Kelley, 2003). Conversely, collectivists behave optimally when other members are perceived to be part of their in-group (Triandis, 1995).

US culture typically leans away from creating deep collective social ties and US citizens are also generally less cooperative than the Chinese (Chen *et al.*, 1998). This is not to say that in-groups do not occur in individualistic societies, but rather, that in-groups are less frequent, less important and less rigid. Because individualists do not value in-groups based on cultural similarities as much as collectivists, individualists are more likely to trust others in a newly formed, culturally heterogeneous group than collectivists will. Jarvenpaa & Leidner (1999) believe that individualists would exhibit more trust than collectivists in virtual-group environments. Thus, we hypothesize that:

H5. In culturally heterogeneous groups, collectivistic members will perceive less interpersonal trust than individualistic members.

## METHODOLOGY

Our laboratory experiment involved a  $3 \times 2 \times 2$  factorial design that manipulated social presence (FtF unsupported, FtF CS and virtual CS settings), degree of individualism (with the USA representing a high individualistic culture and China a low individualistic or a high collectivistic culture) and group composition (culturally homogeneous Chinese and US groups and heterogeneous groups). A total of 183 four-member groups participated in this study. This study is the second portion of a research project that involved majority influence (Zhang *et al.*, 2007). Table A1 shows the sample size under each experimental condition. Due to space limitation, we can only provide an overview of the research method; much greater detail can be

found in supplementary Appendix C. (These supplementary tables and indices can be found online at [http://marriottschool.byu.edu/emp/pbl/appendices/ISJ MC trust APPENDIX 04-07-09.pdf](http://marriottschool.byu.edu/emp/pbl/appendices/ISJ_MC_trust_APPENDIX_04-07-09.pdf), or you may email the authors for a copy).

### Sample

Participants were undergraduate students recruited from four universities in China and the USA. Human-subject protocols were followed at all participating institutions. In culturally heterogeneous groups, the Chinese members were students who had been in the USA for less than 2 years and who spoke any dialect of Chinese as their native language, similar to Setlock *et al.*'s (2004) study. All participants in CS-supported groups were familiar with computers and online communication tools. Each group consisted of one naïve participant (the target) and three scripted confederates who were carefully trained in advance and followed specific, pre-developed instructions in the experiment. No participants had prior knowledge about the experimental task. They were randomly assigned to experimental groups.

### Procedures

Because the decision task selected for this study needed to be equally understandable to both Chinese and US participants, we chose a well-known group preference task called the desert survival problem, which has been frequently used in studies focusing on group work and computer-mediated communication (e.g. Zhou *et al.*, 2004). In this hypothetical task, each group of participants was given eight items (e.g. sunglasses and a parachute) and was required to rank the importance of those items to survival in the desert. This task required several decision rounds with the ideal goal being a final group consensus.

All participants in the USA were provided with an English version of the task scenario and instructional materials, which were translated into Chinese and back-translated by bilingual professionals in advance to ensure cross-language equivalence in meaning. The validated Chinese versions of these documents were given to the Chinese participants. To ensure consistency, the same facilitator was used for all sessions at each site. All FtF CS and virtual CS groups participated using a web-based CS system called TeamDiscussion (See Appendix C).

### Measures

Table A2 summarizes the questionnaire items for the measures and their reliabilities. To further establish factorial validity, we conducted a factor analysis with Varimax rotation, as summarized in Table A3. Specifically, trust was measured in two dimensions: communication openness and task discussion effectiveness.

## RESULTS

For brevity, the statistical details of the analyses are reported in Appendix B. We first confirmed that the Chinese participants had much lower scores on individualism than the US participants,

showing the success of our culture manipulation. Meanwhile, H1a and H1b were partially supported; H2a, H2b, H3 and H5 were fully supported; H4a and H4b were not supported.

## DISCUSSION

The paper addresses theoretical and empirical gaps in IS cross-cultural literature by proposing and testing a theoretical model that explains interpersonal trust in FtF and virtual technology-supported decision-making groups by using *culture*, *social presence* and *group composition* as influential factors. As discussed in Zhang & Lowry, (2008), addressing such cross-cultural issues in a technological context is a key contribution to IS research.

For example, investigating virtual and culturally diverse groups makes an important contribution to IS research, given the impact of globalization on the world's organizations. The study of collaboration has become all the more important in IS literature because of the added complexities created by virtual groups and global virtual organizations (Furst *et al.*, 1999; Jackson, 1999; Warkentin & Beranek, 1999; Gallivan, 2001; Kock, 2001; Koch & Schneider, 2002; Walsham, 2002; Jarvenpaa *et al.*, 2004; Paul & McDaniel, 2004; Chudoba *et al.*, 2005; Paul *et al.*, 2005; Fuller *et al.*, 2007; Kanawattanachai & Yoo, 2007; Kankanhalli *et al.*, 2007). Social aspects of technology-supported work have often been treated as secondary rather than primary in many previous IS studies on technology-supported work (Paul *et al.*, 2005; Leidner & Kayworth, 2006). Increased globalization and use of virtual groups has made the study of the cultural differences in technology-supported groups in IS research more important (Furst *et al.*, 1999; Jackson, 1999; Walsham, 2002; Tan *et al.*, 2003; Jarvenpaa *et al.*, 2004; Paul & McDaniel, 2004; Chudoba *et al.*, 2005; Paul *et al.*, 2005; Leidner & Kayworth, 2006; Kanawattanachai & Yoo, 2007). This is because 'culture at the national, organizational, or subunit level exerts a subtle yet powerful influence on people and organizations and that information flows and information technologies are often closely intertwined with culture' (Leidner & Kayworth, 2006, p. 358).

Culture and trust in an IS context has become more important over time because heterogeneity and cultural differences that create conflict have increased with globalization. When these differences manifest themselves in heterogeneous virtual groups, trust issues and more conflict can emerge than in homogeneous virtual groups (Furst *et al.*, 1999; Jackson, 1999; Walsham, 2002; Paul & McDaniel, 2004; Chudoba *et al.*, 2005; Paul *et al.*, 2005; Leidner & Kayworth, 2006; Kanawattanachai & Yoo, 2007). This is a notable challenge because trust is considered as the 'glue of the global workspace' (O'Hara-Devereaux & Johansen, 1994, p. 243). It plays a key role in successful organizations and group collaboration (Ibbott & O'Keefe, 2004, Gallivan & Depledge, 2003). Because trust is so important in facilitating transactions and relationships in groups, it is essential for researchers to consider the potential effects of culture on trust (Doney *et al.*, 1998; Ford *et al.*, 2003; McCoy *et al.*, 2005).

## Findings

In terms of significant findings, we found in an experiment with limited generalizability that communication openness and task discussion effectiveness were higher in FtF non-CS groups

than in FtF CS-supported groups and virtual CS-supported groups, but no difference was detected between the different CS-supported groups. We also found that both communication openness and task discussion effectiveness positively predict interpersonal trust. Moreover, we found that interpersonal trust was higher in collectivistic (Chinese) groups than in individualistic (US) groups. Finally, we showed that in culturally heterogeneous groups, collectivistic (Chinese) members will perceive less interpersonal trust than individualistic (US) members.

### Managerial and practice implications

These findings provide an insight to managers who are managing group decision tasks that require rich communication and high levels of trust. For example, some communication-intensive decision tasks such as legal negotiation or strategic planning in new executive groups may be best performed FtF from a communication perspective. Given that virtual CS-supported groups appear to communicate as effectively as FtF CS-supported groups, virtual communication can be appropriate for lean-communication tasks that require a moderate amount of trust, especially for groups that are highly familiar and distributed.

Our results also provide additional evidence that culture matters greatly in fostering trust in decision-making groups, and thus managers need to exercise extra care while composing such groups. Furthermore, they must consider the importance of trust in the particular task and the cultural diversity of the team. With an improved understanding of the cultural impacts on virtual groups, managers of multicultural groups can improve trust, relationships and performance in such groups. As a result, organizations can function more effectively in multicultural group environments (Leidner & Kayworth, 2006). If changing the group cultural composition is not an option, managers should consider providing motivation for interpersonal trust in performing group tasks. It is particularly important to provide trust-enhancing mechanisms for CS-supported groups in general, for US members in homogeneous groups and for Chinese members in heterogeneous groups. Additionally, managers may also use different reward systems for individualists (e.g. individual merit pay) from those for collectivists (e.g. benefits to the whole group; Paul *et al.*, 2005).

An important finding of this study is that social presence of a communication medium influences interpersonal trust. This finding suggests that managers should improve trust in distributed and culturally diverse teams by choosing collaboration software that promotes social presence. Likewise, designers of collaboration software can include features that facilitate awareness of social cues in the software design. A valuable area of future research would be to identify software features that enhance social presence. Examples of such features are video streams, personal profiles, voice support, avatars and personal identities attached to the input.

Designers of collaborative software should take culture into account and be aware that some software features and assumptions may be blindly biased towards a western, individualistic perspective and may actually undermine the performance of collectivistic or multicultural groups. Our results also indicate that when trust is vital in multicultural group settings, it seems best to start with FtF communication.

The findings of this study can also help improve collaboration technology adoption in distributed groups, and thus improve overall group success. Interpersonal and IT-artefact trust has been shown to predict technology adoption (e.g. Komiak & Benbasat, 2006; Wang *et al.*, 2006). The adoption of collaboration technologies can be critical to the success of distributed teams (e.g. Chen *et al.*, 2007). Without collaboration technology, communication could be hindered, if not completely stopped. Our study suggests that managers can carefully manage group composition in terms of individualism-collectivism/culture homogeneity-heterogeneity to promote trust and thereby potentially influence technology adoption and overall success of distributed groups. Improved trust in technology-supported, culturally heterogeneous groups is highly important to improving the production of IT artefacts, because virtually everything important in respect to IS and IT is done in a team context. A key factor of why software development and package software implementation require groups is that various views on requirements and design elements (from the user community and development community) need a decision process of coming to a shared understanding of these elements (Gefen & Ridings, 2002). Examples include general decision making (Heninger *et al.*, 2006), custom and packaged software development (Sawyer, 2001; Walsham, 2002), Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP) implementations (Gefen & Ridings, 2002), communities of practice and knowledge management (Kanawattanachai & Yoo, 2007; Kankanhalli *et al.*, 2007; Venters & Wood, 2007) and Open-Source Software (OSS) communities (Bergquist & Ljungberg, 2001; Gallivan, 2001; Koch & Schneider, 2002).

Improving decision making in technology-supported groups is critical not just for producing IT artefacts but also for producing strategic organizational artefacts. Through effective teamwork and partnering, IT can provide change, new processes and new business models and strategies that influence an organization at large (Kock & McQueen, 1998; Jackson, 1999; Davison & Vogel, 2000; Kock, 2001). The positive effects of appropriate team technology support extend far beyond the IT organization and IT artefacts into the organization itself (Kock & McQueen, 1998; Furst *et al.*, 1999; Jackson, 1999; Gallivan, 2001; Chudoba *et al.*, 2005; Venters & Wood, 2007).

### Research implications

Using Hofstede's model, we examined technology-based groups in FtF and virtual settings from a culture perspective. Our results have significant potential implications for this line of research because most applications of Hofstede's model of culture in technological contexts have focused on IS management and little has been done to tie theories and empirical work together (e.g. Myers & Tan, 2002; Straub *et al.*, 2002; Ford *et al.*, 2003). This is also highly relevant in a global economy in which people from various national cultures are increasingly using CS. Further, we have enriched the body of literature by validating that Hofstede's model on I-C is generalizable to Chinese and US national cultures.

The TeamDiscussion tool was designed to capture the basic elements of any major CS so that our testing results could generalize to other collaborative tools. These critical elements include features that create shared cognition. Shared cognition is basically shared mental models within a group (Weick & Roberts, 1993; Espinosa *et al.*, 2001). Shared cognition is

created through group memory (Wegner *et al.*, 1991; Tyran & George, 2002) and group awareness (Lowry & Nunamaker, 2003). *Group memory* exists when the knowledge of a group is shared (Wegner *et al.*, 1991; Dennis & Garfield, 2003). *Group awareness* is the ability to know, without direct communication, what other group members are doing at any given time; this implicitly increases social pressure to contribute more to a group's effort, to coordinate work, and to avoid duplicate work (Lowry & Nunamaker, 2003).

Consistent with this line of Group Support Systems/Collaborative Support (GSS/CS) research, we implemented group memory and group awareness through a shared user interface that is enhanced with two other critical features: self-scribing ability and parallelism. *Self-scribing ability* allows each individual to type comments directly into group memory (Rodgers *et al.*, 2004). Self-scribed formalized group memories can be used to document work sessions (Nunamaker *et al.*, 1991) so that information is not overlooked (Maier, 1970; Harari & Graham, 1975). *Parallelism* is the ability of group members to contribute information simultaneously (Dennis *et al.*, 2001).

Our extension of SIT to culturally heterogeneous groups is a particularly important theoretical contribution, as virtually all previous research on interpersonal trust has only involved culturally homogenous groups except for Paul *et al.* (2005) and Kankanhalli *et al.* (2007). We provide the first empirical evidence for the effect of group cultural composition on interpersonal trust. Specifically, Chinese participants had higher interpersonal trust than US participants in homogeneous groups. Conversely, Chinese participants were less trusting than the US participants in heterogeneous groups. Despite its lack of effect on Chinese participants, group composition did affect the levels of interpersonal trust of US participants, with the trust in homogenous US groups being lower than in the heterogeneous groups. Thus, our findings highlight the importance of the culture factor in studying physical or virtual groups, which go beyond China and the USA. These findings can potentially be extended to other many individualistic (e.g. UK, Germany) and collectivistic (e.g. Japan, Mexico) cultures.

This study also reveals a moderating effect of communication quality on the relationship between social presence and trust. Specifically, FtF non-CS supported groups offer higher communication quality than CS-supported groups. Additionally, greater communication quality in turn leads to a higher level of trust, though this effect varies with the culture, and communication quality may be perceived differently depending on one's cultural perspective. Given this additional information and the specific results of the individualistic and collectivistic groups, we refine our originally proposed model (Figure 1) as shown in Figure 2.

## FUTURE DIRECTIONS

Future research should build upon the limitations of our study and the developed model. Our experiment was limited to college students using a particular collaborative tool. Use of student participants is appropriate when they fit the task and objectives of a study: participants in studies should have characteristics representing the population of interest and be presented with tasks for which they have the requisite skills and knowledge (Gordon *et al.*, 1986). In this study, student participants clearly represent a subset of the broader population of collectivistic

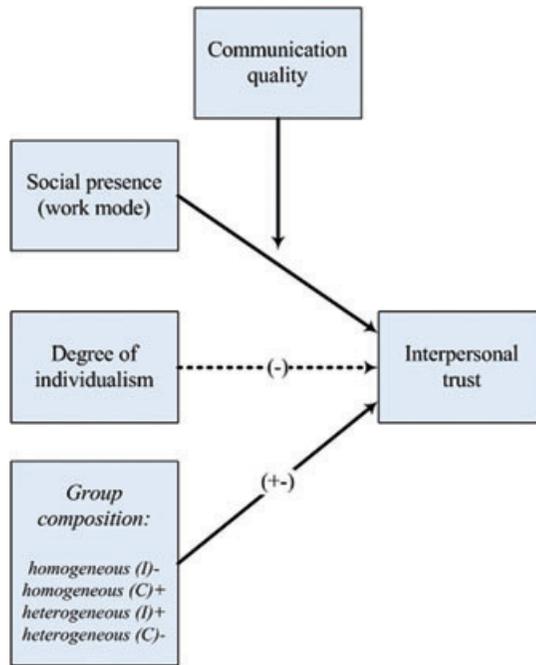


Figure 2. Proposed modified model.

and individualistic workers who are educated, speak English and would be candidates for working in cross-cultural scenarios. Thus, the use of students in this study was appropriate, but additional insights in future studies can be gained by involving more experienced workers and a broader range of participants.

Similarly, our model provides a baseline on which additional cross-culture factors can be added for consideration. We examined group composition, individualism-collectivism and social presence. However, there are mediators, moderators and other factors that could enrich our model. Some considerations for future model extensions include: (1) tight or loose coupling of work tasks; (2) the familiarity between group members; (3) whether collaboration is voluntary or mandated; (4) using other types of group tasks; (5) whether the members of a group have a shared, stable goal given to them or are involved in goal creation themselves; (6) whether groups have appointed leaders, informal leadership or no hierarchy; and (7) whether distributed groups consist of individual members all in different geographical places or of geographically distributed subgroups of collocated members.

Our finding that US members in homogeneous groups are less trusting than those in heterogeneous groups counters the prevailing notion of in-groups and SIT. Although McAllister also predicted that group members would be more likely to trust those who were similar to them, his empirical results (1995) did not support this prediction as his participants knew each

other and had little ethnic or cultural diversity. Thus, we offer two explanations that undermine the purported positive benefits of SIT on homogeneous US groups.

One possibility may be the differences in social values. US participants may place more value on heterogeneity, as their society has a long-standing tradition of mixing cultures and ethnicities. Indeed, the USA is the most ethnically diverse country in the world (Naylor, 1997). Conversely, China is one of the least ethnically diverse countries. It makes sense that those from the US may be more open to heterogeneous cultural groups.

Recent social psychology research may provide another explanation for this paradox with SIT. Norton *et al.* (2007) show that perceived similarity increases liking; however, increased perceptual knowledge of another person's traits in a short period of time directly decreases perceived similarity and liking. In contrast, more ambiguity about another person's traits causes more similarity and liking. If liking and trust are highly correlated, then their findings may explain our results with individualists: the increased confrontational and competitive nature of individualists could cause them to be more judgmental and to see more differences in those who are similar to them than collectivists do. Consequently, this may lead to dislike and distrust of people who are similar.

We believe that because collectivists are more inclined towards in-groups and working towards the good of the whole, they are less inclined to perceive differences in those who are similar to them than individualists are. By seeing more similarity, they have more liking and trust in homogeneous groups.

If our explanations hold, they also help explain why FtF non-CS US groups have the lowest levels of trust among the three types of operationalizations of social presence. Specifically, increased social presence and communication in FtF non-CS settings allowed these US groups to have more cues and social interactions from which to form knowledge of traits that were used to form judgments of dissimilarity. Meanwhile, the use of CS allowed some masking of this knowledge and of the perceived differences between group members. These clearly merit future research and further theoretical development through SIT.

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## REFERENCES

- Atuahene-Gima, K. & Li, H. (2002) When does trust matter? Antecedents and contingent effects of supervisee trust on performance in selling new products in China and the United States. *Journal of Marketing*, **66**, 61–81.
- Bergquist, M. & Ljungberg, J. (2001) The power of gifts: organizing social relationships in open source communities. *Information Systems Journal*, **11**, 305–320.
- Brewer, M.B. (1979) In-group bias in the minimal intergroup situation: a cognitive-motivational analysis. *Psychological Bulletin*, **86**, 307–324.
- Chen, C.C., Chen, X.P. & Meindl, J.R. (1998) How can cooperation be fostered? The cultural effects of individualism-collectivism. *Academy of Management Review*, **23**, 285–304.
- Chen, M., Liou, Y., Wang, C.-W., Fan, Y.-W. & Chi, Y.-P. J. (2007) TeamSpirit: design, implementation, and evaluation of a web-based group decision support system. *Decision Support Systems*, **43**, 1186–1202.
- Chudoba, K.M., Wynn, E., Lu, M. & Watson-Manheim, M.B. (2005) How virtual are we? Measuring virtuality and understanding its impact in a global organization. *Information Systems Journal*, **15**, 279–306.
- Daft, R.L. & Lengel, R.H. (1986) Organizational information requirements, media richness and structural design. *Management Science*, **32**, 554–571.
- Daily, B.F. & Steiner, R.L. (1998) The influence of group decision support systems on contribution and commitment levels in multicultural and culturally homogeneous decision-making groups. *Computers in Human Behavior*, **14**, 147–162.
- Davison, R. & Vogel, D. (2000) Group support systems in Hong Kong: an action research project. *Information Systems Journal*, **10**, 3–20.
- Dennis, A.R. & Garfield, M. (2003) The adoption and use of GSS in project teams: toward more participative processes and outcomes. *MIS Quarterly*, **27**, 289–323.
- Dennis, A.R., Wixom, B. & Vandenberg, R. (2001) Understanding fit and appropriation effects in group support systems via meta-analysis. *MIS Quarterly*, **25**, 167–193.
- Doney, P.M., Cannon, J.P. & Mullen, M.R. (1998) Understanding the influence of national culture on the development of trust. *Academy of Management Review*, **23**, 601–620.
- Dunn, J.R. & Schweitzer, M.E. (2005) Feeling and believing: the influence of emotion on trust. *Journal of Personality and Social Psychology*, **88**, 736–748.
- Earley, P.C. & Mosakowski, E. (2000) Creating hybrid team cultures: an empirical test of transactional team functioning. *Academy of Management Journal*, **43**, 26–49.
- Espinosa, A., Kraut, R., Lerch, J., Slaughter, S., Herbsleb, J. & Mockus, A. (2001) Shared mental models and coordination in large-scale, distributed software development. In: *22nd International Conference on Information Systems (ICIS'2001)*, pp. 513–517. Atlanta, GA, USA.
- Ford, D.P., Connelly, C.E. & Meister, D.B. (2003) Information systems research and Hofstede's culture's consequences: an uneasy and incomplete partnership. *IEEE Transactions on Engineering Management*, **50**, 8–25.
- Fulk, J., Schmitz, J. & Steinfield, C. (1990) A social influence model of technology use. In: *Organizations and Communication technology*, Fulk, J. & Steinfield, C. (eds), pp. 117–142. Sage, Newbury Park, CT, USA.
- Fuller, M.A., Hardin, A.M. & Davison, R.M. (2007) Efficacy in technology-mediated distributed teams. *Journal of Management Information Systems*, **23**, 209–235.
- Furst, S., Blackburn, R. & Rosen, B. (1999) Virtual team effectiveness: a proposed research agenda. *Information Systems Journal*, **9**, 249–269.
- Gallivan, M.J. (2001) Striking a balance between trust and control in a virtual organization: a content analysis of open source software case studies. *Information Systems Journal*, **11**, 277–304.
- Gallivan, M.J. & Depledge, G. (2003) Trust, control and the role of interorganizational systems in electronic partnership. *Information Systems Journal*, **13**, 159–190.
- Gefen, D. & Ridings, C.M. (2002) Implementation team responsiveness and user evaluation of customer relationship management: a quasi-experimental design study of social exchange theory. *Journal of Management Information Systems*, **19**, 47–69.
- Gordon, M.E., Slade, L.A. & Schmitt, N.W. (1986) The 'Science of the Sophomore' revisited: from conjecture to empiricism. *Academy of Management Review*, **11**, 191–207.
- Harari, O. & Graham, W. (1975) Tasks and task consequences as factors in individual and group brainstorming. *Journal of Social Psychology*, **95**, 61–65.
- Hassanein, K. & Head, M. (2006) The impact of infusing social presence in the Web interface: an investigation across product types. *International Journal of Electronic Commerce*, **10**, 31–55.

- Heninger, W.G., Dennis, A.R. & Hilmer, K.M. (2006) Individual cognition and dual-task interference in group support systems. *Information Systems Research*, **17**, 415–424.
- Hofstede, G. (1991) *Cultures and Organizations: Software of the Mind*. McGraw-Hill, Berkshire, UK.
- Huff, L. & Kelley, L. (2003) Levels of organizational trust in individualist versus collectivist societies: a seven-nation study. *Organization Science*, **14**, 81–90.
- Ibbott, C.J. & O'Keefe, R.M. (2004) Trust, planning and benefits in a global interorganizational system. *Information Systems Journal*, **14**, 131–152.
- Jackson, P.J. (1999) Organizational change and virtual teams: strategic and operational integration. *Information Systems Journal*, **9**, 313–332.
- Jarvenpaa, S.L. & Leidner, D.E. (1999) Communication and trust in global virtual teams. *Organization Science*, **10**, 791–815.
- Jarvenpaa, S.L., Shaw, T.R. & Staples, D.S. (2004) Toward contextualized theories of trust: the role of trust in global virtual teams. *Information Systems Research*, **15**, 250–264.
- Kanawattanachai, P. & Yoo, Y. (2007) The impact of knowledge coordination on virtual team performance over time. *MIS Quarterly*, **31**, 783–808.
- Kankanhalli, A., Tan, B.C.Y. & Wei, K.-K. (2007) Conflict and performance in global virtual teams. *Journal of Management Information Systems*, **23**, 237–274.
- Koch, S. & Schneider, G. (2002) Effort, co-operation and co-ordination in an open source software project: GNOME. *Information Systems Journal*, **12**, 27–42.
- Kock, N. (2001) Asynchronous and distributed process improvement: the role of collaborative technologies. *Information Systems Journal*, **11**, 87–110.
- Kock, N. & McQueen, R.J. (1998) Groupware support as a moderator of interdepartmental knowledge communication in process improvement groups: an action research study. *Information Systems Journal*, **8**, 183–198.
- Komiak, S.Y.X. & Benbasat, I. (2006) The effects of personalization and familiarity on trust and adoption of recommendation agents. *MIS Quarterly*, **30**, 941–960.
- Lee, D.Y. & Dawes, P.L. (2005) Trust, and long-term orientation in Chinese business markets. *Journal of International Marketing*, **13**, 28–56.
- Leidner, D.E. & Kayworth, T. (2006) A review of culture in information systems research: toward a theory of information technology culture conflict. *MIS Quarterly*, **30**, 357–399.
- Lowry, P.B. & Nunamaker, J.F. Jr. (2003) Using internet-based, distributed collaborative writing tools to improve coordination and group awareness in writing teams. *IEEE Transactions on Professional Communication*, **46**, 277–297.
- Lowry, P.B., Roberts, T.L., Romano, N.C., Cheney, P. & Hightower, R.T. (2006) The impact of group size and social presence on small-group communication: does computer-mediated communication make a difference? *Small Group Research*, **37**, 631–661.
- Maier, N. (1970) *Problem Solving and Creativity*. Brooks/Cole, Pacific Grove, CA, USA.
- McAllister, D.J. (1995) Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal*, **38**, 24–59.
- McCoy, S., Galletta, D.F. & King, W.R. (2005) Integrating national culture into IS research: the need for current individual-level measures. *Communications of the AIS*, **15**, 211–224.
- McKnight, D.H., Cummings, L.L. & Chervany, N.L. (1998) Initial trust formation in new organizational relationships. *Academy of Management Review*, **23**, 473–490.
- Miranda, S.M. & Saunders, C.S. (2003) The social construction of meaning: an alternative perspective on information sharing. *Information Systems Research*, **14**, 87–106.
- Myers, M.D. & Tan, F.B. (2002) Beyond models of national culture in information systems research. *Journal of Global Information Management*, **10**, 24–32.
- Naylor, L.L. (1997) *Cultural Diversity in the United States*. Bergin & Garvey, Westport, CT, USA.
- Norton, M.I., Frost, J.H. & Ariely, D. (2007) Less is more: the lure of ambiguity, or why familiarity breeds contempt. *Journal of Personality and Social Psychology*, **92**, 97–105.
- Nunamaker, J.F. Jr., Dennis, A., Valacich, J., Vogel, D. & George, J. (1991) Electronic meeting systems to support group work. *Communications of the ACM*, **34**, 40–61.
- O'Hara-Devereaux, M. & Johansen, R. (1994) *Global Work: Bridging Distance, Culture, and Time*. Jossey-Bass, San Francisco, CA, USA.
- Oetzel, J.G. (2001) Self-construals, communication processes, and group outcomes in homogeneous and heterogeneous groups. *Small Group Research*, **32**, 19–54.
- O'Reilly, C.A. & Roberts, K.H. (1977) Task group structure, communication, and effectiveness in three organizations. *Journal of Applied Psychology*, **62**, 674–681.
- Paul, D.L. & McDaniel, R.R. (2004) A field study of the effect of interpersonal trust on virtual collaborative relationship performance. *MIS Quarterly*, **28**, 183–227.
- Paul, S., Samarah, I.M., Seetharaman, P. & Mykytyn, P.P. Jr. (2005) An empirical investigation of collaborative

- conflict management style in group support system-based global virtual teams. *Journal of Management Information Systems*, **21**, 185–222.
- Putnam, R.D. (2007) *E pluribus unum: diversity and community in the twenty-first century*. The 2006 Johan Skytte Prize Lecture. *Scandinavian Political Studies*, **30**, 137–174.
- Ridings, C.M., Gefen, D. & Arinze, B. (2002) Some antecedents and effects of trust in virtual communities. *Journal of Strategic Information Systems*, **11**, 271–295.
- Roberts, T.L., Lowry, P.B. & Sweeney, P.D. (2006) An evaluation of the impact of social presence through group size and the use of collaborative software on group member 'voice' in face-to-face and computer-mediated task groups. *IEEE Transactions on Professional Communication*, **49**, 28–43.
- Rodgers, T.L., Dean, D.L., Nunamaker, J.F. Jr. (2004) Increasing inspection efficiency through group support systems. In: *37th Hawai'i International Conference on System Sciences*, pp. 18–27. IEEE Computer Society Press, Waikaloa, HI, USA.
- Sawyer, S. (2001) Effects of intra-group conflict on packaged software development team performance. *Information Systems Journal*, **11**, 155–178.
- Setlock, L.D., Fussell, S.R. & Neuwirth, C. (2004) Taking it out of context: collaborating within and across cultures in face-to-face settings and via instant messaging. In: *ACM CSCW'04*, pp. 604–613. Chicago, IL, USA.
- Short, J., Williams, E. & Christie, B. (1976) *The Social Psychology of Telecommunication*. John Wiley and Sons, London, UK.
- Straub, D., Loch, K., Evaristo, R., Karahanna, E. & Srite, M. (2002) Toward a theory-based measurement of culture. *Journal of Global Information Management*, **10**, 13–23.
- Tan, B.C.Y., Smith, H.J. & Keil, M. (2003) Reporting bad news about software projects: impact of organizational climate and information asymmetry in an individualistic and collectivistic culture. *IEEE Transactions on Engineering Management*, **50**, 65–77.
- Tan, B.C.Y., Watson, R. & Wei, K.-K. (1995) National culture and group support systems: filtering communication to dampen power differentials. *European Journal of Information Systems*, **4**, 82–92.
- Tan, B.C.Y., Wei, K.-K., Watson, R.T. & Walczuch, R.M. (1998a) Reducing status effects with computer-mediated communication: evidence from two distinct national cultures. *Journal of Management Information Systems*, **15**, 119–142.
- Tan, B.C.Y., Wei, K.-K., Watson, R.T., Clapper, D.L. & McLean, E.R. (1998b) Computer-mediated communication and majority influence: assessing the impact in an individualistic and a collectivistic culture. *Management Science*, **44**, 1263–1278.
- Triandis, H.C. (1989) The self and social behavior in differing cultural contexts. *Psychological Review*, **96**, 506–520.
- Triandis, H.C. (1995) *Individualism and Collectivism*. Westview Press, Boulder, CO, USA.
- Triandis, H.C., Bontempo, R., Betancourt, H., Bond, M., Leung, K., Brenes, A. et al. (1986) The measurement of the etic aspects of individualism and collectivism across cultures. *Australian Journal of Psychology*, **38**, 257–267.
- Turner, J.C. (1982) Toward a cognitive definition of the group. In: *Social Identity and Intergroup Relations*, Tajfel, H. (ed.), pp. 15–40. Cambridge University Press, Cambridge, UK.
- Turner, J.C. (1987) *Rediscovering the Social Group: A Self-Categorization Theory*. Blackwell, Oxford, UK.
- Tyran, C.K. & George, J.F. (2002) Improving software inspections with group process support. *Communications of the ACM*, **45**, 87–92.
- Venters, W. & Wood, B. (2007) Degenerative structures that inhibit the emergence of communities of practice: a case study of knowledge management in the British Council. *Information Systems Journal*, **17**, 349–368.
- Walsham, G. (2002) Cross-cultural software production and use: a structural analysis. *MIS Quarterly*, **26**, 359–380.
- Wang, W. & Benbasat, I. (2007) Recommendation agents for electronic commerce: effects of explanation facilities on trusting beliefs. *Journal of Management Information Systems*, **23**, 217–246.
- Wang, Y.-S., Lin, H.-H. & Luarn, P. (2006) Predicting consumer intention to use mobile service. *Information Systems Journal*, **16**, 157–180.
- Warkentin, M. & Beranek, P.M. (1999) Training to improve virtual team communication. *Information Systems Journal*, **9**, 271–289.
- Watson, W.E., Kumar, K. & Michaelsen, L.K. (1993) Cultural diversity's impact on interaction process and performance: comparing homogeneous and diverse task groups. *Academy of Management Journal*, **36**, 590–602.
- Wegner, D.M., Erber, R. & Raymond, P. (1991) Transactive memory in close relationships. *Journal of Personality and Social Psychology*, **61**, 923–929.
- Weick, K. & Roberts, K. (1993) Collective mind in organizations: heedful interrelating on flight decks. *Administrative Science Quarterly*, **38**, 357–381.

- Williams, K.Y. & O'Reilly, C.A. (1998) Demography and diversity in organizations: a review of 40 years of research. In: *Research in Organizational Behavior*, Vol. 20, Straw, B.M. & Cummings, L.L. (eds), pp. 77–140. JAI Press Inc, Greenwich, CT, USA.
- Xin, K.K. & Pearce, J.L. (1996) Guanxi: connections as substitutes for formal institutional support. *Academy of Management Journal*, **39**, 1641–1658.
- Zhang, D. & Lowry, P.B. (2008) Issues, limitations, and opportunities in cross-cultural research on collaborative software in information systems. *Journal of Global Information Management*, **16**, 61–92.
- Zhang, D., Lowry, P.B., Zhou, L. & Fu, X. (2007) The impact of individualism-collectivism, social presence, and group diversity on group decision making under majority influence. *Journal of Management Information Systems*, **23**, 53–80.
- Zhou, L., Burgoon, J.K. Jr., Nunamaker, J.F. Jr. & Twitchell, D. (2004) Automated linguistics based cues for detecting deception in text-based asynchronous computer-mediated communication: an empirical investigation. *Group Decision and Negotiation*, **13**, 81–106.

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