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A Comparative Study of Individual Acceptance of Instant Messaging in the US and China: A Structural Equation Modeling Approach

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Abstract:

The use of computer-mediated communication technology across different countries and cultures is under-investigated in information systems (IS) research. The measurement equivalence issue in cross-cultural IS studies has also not been addressed adequately. This study applies a rigorous structural equation modeling approach (SEM) to compare differences between two groups of college students in the United States and China, by adapting a research model that explains an individual's use of Instant Messaging (IM). After achieving measurement equivalence across the two groups using SEM, we found that, in their behavioral intention to use IM, Chinese students paid more attention to the effect of perceived enjoyment, while Americans placed more emphasis on perceived usefulness. We found that relationship commitment was more salient in explaining perceived enjoyment for Chinese than for Americans. We also found that the effects of perceived critical mass on perceived enjoyment and perceived usefulness were stronger for Americans than for Chinese. Contrary to our hypothesis, we found that the effect of relationship commitment on perceived usefulness was stronger for Americans than for Chinese. Implications for research and practice are discussed.

Keywords: Instant Messaging, perceived enjoyment, perceived usefulness, relationship commitment, perceived critical mass, culture, factorial invariance, structural equation modeling

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I. INTRODUCTION

The Internet is an important medium for interpersonal communications around the world [Rice, Cool, and Fish 1998; Cole, Massey, Montoya-Weiss, and O'Keefe 2002]. About 60 percent of American adult Internet users reported that the Internet helped them maintain and improve their relationships with family members and friends [Spooner, Meredith, and Rainie 2003]. The number is even higher in China. Eighty-three percent of Chinese Internet users indicated that the Internet improved their relationships with friends; 65 percent of these users suggested that the Internet helped them make new friends [China Internet Network Information Center 2009]. One popular Internet-based computer-mediated communication (CMC) technology is Instant Messaging (IM), which provides real-time communication between people. Compared with e-mail, IM has the feature of presence management, which can notify a user whether his communication partner is online and available to chat. Thus, IM provides "co-presence" and quicker responses [Rennecker and Godwin 2003; Kock 2005]. Previous research found that both Americans and Chinese use IM heavily. The 2004 Pew Internet & American Life surveys reported that there were 53 million IM users in the US, accounting for 42 percent of the Internet population [Shiu and Lenhart 2004]. In 2008, 75 percent of 298 million Chinese Internet users used IM [China Internet Network Information Center 2009]. The use of IM has extended to workplaces. An AP-AOL survey of IM users suggested that 27 percent of respondents sent IM at work to improve productivity and manage relationships with colleagues [AP-AOL 2007].

What factors account for the use of IM in a global context? Do these factors have different effects on IM use across countries? Previous cross-cultural and cross-national information systems (IS) studies have been largely focused on examining mean differences in research constructs. Except for a handful of studies [Straub, Keil, and Brenner 1997; Rice, D'Ambra, and More 1998; Keil, Mann, and Rai 2000; Van Slyke, Belanger, and Sridar 2005; Srite and Karahanna 2006], IS researchers have seldom investigated country-based differences of path coefficients between research constructs. Understanding differences in path coefficients is important to both theory and practice. By investigating path differences, we can examine whether theories and models developed in one setting hold in another. Practitioners who wish to promote the use of IM can use the results of this study to help guide their promotional efforts. If there are differential effects across countries, change agents can focus on the most salient enablers of use for a particular country, which will help maximize the effectiveness of change activities.

Adapting a research model that explains an individual's use of IM [Li, Chau, and Lou 2005], this study investigates differences in an individual's behavioral intention to use IM in social interactions across two countries (i.e., the United States [US] and China [CN]). We follow a rigorous group comparison approach using structural equation modeling (SEM) in our empirical study [Jöreskog and Sörbom 1996; Steenkamp and Baumgartner 1998; Cheung and Rensv 1999].

The current study's theoretical contribution is as follows. First, this study addresses an important and neglected topic in global IS research: country-based differences of CMC use. As suggested by Jarvenpaa and Leidner [1998], there have been limited research interests, efforts, and evidence regarding the use of CMC across countries, although there were abundant studies on CMC and cross-cultural communications respectively. Previous cross-country communication research has found that individuals from different cultural backgrounds have different communication-related attitudes and motivations [Gudykunst 1997]. We posit that these differences might be reflected in the use of CMC. In a literature review of fifty-seven cross-cultural IS studies, Ford et al. [Ford, Connelly, and Meister 2003] found that there was a very limited number of studies (six papers) investigating IS use in a cross-cultural context. Although IS scholars are switching their research interests from IS development and operation to IS usage [Ford, Connelly, and Meister 2003], cross-cultural IS use is still an under-investigated area. Unlike other academic disciplines, such as organizational behavior, which have abundant evidence of the effects of cross-cultural studies [Gelfand, Erez, and Aycan 2007], IS studies have not truly examined the generalizability of research models and frameworks that have originated in the West and moved to countries in the East [Zhao, Flynn, and Roth 2006; 2007].

Second, this study sets an example for how to address the methodology equivalence issue in cross-cultural IS studies. Comparative studies of different nations and cultures represent a major theme of cross-cultural IS studies [Gallupe and Tan 1999]. However, these studies are challenged by various methodological difficulties [Myers and Tan, 2002; Straub, Loch, Evaristo, Karahanna, and Srite, 2002]. Before making meaningful comparisons across cultures, empirical studies must ensure various methodological equivalences in research design, such as research instruments, measures, and data collection procedures [Karahanna, Evaristo, and Srite 2002]. Previous cross-

cultural IS studies have seldom examined the equivalence of measurements, so that whether research findings are due to culture or to measurement issues is often questioned [Karahanna, Evaristo, and Srite 2002]. To address this underdeveloped empirical issue in cross-cultural IS studies, this study adopts a rigorous multi-group analysis approach to achieve measurement invariance using structural equation modeling (SEM) [Jöreskog and Sörbom 1996; Doll, Hendrickson, and Deng 1998; Steenkamp and Baumgartner 1998; Cheung and Rensvold 1999].

This study will also provide practical implications for decision makers and managers, because of the wide use of IM in workplaces. Managers could not reverse the grassroots adoption of IM in workplaces. The findings of this study can help business managers deploy effective guidelines and policies to direct the use of IM that are appropriate for an increased diversity of employees from different countries and cultural backgrounds. A better understanding of the factors that most strongly influence IM use from different countries can also help IM vendors and service providers improve the features and functions of IM to fit the requirements of users from different countries. Vendors can implement and promote features that may improve perceptions of the beliefs that have the strongest impacts on IM use, and can tailor offerings and promotional activities to the country of interest.

The rest of the paper is organized as follows. We first present a review of cross-cultural literature as the theoretical background of the study. Then, we discuss a research model and corresponding research hypotheses. After presenting the research method adopted to test our research hypotheses, we report data analyses and results. The paper concludes with a discussion of findings and implications for theory and practice.

II. LITERATURE REVIEW

Most cross-country IS studies are based on Hofstede's culture dimensions [Myers and Tan 2002; Ford, Connelly, and Meister 2003]. National differences can be understood in terms of national cultures—the collective programming of the mind that distinguishes the members of one human group from another [Hofstede 1991; Hofstede 2001]. Even though a given individual within a country may or may not follow the cultural norms of that country, s/he is still influenced by those norms. Among the five dimensions of cultural differences, i.e., power distance, individualism/collectivism, masculinity/femininity, uncertainty avoidance, and long-term/short-term orientation [Hofstede 1991], individualism/collectivism is particularly relevant in studying the use of CMC technologies in social interactions. At the national level, individualism means that loosely connected social relationships are valued, and individuals are expected to care only for themselves and their immediate members. Collectivism means that tightly-knit relations are valued, and individuals are expected to look after their extended social relations [Hofstede 1991; Hofstede 2001]. In Chinese, these types of social relations are referred to as *guanxi*, which typically ties an individual into various connections with other people [Zhao, Flynn, and Roth 2006; 2007]. Unlike cultural dimensions at the national level, individualism/collectivism is an important variable to explain cultural differences at the individual level, as discussed in social psychology research [Triandis 1989; Markus and Kitayama 1991; Triandis 1994; Triandis 1995; Markus and Kitayama 1998]. Individualism refers to the importance placed on the welfare and values of the individual person, as opposed to collectivism which emphasizes the good or desire of the group [Triandis 1995].

The differences between individualism and collectivism can influence and determine an individual's cognition, attitude, emotion, motivation, and social behavior [Markus and Kitayama 1991; Triandis 1994; Triandis 1995]. For example, individualism is more focused on, more attentive to, and more knowledgeable about the self than about others. Social behavior is driven by attitude, personal values, and cost-benefit analysis, which emphasizes objective rules and principles rather than subjective experiences, processes, and specific contextual information [Fried 1995]. Collectivism culture tends to provide approval and emotional support so that conversations are likely to revolve around feelings. We advance our discussion along four important distinctions.

The first distinction is the individual's personality orientation (idiocentric and allocentric) [Triandis 1989]. People from individualistic culture are idiocentric, and regard it natural to "do their own thing" and disregard the need of the group [Triandis, Bontempo, Villareal, Asai, and Lucca 1988]. These people place a higher value on achievement, affluence, productivity, and individual responsibility. They are also emotionally detached from groups. Their behaviors are regulated by their attitudes and by a cost-benefit analysis perspective that relies on objective and empirically validated data [Triandis, McCusker, and Hui 1990]. In collectivist cultures, most people are allocentric and value sharing, cooperation, and social responsibility. There is a collective conceptualization of the society in which allocentric people function as interdependent members of a group. Allocentric individuals define themselves in terms of groups, and they cannot be understood separately from others in the social group. There is no perceptual, cognitive, and emotional separation between the individual and others in the group. There are also strong distinctions between in-group and out-group, so that only in-group members enjoy beneficial aspects of collectivism. Alternatively, individualists may downplay group- or collective-benefits, although they are more likely to help others outside their local group because of the decreased in/out-group distinction [Triandis 1995].

The second distinction is self-construal [Markus and Kitayama 1991], or whether an individual interprets the self as independent or interdependent. An independent view of the self, mostly found in individualistic cultures, emphasizes “attending to the self, the appreciation of one’s difference from others, and the importance of asserting the self” [Markus and Kitayama 1991]. Often reviewed as independent, self-contained, and autonomous, individuals of an independent view are believed to have unique internal traits, abilities, motives, and values that provide a rationale for the individual’s cognition, emotion, and motivation. Social interactions and responsiveness result from the need to express their internal attributes. Others, and the social context surrounding the self, are less important. On the other hand, an interdependent view, exemplified in collectivistic cultures such as Asian, Latin American, African, and many southern European countries, is focused on “attending to and fitting in with others and the importance of harmonious interdependence and relationships with them” [Markus and Kitayama 1991]. Connectedness of the self and the others is at the center of the culture. Individuals are not separated from social context and relationships with others but embedded with each other. Others become an integral part of the social contexts to which an individual is linked. The focus of this culture is on the relationships between the self and others, without whom the self could not be understood.

The third distinction lies in communication style (low-context communication and high-context communication) [Hall 1976]. Communication context implies information that provides meanings to a task and activity. Further, the amount of implicit information embedded in the context of communications is different across cultures; individualism is low-context, while collectivism is high-context [Triandis 1995]. In the high-context culture, meanings in communication are not only found in the content but also in the nature of the situation and relationships. People take for granted that much information is latent in the structure of messages, assuming that their communication partners understand most of what they want to communicate, without being told directly. In contrast, the low-context culture sees little or no information embedded in the context, but emphasizes more explicit verbal communication. The meanings to be conveyed between each other are found in the words, and little is left to the imagination or intuition. Thus, the low-context culture values straight talk, assertiveness and honesty in order to avoid misunderstandings or differing interpretations. Collectivistic cultures need face-to-face contact because people in this culture depend on context more than people in an individualistic culture, who are quite satisfied with written communications [Triandis 1994]. Those in collectivist cultures are more concerned with the opinions of others. In addition, normative pressures are more salient for collectivist cultures [Srite et al. 2006]. Therefore, the visual cues that are present in face-to-face (collectivist) communication are more important, since collectivists seek to maximize the amount of normative information available.

The fourth distinction is related to time orientation (monochronic and polychronic) [Hall 1976]. Individualistic cultures are monochronic, which means that only one task is undertaken by an individual at any given moment. People want to finish what they have started before beginning something new. At the same time, they are less invested in the activity and more concerned with the outcome or product of the activity [Hall 1982]. On the other hand, collectivist cultures view time holistically and as polychronic, which means that people engage in many tasks at any given moment [Hall 1976]. People pay attention to the activity of the moment and the emphasis is on people, not on schedules [Samovar and Porter 1994]. Because of multitasking, people in polychronic cultures are more concerned with the activity itself than with the outcome.

To summarize, the difference between individualism and collectivism at the individual level may cause people from different cultural backgrounds to express different cognitions, attitudes, emotions, motivations, and social behaviors. Having been shown in previous research [Gudykunst 1997], such differences might also influence an individual’s use of CMC. To be specific, both an individual’s perception of the attributes of IM and the motivation to use IM may be different across cultures. Cultural effects on an individual’s use of IM may also be different. It is well-known that Chinese are representative of the collectivist culture and Americans represent an individualist culture [Hall 1976; Hofstede 1991; Triandis 1994; Gudykunst 1997; Hofstede 2001; Zhao, Flynn, and Roth 2006; 2007], although there are some transitions between the two cultures. For instance, individualism is emerging in the collective culture, and collectivism is seen in the individualist culture.

III. RESEARCH MODEL AND HYPOTHESES

Our research model (Figure 1) is adapted from Li et al. [Li, Chau, and Lou 2005], which examined American college students’ use of IM using the Motivational Model [Davis, Bagozzi, and Warshaw 1992]. The Motivational Model has the advantage of including nonutilitarian drivers of technology use. Other acceptance models widely used in the IS literature focus on the utility of technology use, such as perceived usefulness in the Technology Acceptance Model. Utility-driven models may not account for more hedonic drivers of use, such as enjoyment. Following previous studies [Davis, Bagozzi, and Warshaw 1992; Igbaria, Parasuraman, and Baroudi 1996; Li, Chau, and Lou 2005; Teo, Lim, and Lai 1999], we model an individual’s behavioral intention to use IM as the outcome in the research model. Using behavioral intention to explain actual behavior has both a solid theoretical foundation and sufficient empirical support across academic disciplines [e.g., Sheppard, Hartwick, and Warshaw 1988; Venkatesh and Davis

2000; Venkatesh, Morris, Davis, & Davis 2003]. In order to achieve model parsimony and be consistent with the Motivational Model [Davis, Bagozzi, and Warshaw 1992], we removed the link from perceived enjoyment to perceived usefulness and that from perceived critical mass to behavioral intention. Attachment motivation is also not included because we focus on an individual's continuous use; attachment motivation may be salient for initial development of a relationship and the initial use of IM [Li, Chau, and Lou 2005].

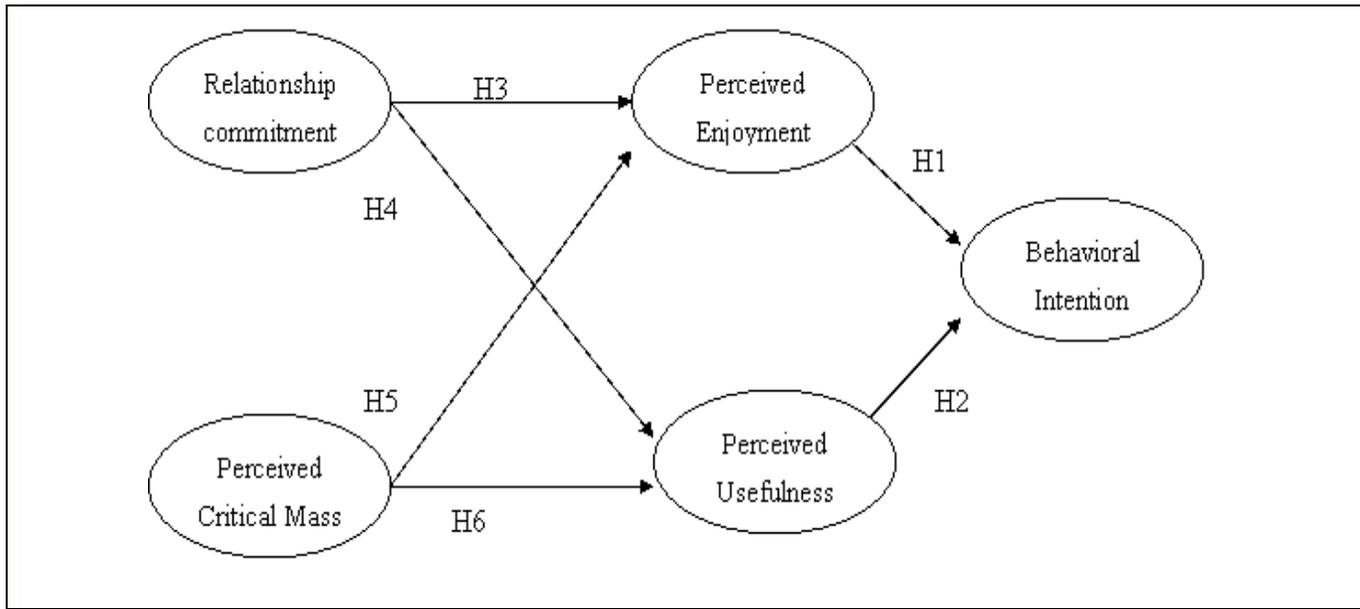


Figure 1: The Research Model.

Perceived Enjoyment and Perceived Usefulness

Studies based on the Motivational Model measure intrinsic motivation in terms of perceived enjoyment and extrinsic motivation in terms of perceived usefulness [Davis, Bagozzi, and Warshaw 1992; Trevino and Webster 1992; Webster and Martocchio 1993; Igbaria, Parasuraman, and Baroudi 1996; Teo, Lim, and Lai 1999; Stafford, Stafford, and Schkade, 2004; Li, Chau, and Lou 2005]. Because of the accumulated empirical evidence about the effects of intrinsic/extrinsic motivation on technology acceptance and use [e.g., Davis, Bagozzi, and Warshaw 1992; Trevino and Webster 1992; Igbaria, Parasuraman, and Baroudi 1996; Teo, Lim, and Lai 1999; Venkatesh, Morris, Davis, and Davis 2003; Stafford, Stafford, and Schkade 2004; Li, Chau, and Lou 2005], we expect the generalizability of these findings can be applied to an individual's use of IM. Thus, we hypothesize:

H1: Perceived enjoyment of IM is positively associated with behavioral intention to use IM.

H2: Perceived usefulness of IM is positively associated with behavioral intention to use IM.

The role of perceived enjoyment may be more salient for Chinese than for Americans because of four general research findings on cultural differences. First, IM supports polychronic communications [Bluedorn, Kaufman, and Lane 1992], so that people could be simultaneously involved in more than one conversation. This feature might be more appealing to Chinese than to Americans because Chinese tend to have a polychronic orientation [Hall 1976]. Second, Chinese are more concerned with the subjective experience and the process of being involved in an activity than Americans [Hall, 1982; Okun, Fried, and Okun 1999]. Following Triandis [Triandis 1995] who argues that collectivists "are often socialized to enjoy doing their duty" [Triandis 1995, p. 11], we posit that Chinese may enjoy "being" in the course of using IM more than American do [Triandis 1994]. Third, Chinese tend to provide more attendance and emotional support to others than Americans do. Further, Chinese conversations are more likely to revolve around feelings [Okun, Fried, and Okun 1999]. This may contribute to pleasant and enjoyable components of interpersonal communications [Markus and Kitayama 1991; Triandis 1994]. Last, but not least, people from high-context cultures such as China seek subtle contextual information and imagination in their communications [Hall 1976; Okun, Fried, and Okun 1999]. The unique features provided by IM, such as different colors, smiling faces, and icons, might help convey contextual information, and thus contribute to the fun of communications. If Chinese find more enjoyment from IM use than Americans, this fact may lead to enjoyment being a more important factor in bringing about IM use for Chinese. In addition, there is evidence that those in collectivist countries are less driven by utilitarian outcomes than those in more individualistic countries. For example, Straub et al. [1997] found that perceived usefulness was not a significant predictor of e-mail use for Japanese managers, while it was for American



managers. Similarly, Van Slyke et al. [2005] found similar results in a study of Indian and American consumers' use of e-commerce. Given that both Japan and India are more collectivist than the United States, it seems that those in collectivist countries are not as driven by utilitarian outcomes, which may indicate that less utilitarian-oriented benefits of IM use, such as enjoyment, may be stronger determinants of IM use. Thus, we hypothesize:

H1a: The effect of perceived enjoyment of IM on behavioral intention to use IM is higher for Chinese than for Americans.

On the other hand, the effect of perceived usefulness might be higher for Americans than for Chinese. Compared with Chinese, Americans are more rational, scientific, pragmatic, dogmatic, and objective toward the outside world and their own behavior [Markus and Kitayama 1998; Kim 2002]. Because of this, Americans' IM behaviors are more likely to be driven by their perceptions of whether IM use results in pragmatic gains. For Americans the primary drivers and attributions of perceptions, attitudes, and behaviors are believed to be internal attributes or dispositions [Triandis 1994; Markus and Kitayama 1998; Kim 2002]. In individualistic cultures, social relationships tend to be formed around tasks, activities, and work [Okun, Fried, & Okun 1999]. Therefore, it is likely that Americans are more driven by beliefs regarding how IM can help improve task performance, which is the focus of perceived usefulness. Triandis [1994] also suggested that Americans follow the "doing" orientation, which means that they value an action for its own sake. When Americans are involved in interpersonal communications, their purposes are more likely to be goal-, task-, and problem-solving- oriented. Further, communication should be done in a focused and direct manner [Okun, Fried, and Okun 1999].

Among the limited cross-cultural literature on CMC, Straub et al. [Straub, Keil, and Brenner 1997] found that perceived usefulness had significant effect on the use of e-mail for Americans and that the same effect was not significant for Japanese. Van Slyke et al. [Van Slyke, Belanger, and Sridar 2005] also found culture-based differences in the impact of perceived relative advantage on e-commerce use between Americans and Indians. In both cases, usefulness was a significant predictor of CMC use for the individualistic country (United States), but not for the collectivist country (Japan and India). Thus, we hypothesize:

H2a: The effect of perceived usefulness of IM on behavioral intention to use IM is higher for Americans than for Chinese.

Relationship Commitment

Relationship commitment indicates an individual's dependence on a social relationship [Rusbult 1983]. The concept suggests that an individual is psychologically attached to a relationship and has the long-term orientation to persist with the relationship [Agnew, Van Lange, Rusbult, and Langston 1998]. The target of relationship commitment might be either specific and dyadic close relationships for couple, family, and spouse [Rusbult 1983; Agnew, Van Lange, Rusbult, and Langston 1998] or very general collective social relationships [Kanter 1972]. An individual's relationship orientation affects his emotional and mental health [Baumeister and Leary 1995]. Happiness and enjoyment in social interactions with a relationship partner cannot be obtained without high-level commitment to the relationship [Baumeister and Leary 1995]. Extending this to the context of IM, one is unlikely to derive enjoyment from the use of IM unless s/he is committed to those relationships that are maintained through IM. So, the degree of relationship commitment should influence beliefs regarding the enjoyment of IM use. The sharing of happiness, sorrow, worry, and stress is often found among the communications between highly committed people [Rusbult, Martz, and Agnew 1998]. Therefore, if one is using IM to communicate with those to whom one is committed, this communication should be more enjoyable. Thus, we hypothesize:

H3: Relationship commitment to IM buddies is positively associated with perceived enjoyment of IM.

Relationship commitment is conceptually similar to long-term orientation, the fifth dimension of culture [Hofstede 1991]. Being connected to others, collectivists view commitment to a relationship as the moral aspect of their social behavior. Collectivists are also long-term oriented, emphasizing the benefits of keeping long-term relationships and the commitment to existing relationship [Hofstede 1991]. By inheriting the wisdom of dealing with social relationships, Chinese typically try to understand and pay attention to others, social contexts, and the welfare of the group more than Americans do [Markus and Kitayama 1991; Okun, Fried, and Okun 1999; Kim 2002]. Relying more on a relational understanding of the social environment, Chinese are more likely to be sensitive to others, take the perspective of others, disclose themselves, provide emotional supports for others, and share their feelings with their partners in their communications than Americans [Markus and Kitayama 1991; Triandis 1994]. These sentiments, commitment, long-term orientation, and pro-social relationship motivations should be more important for Chinese in their enjoyment of interpersonal communications with other people than for Americans. Previous studies have accumulated some evidences of the greater preference to commitment in China [see Zhao, Flynn, and Roth 2006, 2007]. Thus, we hypothesize:



H3a: The effect of relationship commitment to IM buddies on perceived enjoyment of IM is higher for Chinese than for Americans.

Because of the real-time communication nature of IM, an individual can rely on IM to indicate his/her persistence in interactions with others. Unlike many other communication media, most IM systems allow the indication of "presence" by showing which IM "buddies" are currently available. This may increase the level of persistence in an interaction. The notion of sending instant messages is very similar to saying "Hi" in the traditional context [Baumeister and Leary 1995]. Further, being a synchronous medium, IM requires a more immediate response to such greetings; it is more difficult to put off responding to an IM than to an e-mail message. The conversational nature of IM may lead to a more personal relationship among participants than would e-mail. Being willing to engage in this more demanding communication may serve as a signal that one is more committed to a relationship. Because of IM's superior ability to show that an individual is connected with peers, highly-committed and long-term oriented people may perceive the relatively superior performance of IM more than less-committed and short-term oriented people do. Usefulness beliefs are constructed relative to other means of achieving a task. Because IM communication enables more highly interactive communication, it is likely that IM communication will be seen as relatively more useful when there is a high level of relationship commitment. Therefore, we hypothesize:

H4: Relationship commitment to IM buddies is positively associated with perceived usefulness of IM.

As mentioned above, the beliefs, perceptions, attitudes, and behaviors of an interdependent self are more likely to be influenced by relationships with others [Markus and Kitayama 1991]. Chinese are long-term oriented and committed to future benefits in social interactions, while Americans are short-term oriented [Hofstede 1991]. The concept of commitment is challenged in the individualistic culture because of its threat to individual autonomy [Dion and Dion 1988]. Lin and Rusbult [Lin and Rusbult 1996] found that Chinese were more committed to their partners than Americans. Chinese are more "motivated to find a way to fit in with relevant others" and "become part of various interpersonal relationships" [Markus and Kitayama 1991, p. 227]. IM enables its users to see whether their communication partners are available online. Keeping IM users in the contact list also indicates an individual's motivation to be connected. A shared space for synchronous communication may also help create the cognitive illusion of "co-presence." All these distinctive features have been found to be more likely to occur for highly committed and long-term oriented partners than for less committed and short-term oriented people [Agnew, Van Lange, Rusbult, and Langston 1998]. Given that Chinese are more long-term oriented than Americans, it is likely that the extent to which they are committed to their relationships with IM "buddies" will influence the degree to which IM is seen as being useful. In contrast, Americans, being relatively utilitarian, may be more focused on communication efficiencies as the source of usefulness, rather than the relationship effects. Therefore, connecting people in real-time communications via IM may be more salient for Chinese, who value long-term orientation in their evaluation of utility of IM. Further, because of the power of context, high-context cultures may prefer to use low-social-presence media for conflict situations to avoid loss of face [Rice, D'Ambra, and More 1998]. Thus, we hypothesize:

H4a: The effect of relationship commitment to IM buddies on perceived usefulness of IM is higher for Chinese than for Americans.

Perceived Critical Mass

Perceived critical mass is based on the notion of critical mass, which means that the diffusion of communication technologies cannot be secured if the number of adopters does not cross a threshold [Oliver, Marwell, and Teixeira 1985; Markus 1987]. Because it is difficult, and sometimes impossible, to obtain the actual number of users of a communication medium [Oliver, Marwell, and Teixeira 1985; Markus 1987], an individual user usually relies on his perception of whether the diffusion of the medium has reached the threshold, which is often termed as perceived critical mass [Lou, Luo, and Strong 2000].

Perceived critical mass has significant impacts on the adoption and use of information and communication technologies [e.g., Rice, Grant, Schmitz, and Torobin 1990; Kraut, Rice, Cool, and Fish 1998; Lou, Luo, and Strong 2000; Ilie, Van Slyke, Green, and Lou 2005; Li, Chau, and Lou 2005]. Such impact may be carried out through two distinct processes, normative influence and informational influence [Deutsch and Gerard 1955; Rice, Grant, Schmitz, and Torobin 1990]. Normative influence, in the form of subjective norm, social factor, and social influences [Venkatesh, Morris, Davis, and Davis 2003], suggests that an individual user perceives that important others believe he or she should use the new technology. However, while "social influence in the form of coercion or collective adoption decisions may be necessary to attract the earlier users" [Markus 1987, p. 494], "self-sustaining" diffusion of communication technologies is more dependent on critical mass [Markus 1987]. This proposition has been confirmed in previous studies. Empirical studies have consistently found that the impact of social influence was not significant in the continuous phase of technology diffusion, or where the use of the technology was voluntary [Kraut,

Rice, Cool, and Fish,1998; Venkatesh, Morris, Davis, and Davis 2003]. Instead, the impact was significant in the very early phase of mandatory use. Therefore, we argue that normative influence is less an issue in the context of the current study, which is focused on the continuous use of voluntary use of IM.

On the other hand, information influence, defined as “influence to accept information from another as evidence about reality” [Deutsch and Gerard 1955, p. 629], is similar to the conceptualization of perceived critical mass [Kraut, Rice, Cool, and Fish 1998; Lou, Luo, and Strong 2000]. The perception of the number of users of the communication technology may be considered evidence of the objective reality of the diffusion of the technology. Thus, an individual user may internalize, or incorporate such information in the individual’s perception, intention, and use of the technology [Venkatesh and Davis 2000]. Therefore, the following arguments are based on the informational, rather than normative, aspect of perceived critical mass.

In the use of communication technologies, different individuals have different interests or values, and contribute different resources [Oliver, Marwell, and Teixeira 1985; Markus 1987; Rice, Grant, Schmitz, and Torobin 1990]. Among the number of users of a communication technology, some individuals have “the personal characteristics of being sought after” by others [Markus 1987, p. 503]. These individuals may contribute to the creation of a pleasant and enjoyable atmosphere in communication. On the other hand, a perception of the hedonic or intrinsic quality of the communication technology may be enhanced when more and more people use the technology [Lou, Luo, and Strong 2000]. The perception of having fun collectively may be higher in a larger group of users. Put simply, if there is only a small number of users with whom to communicate using IM, there is less chance for enjoyable communication. Thus, we hypothesize:

H5: Perceived critical mass of IM is positively associated with perceived enjoyment of IM.

Being idiocentric, Americans are more concerned with truth and facts, and emphasize rationality, pragmatism and the objectivity of the world [Markus and Kitayama 1991; Markus and Kitayama 1998; Kim 2002]. The perception, attitude, and emotion of people in individualistic cultures are more influenced by these facts and truth [Markus and Kitayama 1991; Triandis 1994]. Perceiving a large number of people using a communication technology may suggest that a social network exists and that the communication technology itself may be very pleasant to use and, therefore, has been successfully adopted by many people. Knowledge about the factual number of users might be more influential for the individualist, who is more inclined to make rational decisions. Further, Americans may wish to have a broader network of fellow IM users, which increases the utility of IM. In contrast, Chinese may be less concerned about having a “critical mass” of users, as long as they can communicate with those to whom they are committed. Thus, we hypothesize:

H5a: The effect of perceived critical mass of IM on perceived enjoyment of IM is higher for Americans than for Chinese.

Critical mass theory describes an individual’s evaluation of the benefits and costs of using a communication technology [Markus 1987]. A few highly interested and highly resourceful people, who are willing and able to contribute some good for everyone else, may impact other people’s perception of the utility of a communication technology [Markus 1987]. In the context of IM, the benefits of using IM cannot be achieved if communication partners do not use the technology. The effect of perceived critical mass on perceived usefulness has been found in previous empirical studies [Lou, Luo, and Strong 2000; Ilie, Van Slyke, Green, and Lou 2005; Li, Chau, and Lou 2005; Van Slyke, Ilie, Lou and Stafford 2007]. Thus, we hypothesize:

H6: Perceived critical mass of IM is positively associated with the perceived usefulness of IM.

Individualistic culture emphasizes the objectivity and reality of the world more than collectivism does [Markus and Kitayama 1991]. Individualistic people emphasize internal attributes and dispositions, which suggests that American people are more likely to be driven by fact and truth that are embedded into their own judgment and understanding of the social context. In an individualistic culture, “differential ability to derive benefit from the public good increases the likelihood that someone will value it enough to pay more for it than the others do” [Oliver, Marwell, and Teixeira 1985, p. 530]. Thus, because Americans are more rational in their judgment [Markus and Kitayama 1991; Markus and Kitayama 1998; Kim 2002], their evaluation of the usefulness of IM may be more influenced by the perception of critical mass than that of Chinese, whose collectivistic cultural view indicates that it is taken for granted for Chinese to be embedded into social networks and inseparable from other people. Thus, we hypothesize:

H6a: The effect of perceived critical mass of IM on perceived usefulness of IM is higher for Americans than for Chinese.

IV. RESEARCH METHOD

Cross-cultural IS studies need to pay attention to several methodological issues [Karahanna, Evaristo, and Srite 2002; Myers and Tan 2002; Straub, Loch, Evaristo, Karahanna, and Srite 2002]. To ensure cross-cultural equivalence in the empirical study, we followed the guidelines suggested by Karahanna et al. [Karahanna, Evaristo, and Srite 2002], which are reported later.

Sample and Data Collection

We used the survey method to collect data. The American respondents were typical undergraduate college students from two Midwestern public universities in the United States, while the Chinese respondents were typical graduate students from one large university in China. According to a survey from comScore Media Metrix, almost seven million university Internet users in the US used IM, which was about 70 percent of the total university Internet population. In China, college students or graduates accounted for 50 percent of the registered users of the largest Chinese IM vendor-www.tencent.com.

We followed the same sampling procedure for both the American sample (US) and the Chinese sample (CN) to establish sample equivalence [Karahanna, Evaristo, and Srite 2002]. For both samples, the instructors gave bonus course credits to motivate successful completion of the survey. Because there were several available dominant IM for the US sample, we asked the US students to evaluate the IM they were most familiar with, from a list of AOL, ICQ, MSN, Yahoo, and Trillian. The IM for the CN sample was QQ, which was developed by the Chinese company Tencent Inc. The functions provided in QQ were very similar to those used in the US. We distributed a total of 400 questionnaires to the undergraduate students in the US sample and 550 to the graduate students in the CN sample.

Previous cross-cultural studies often translated research instruments developed in one language into the languages of the other cultures [Brislin 1986]. However, we did not translate the questionnaire into Chinese, but used the same English questionnaire for the CN sample. First, as Triandis [1994] suggested, "It is ideal to gather the data in each culture by using the same procedures but without translating specific items" (p. 81) and that "translation should be avoided" to maintain equivalences between cultures (p. 82). Zhao, Flynn, and Roth [2006] pointed out that some professional words and concepts in English do not have a Chinese equivalent. Therefore, it is challenging to maintain the original meaning and comprehensibility in English after translation into Chinese. Second, the Chinese respondents had achieved a sufficient level of English to understand the questionnaire. As mentioned above, we selected graduate students for the CN sample because these graduate students had passed the fourth-grade National College English Test (CET4) and the National Graduate School Entrance English Test before being admitted to the graduate school. These two tests are well-established English proficiency tests in China. The content and format of these two tests are also similar to those of the Test of English as a Foreign Language (TOEFL) and the International English Language Testing System (IELTS) [Davies, Hamp-Lyons, and Kemp 2003]. As discussed later, respondents had no difficulty with the questionnaire.

We carefully examined the returned questionnaires. We removed careless and incomplete responses, as well as those indicating no experience with IM. To ensure that survey respondents were familiar with IM, we removed those respondents who reported that they had used IM for less than six months. We kept 273 and 341 responses for the US sample and CN sample, representing a response rate of 68 percent and 62 percent, respectively.

Measures

The measures we used are reported in Li, Chau, and Lou [2005]. Specifically, we adapted the scale of behavioral intention from Agarwal and Karahanna [2000]. The scales for perceived enjoyment and perceived usefulness were from Agarwal & Karahanna [2000] and Davis [Davis 1989] respectively. The scale for relationship commitment was from Rusbult et al. [Rusbult, Martz, and Agnew 1998] and items for perceived critical mass were from Lou et al. [Lou, Luo, and Strong 2000]. All the scales were 7-point, anchored by "strongly disagree" and "strongly agree." Appendix 1 lists the items used in the study.

Pre-Tests

We conducted several pre-tests to examine and validate the survey instrument before data collection in the United States, as shown in Li et al. [2005]. For the CN sample, we distributed the English format of the questionnaire to forty graduate students in a pilot study, before the main survey, in order to minimize various response biases [Karahanna, Evaristo, and Srite 2002]. We observed and recorded response time and whether the questionnaire could be successfully completed. The results showed that Chinese graduate students could finish the questionnaire without difficulty. After they completed the questionnaire, we interviewed several graduate students briefly. Again, we modified the questionnaire after getting these students' comments.

Sample Characteristics

Table 1 shows sample characteristics. The subjects in the US sample were very experienced with computers, web sites, and e-mail. The CN sample was a typical college graduate student sample. However, Table 1 shows that Chinese respondents were less experienced with IT, because these students usually did not start using computers until they entered college. Comparing the two samples, there were significant differences in age, gender, experience with IM, computer, web, and e-mail (all $p < 0.001$).

Table 1: Sample Statistics				
Characteristics	US Sample		Chinese Sample	
	N=273	%	N=341	%
	Undergraduate Student		Graduate Student	
Age				
< 21	96	35%	31	9%
21–25	160	59%	264	77%
26–30	5	2%	37	11%
> 30	12	4%	3	1%
Missing			6	2%
Gender				
Male	165	60%	235	69%
Female	108	40%	105	31%
Missing			1	
Experience with IM				
7–12 Months	6	2%	31	9%
1–2 Year	25	9%	95	28%
> 2 Year	242	89%	215	63%
Experience with IT	Mean(Yrs)	Std. Dev	Mean(Yrs)	Std. Dev
Computer	10.1	3.5	5.2	2.1
Web	6.7	2.2	3.8	1.4
E-mail	5.9	2.1	3.6	1.3

V. RESULTS

We first assessed a baseline model using multi-group confirmatory factor analysis in LISREL 8.30. The input files were sample covariance matrices. We followed the rigorous technique for multi-group analysis provided by LISREL [Jöreskog and Sörbom 1996].

Scale Validation

Before making meaningful cross-cultural comparisons, data from different groups must meet a condition called *factorial invariance*, which means the same factor loadings for the same latent constructs are found for all groups [Jöreskog and Sörbom 1996; Steenkamp and Baumgartner 1998; Cheung and Rensvold 1999]. Our analysis of the factorial invariance as well as measurement model followed the approach suggested by previous literature [Jöreskog and Sörbom 1996; Doll, Hendrickson and Deng 1998; Steenkamp and Baumgartner 1998; Cheung and Rensvold 1999].

First, we examined the fit of an unconstrained baseline model. In the process of developing this baseline model, we dropped several items. The results suggest satisfactory fit with the data ($\chi^2 = 251.67$ $df = 134$ $p < 0.001$; CFI = 0.98; TLI = 0.97; RMSEA = 0.051; GFI = 0.94), except for the χ^2 test, which depends on sample size. Second, we examined a fully-constrained model with factor loadings invariant across the two groups. The results suggested that the fit was also satisfactory ($\chi^2 = 257.69$ $df = 143$; CFI = 0.98; TLI = 0.98; RMSEA = 0.048; GFI = 0.94), except for the χ^2 test which depends on sample size. To examine factorial invariance, we compared the fully constrained model with the baseline model by comparing the chi-square difference ($\Delta\chi^2 = 6.02$ $df = 9$; $p > 0.05$). The non-significant $\Delta\chi^2$ test suggested the existence of factorial invariance, which allowed us to be confident in comparing path coefficients among the research constructs between the two groups.

The fit indices of the baseline model in the analysis of factorial invariance for the two samples are shown in Table 2. As mentioned above, the χ^2 statistics of US and CN were all significant at the 0.001 level. Given the dependence of the chi-square test on sample size, we examined other indices as well. Compared to commonly-accepted values suggested in the literature [Chau 1997], all of the measures suggested a good fit of the measurement model for the two samples.

	US	CN
Sample size	273	341
Degrees of Freedom	67	67
χ^2	118.10	133.57
p-value	<0.001	<0.001
Root Mean square error of Approximation (RMSEA)	0.051	0.050
Root Mean Square Residual (RMR)	0.044	0.054
Standardized RMR (SRMR)	0.026	0.038
Goodness-of-Fit Index (GFI)	0.94	0.95
Adjusted GFI (AGFI)	0.91	0.92
Normed Fit Index (NFI)	0.97	0.95
Non-Normed Fit Index (NNFI)	0.98	0.96
Comparative Fit Index (CFI)	0.99	0.97

We then assessed construct reliability and validity using the results from the baseline measurement model (shown in Table 3 and Table 4). We assessed reliability by composite reliability following the formula: $\rho = (\sum \lambda_i)^2 / ((\sum \lambda_i)^2 + \sum \theta_i)$, where λ_i refers to the i^{th} factor loading and θ_i to the i^{th} error variance. Similar to Cronbach's Alpha, composite reliability considers the actual factor loadings instead of assuming that each item is equally weighted. Composite reliabilities in the measurement model range from 0.74 to 0.97 (Table 3), which were higher than the suggested level of 0.70 [Nunnally 1978].

We examined convergent validity by means of factor loadings and average variance extracted (AVE) following Fornell and Larcker [1981]. Except for four items from the two samples (Table 3), all factor loadings of the items in the two samples were greater than the suggested value of 0.70 [Fornell and Larcker 1981]. All AVEs were at least 0.57 (Table 3), greater than the suggested value of 0.50. Therefore, we achieved adequate convergent validity.

Item	Mean		Std Dev		Std. Loading		Average Variance Extracted		Composite Reliability	
	US	CN	US	CN	US	CN	US	CN	US	CN
RC2	5.72	5.85	1.75	1.58	0.79	0.55	0.78	0.60	0.88	0.74
RC3	5.31	5.77	2.01	1.72	0.97	0.95				
PCM1	5.57	6.17	2.16	1.74	0.93	0.83	0.90	0.58	0.97	0.81
PCM2	5.39	5.53	2.30	1.97	0.96	0.66				
PCM4	5.41	5.94	2.39	1.91	0.96	0.79				
PU2	4.99	4.96	1.38	1.29	0.65	0.62	0.64	0.57	0.84	0.79
PU5	5.88	5.69	1.25	1.23	0.83	0.79				
PU6	5.87	5.80	1.23	1.10	0.90	0.83				
PE1	5.40	5.23	1.57	1.45	0.84	0.79				
PE2	5.50	5.20	1.62	1.51	0.92	0.86	0.74	0.67	0.90	0.86
PE4	5.00	5.08	1.74	1.57	0.82	0.80				
BI1	6.12	5.97	1.31	1.17	0.95	0.91				
BI2	6.05	5.94	1.37	1.17	0.97	0.95	0.93	0.80	0.97	0.92
BI3	6.11	5.84	1.36	1.29	0.97	0.82				

We checked discriminant validity by comparing the shared variances between constructs with the AVEs of the individual constructs [Fornell and Larcker 1981]. Shared variances between constructs that are less than the AVE of the individual constructs suggest discriminant validity. Table 4 presents the correlations between constructs in US sample and those in CN sample. Even though some correlations were above 0.60, comparing these correlations with the square roots of AVE indicated positive support for discriminant validity.

Common Method Bias

Because we used self-reported data from a single source, common method bias may exist [Podsakoff, MacKenzie, Lee, and Podsakoff 2003], we conducted the Harmon one-factor test [Podsakoff, MacKenzie, Lee, and Podsakoff 2003] on all five research constructs. Results showed that the most covariance explained by one factor was 45.7 percent and 41.5 percent for US and CN respectively, suggesting that common method bias is unlikely.

Table 4: Inter-construct Correlations					
(a) US Sample					
	RC	PCM	PU	PE	BI
RC	0.88				
PCM	0.27	0.95			
PU	0.35	0.64	0.80		
PE	0.34	0.64	0.74	0.86	
BI	0.30	0.65	0.75	0.71	0.96
(b) CN Sample					
	RC	PCM	PU	PE	BI
RC	0.78				
PCM	0.43	0.76			
PU	0.28	0.50	0.75		
PE	0.38	0.43	0.48	0.82	
BI	0.44	0.50	0.57	0.60	0.89
Square root of Average Variance Extracted (AVE) is shown on the diagonal of the matrix. Inter-construct correlation is shown off the diagonal.					

Hypotheses Testing

Two Samples

To test H1, H2, H3, H4, H5, and H6, we examined the structural model using the two samples respectively. The results, are shown in Figure 2 and Table 5, indicate an acceptable model fit [Chau 1997].

Table 5: The Structural Model—Model Fit Indices		
	US	CN
Sample size	273	341
Degrees of Freedom	70	70
χ^2	179.16	174.46
p-value	<0.001	<0.001
RMSEA	0.074	0.063
RMR	0.12	0.087
Standardized RMR	0.074	0.065
GFI	0.92	0.94
AGFI	0.87	0.90
NFI	0.95	0.93
NNFI	0.96	0.95
CFI	0.97	0.96

Assessing the results in terms of paths, we found support for all hypotheses except for the path from relationship commitment to perceived usefulness, which was not supported by the CN sample. Perceived enjoyment (H1) and perceived usefulness (H2) had significant effects on behavioral intention in the US sample and the CN sample. H3

was supported in both samples, meaning that relationship commitment had significant effects on perceived enjoyment. However, the effect of relationship commitment on perceived usefulness (H4) was not significant for the CN sample, but was significant for the US sample. Further, perceived critical mass had significant effects on perceived enjoyment (H5) and perceived usefulness (H6) in both samples.

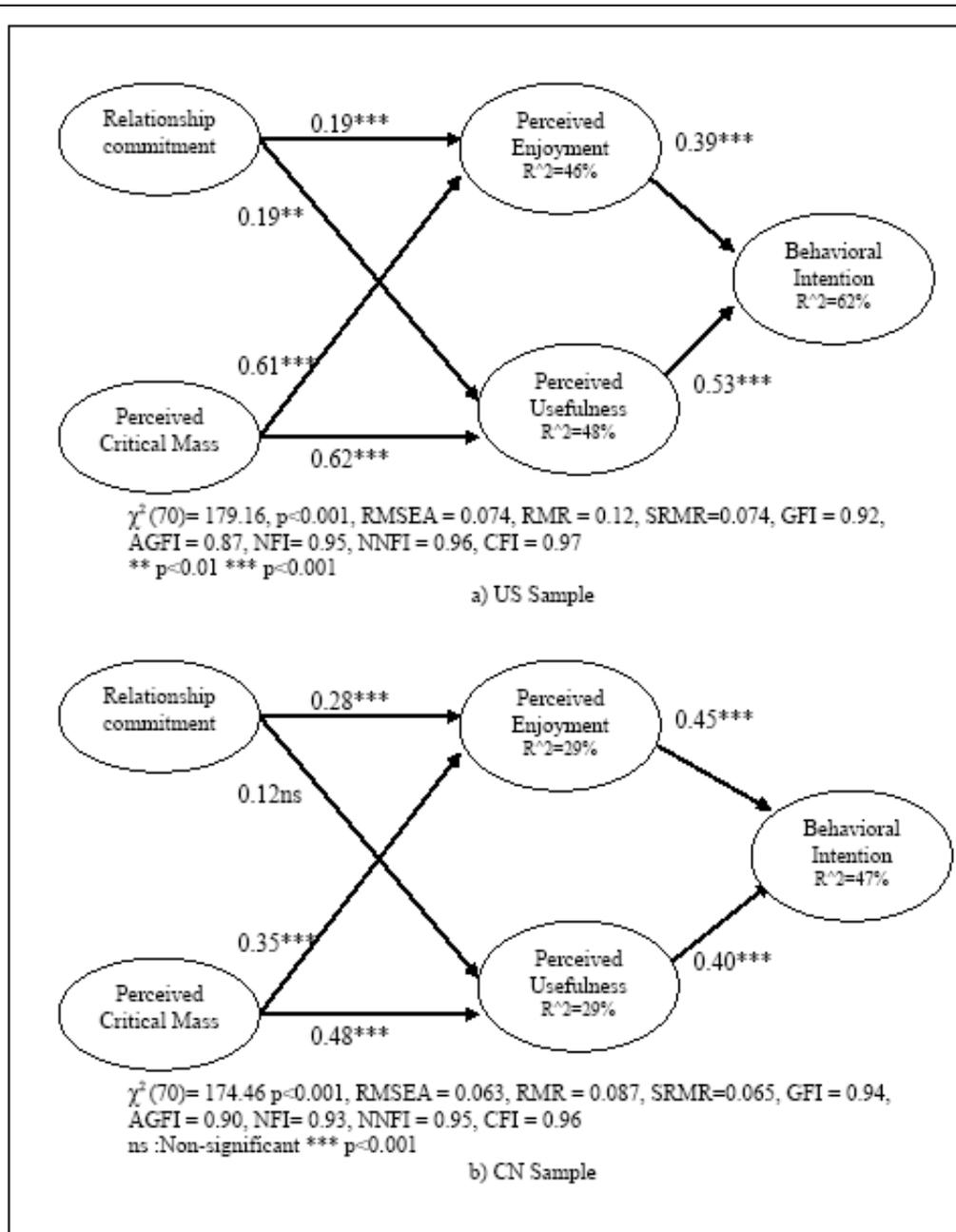


Figure 2: Hypothesis Testing—Two Samples.

Group Comparison

To test the hypotheses regarding culture difference, i.e., H1a, H2a, H3a, H4a, H5a, and H6a, we use an accepted SEM method [Jöreskog and Sörbom 1996]. First, we specified an unconstrained structural model for the two groups, with the path corresponding to a hypothesis (e.g., H1a) set freely estimate. Second, we specified a constrained structural model with the same path fixed to be equal. Third, we examined the significance of the chi-square difference ($\Delta \chi^2 = \chi^2$ (constrained model) - χ^2 (unconstrained model)) with one degree of freedom. A significant $\Delta \chi^2$ suggests that the path coefficient is different between the groups. We conducted the same steps for H1a, H2a, H3a, H4a, H5a, and H6a. Results are shown in Table 6.

Table 6: Hypothesis Testing—Between Group Comparison

Hypothesis	Unconstrained Model		Constrained Model		Difference		p-value	Supported
	χ^2	df	χ^2	df	χ^2	df		
H1a	354.09	141	453.19	142	99.10	1	<0.001	Y
H2a	355.96	141	464.89	142	108.93	1	<0.001	Y
H3a	355.50	141	379.95	142	24.45	1	<0.001	Y
H4a	353.81	141	367.57	142	13.76	1	<0.001	N (opposite direction)
H5a	354.57	141	482.85	142	128.28	1	<0.001	Y
H6a	353.95	141	504.12	142	150.17	1	<0.001	Y

As shown in Table 6, all the differences of the path coefficients between US and CN were significant at the 0.001 level. Examining the absolute values of path coefficients (Figure 2) suggests that five path coefficient differences were at the hypothesized direction, while one (H4a) was not. The coefficient of the path from perceived enjoyment to behavioral intention was higher for the CN sample than for the US sample, suggesting that the effect of perceived enjoyment on behavioral intention was more salient for Chinese than for Americans. Thus H1a was supported. H2a was also supported because the coefficient of the path from perceived usefulness to behavioral intention was higher for Americans than for Chinese. H3a was supported, suggesting that the effect of relationship commitment on perceived enjoyment was higher for Chinese than for Americans. However, H4a was not supported. Compared with the Chinese, Americans' perceptions of usefulness were found to be more, rather than less, influenced by relationship commitment. Finally, the effects of perceived critical mass on perceived enjoyment and perceived usefulness were higher for Americans than for Chinese, so that H5a and H6a were supported.

VI. DISCUSSION

The empirical study found support for the research model in explaining the differences of IM use in the United States and China. First, the research model has an acceptable fit with data collected in two countries, which are exemplary of individualism and collectivism. Perceived enjoyment and perceived usefulness were found to be significant in explaining an individual's behavioral intention to use IM across cultures, explaining large percentage of the variances (62 percent and 47 percent by the US sample and the CN sample respectively). The findings are consistent with previous empirical studies [Davis, Bagozzi, and Warshaw 1989; Davis, Bagozzi, and Warshaw 1992; Venkatesh, Morris, Davis, and Davis 2003]. As suggested by Venkatesh and Brown [Venkatesh and Brown 2001], both utilitarian outcomes (perceived usefulness) and hedonic outcomes (perceived enjoyment) were significant drivers of household adoption of IT. These findings are also consistent with those in previous studies [e.g., Igbaria, Parasuraman, and Baroudi 1996; Teo, Lim, and Lai 1999; Li, Chau, and Lou 2005] based on the Motivational Model [Davis, Bagozzi, and Warshaw 1992].

Second, we showed cultural differences of the path coefficients across the two samples. As we hypothesized about cross-cultural differences (H1a and H2a), we found that Chinese IM use intentions were more strongly impacted by perceived enjoyment than Americans, while Americans were more influenced by perceived usefulness than the Chinese were. Therefore, we conclude that individualism emphasizes the benefit or utilitarian outcome in their use of CMC more than collectivism, while collectivism emphasizes the experiential process more than individualism.

Third, relationship commitment did not have a significant effect on perceived usefulness in the CN sample; H4a was not supported. In contrast, we found relationship commitment to be more salient for Americans in determining perceived usefulness of IM than for Chinese, which means relationships are more utilitarian in the US, even though relationship commitment is as valued as in China.

We feel that three possible explanations might help account for this unexpected finding. First, usefulness is largely determined by the match between the purpose and performance of using a technology [Venkatesh and Davis 2000]. Our finding suggests that the outcome of using IM by Chinese may not match very well with the goal of relationship commitment, which may impact perceived usefulness. Because of the high-context nature of communications, which rely on a wide range of social cues, Chinese may not value IM because IM may be limited in its richness or naturalness [Kock 2005], which limits its ability to enhance relationship commitment. On the other hand, the low-presence nature of IM may be sufficient for low-context communications among Americans.

The second explanation concerns the goal of using IM. Following Adams and Plaut [Adams and Plaut 2003], we suggest that if one is using IM is to fulfill the motivation to keep constant relationships, then the goal may be more salient in an individualistic culture that does not readily connect people. Therefore, individualists may value the

features of IM more than those from the collectivistic culture where people seem to be always connected by means of different media. Thus, the perceived usefulness of IM may not be as high for collectivists. Similarly, in a study of willingness to sacrifice in ongoing close relationships (i.e., dating), Van Lange et al. [Van Lange, Drigotas, and Arriaga 1997] found that the effect of relationship commitment on willingness to sacrifice was stronger for individualists than for people with cooperative or pro-social orientations who tend to maximize the joint outcomes of both partners. This is because individualists are driven by self-oriented benefits, which could be clearly derived from the ongoing relationships [Van Lange, Drigotas, and Arriaga 1997]. Markus and Kitayama [Markus and Kitayama 1991] also suggested “that those with interdependent selves do not show a greater need for affiliation, as might at first be thought, but instead they exhibit higher levels of those motives that reflect a concern with adjusting oneself so as to occupy a proper place with respect to others” [Markus and Kitayama 1991, p. 240].

The third possible explanation is based on research on Protestant Relational Ideology [Sanchez-Burks, Nisbett, and Ybarra 2000; Sanchez-Burks 2002], which refers to a deep belief that relational orientations with other people are less appropriate in work settings than in non-work settings. Cross-cultural empirical studies of Protestant Relational Ideology have found that this belief is true for Americans but not true for people from Eastern cultures [Sanchez-Burks, Lee, Choi, Nisbett, and Zhao 2003]. They also found that the difference in relationship orientations between East and West was not significant in non-work setting. This is consistent with our study, which is focused on the non-work environment. We feel that Americans may emphasize relationship commitment no less than Chinese do.

VII. CONCLUSIONS AND IMPLICATIONS

Limitations

There are several limitations in the current study, which could be addressed in the future. First, we collected data from two specific student samples in the US and China. Thus, the generalization of the findings to other age groups such as business executives or other countries should be made with caution. Second, we did not measure actual usage in the study because it was not realistic to collect actual usage data from different IM providers. Instead, we used behavioral intention as a surrogate of actual usage; such an approach has been validated in previous studies. Third, we used the same English questionnaire for the Chinese sample. Although the respondents had adequate English language skills, minor discrepancies might be reflected in differences between their understanding and literal meaning. Fourth, the two groups were different in terms of experience with information technologies. However, we did not control any demographic information in the model. Finally, we did not measure the respondent’s cultural orientation. Instead, we assumed that Chinese respondents were collectivists and American participants were individualists, following findings from previous studies [Hofstede 1991; Hofstede 2001]. Future studies could address this issue by examining cultural orientation explicitly [Myers and Tan 2002; McCoy, Galletta, and King 2005; Srite and Karahanna 2006].

Implications for Research

Our study provides empirical evidence of the usefulness of applying the Motivational Model [Davis, Bagozzi, and Warshaw 1992] to understand IM use in different cultures. By integrating both perceived usefulness and perceived enjoyment, the research model is able to provide a complementary perspective for future CMC studies in voluntary contexts [Kraut, Rice, Cool, and Fish 1998; Venkatesh and Brown 2001]. The two distinct constructs in the research model provide better parsimony than most other research models in the technology acceptance literature [Venkatesh, Morris, Davis, and Davis 2003]. Our model’s ability to predict behavioral intention is similar to other theories such as TAM [Davis, Bagozzi, and Warshaw 1989; Venkatesh and Davis 2000; Venkatesh, Morris, Davis, and Davis 2003]. We feel our research model could be applied to empirical studies of other technologies, such as online communities, virtual reality technologies, and social networking technologies, where the development of social relationships is valued and enabled by means of technologies and services. The empirical findings from two different countries and cultural backgrounds provide convincing evidence for the plausibility of the model. Future studies can apply the model in a ‘cross-cultural interface’ where there is a mixture of different cultural groups such as global and multicultural teams [Gelfand, Erez, and Aycan 2007].

Our integration of relationship commitment and perceived critical mass into the research model has also shown a unified “self” and “other” for users of CMC. Future studies should pay attention to both sides of communication. In addition to relationship commitment, the characteristics of “selves” and “others,” such as trust, intimacy, and social support orientation, are worthy of investigation, especially in China where “guanxi” is emphasized [Zhao, Flynn, and Roth 2006, 2007]. We call for additional studies of perceived critical mass. For example, future studies can examine the causal relationship between commitment and perceived critical mass. It would be interesting to study whether relationship commitment is significant in profiling perceived critical mass (innovators and early adopters). The dynamic effects of relationship commitment and perceived critical mass in the diffusion process could also be investigated in a longitudinal study. It also could be interesting to find whether there are any nonlinear effects of relationship commitment and perceived critical mass on perceived enjoyment and perceived usefulness.

Different from most previous cross-cultural IS studies that rely on ranking and comparing mean difference of research variables across cultures [Straub 1994; Watson, Ho, and Raman 1994], our study investigates cultural differences among associations of theoretically grounded research determinants of CMC use. This perspective is not often seen in previous research, thus there is only very limited evidence regarding these relationships [e.g., Straub, Keil, and Brenner 1997; Keil, Mann, and Rai 2000; Van Slyke, Belanger, and Sridar 2005]. The SEM approach used here offers a robust approach for comparing model paths across groups. We suggest future cross-cultural IS adoption, acceptance, and use studies could apply this SEM approach to test various well-established theories and models in different cultures, and compare the strength of the relationships of research variables. Additional empirical studies could broaden our understanding of technology acceptance in different cultures.

To make meaningful comparisons across different cultures IS researchers have to investigate whether subjects from different cultures have a different understanding of the survey items. The rigorous SEM-base factorial invariance approach reported in this study is able to show whether some survey items have significantly different meaning across cultures [Zhao, Flynn, and Roth 2006, 2007]. Factorial invariance is a prerequisite condition for all levels of measurement equivalence, and should be addressed and achieved [Jöreskog and Sörbom 1996; Doll, Hendrickson, and Deng 1998; Steenkamp and Baumgartner 1998; Cheung and Rensvold 1999]. However, except for SEM, statistical analysis methods and tools, such as regression and Partial Least Squares (PLS), are quite limited in determining factorial invariance. For instance, previous cross-cultural IS studies based on regression analysis and PLS did not report factorial invariance. We suggest that future cross-cultural IS studies examine factorial invariance and other types of equivalence [Karahanna, Evaristo, and Srite 2002].

Implications for Practice

Business decision makers should be aware that their employees are increasingly using IM technologies in work places for both work and social functions [AP-AOL 2007]. We believe that our findings based on cultural dimensions are viable for explaining IM uses in the business environment, where social interactions are inseparable from business operations [AP-AOL 2007].

As found in the AP-AOL survey, employees are increasing their use of such CMC technologies to pursue work productivity and better care for family and personal issues. This will challenge managers to develop appropriate rules to guide employees on how to handle the potential conflicts of using CMC for work and family purposes. Even though the respondents of our study were college undergraduate and graduate students, findings from this study may still have several implications for practice. CMC technologies in general, and IM in particular, facilitate communications with friends and family while at work. Given our findings related to the influence of interpersonal relationship factors, workers who value these relationships may find such communication difficult to resist. The use of IM for business purpose may parallel the use for social and family purposes. It may be difficult for workers to draw a clear boundary for their use of CMC during the course of business operations.

The significant role of perceived enjoyment in IM communication is also pervasive, regardless of whether IM is being used in the workplace or in a social setting. This suggests that IM designers and service providers should continuously emphasize and improve the enjoyment aspect of technology use. IM designers should enhance functions that induce enjoyment (such as avatars and co-presence) when customizing their products and services for collectivistic countries. Business managers and decision makers should understand that the playfulness of technology use is an important aspect of organizational life [Finholt and Sproull 1990; Hassenzahl, Beu, and Burmester 2001]. This is especially true for people from collectivist cultures, as evidenced by our findings that perceived enjoyment had a stronger influence on intentions for the CN sample than it did for the US sample.

Our findings may also have implications for IM design. Because of the significant effect of relationship commitment, IM providers need to consider how to convey an individual's relationship commitment in IM user interface design. Companies that can design CMC features that are able to promote the development of "guanxi" may outperform their rivals in China [Zhao, Flynn, and Roth 2006, 2007], where "guanxi" is taken for granted as the rule of doing business with people. The same is true for how to convey critical mass in IM user interface design. (Recall that perceived critical mass had significant influences on both perceived enjoyment and perceived usefulness; this was true for both groups.) One simple method for conveying critical mass is to show the number of people in each individual's CMC supported social network. Heterogeneous resources available in the social network, as well as each individual's interests and values could also be presented in the user interface design of CMC, so that a user could easily find the locations of those resources. The resource information and an individual's interests and values could be collected together with an individual user's profile. Making these resources more readily available may help increase perceptions of usefulness, which our findings show are significant drivers of use intentions for both of our groups.

Given the diversification of workplaces, especially the emergence of global virtual teams and offshore manufacturing, business managers and decision makers should educate employees of different backgrounds and make them aware of cultural differences in communication patterns, customs, and habits. In a multinational enterprise, or in a company with employees from the East, business managers should be aware of the relationship and contextual orientation of people. Employees with high levels of relationship commitment may perceive CMC as more useful and enjoyable. Because of this, these individuals make good candidates for initial forays into the use of CMC for business tasks. These early users may convey the impression that a crucial mass of users has been reached, which may influence later adopters.

Further, Western employees should be aware of their Eastern peers' relational orientation, and their need for relationship building and maintenance in their communications. Eastern employees should understand their Western counterparts' emphasis on utilitarian tasks. It will also be interesting to observe how the current generation of young people (who have heavily used IM) will adapt to a working environment where the use of IM may or may not be advocated.

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that:

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APPENDIX 1: MEASURES AND SCALES

Relationship Commitment (RC) [adapted from Rusbult, Martz, and Agnew 1998]

- RC1. I am committed to maintaining my relationship with buddies. (dropped)
- RC2. I feel very attached to my relationship to buddies—very strongly linked to my buddies.
- RC3. I am oriented toward the long-term future of my relationship with buddies.

Perceived Critical Mass (PCM) [adapted from Lou, Luo, and Strong 2000]

- PCM1. Many of my buddies use _____.
- PCM2. Of the buddies I communicate with regularly, many use _____.
- PCM3. Few buddies I communicate with use _____. (dropped)
- PCM4. A large percentage of my buddies use _____.

Perceived Usefulness (PU) [adapted from Davis 1989]

- PU1. Using _____ enables me to accomplish the tasks more quickly in my communication with buddies. (dropped)
- PU2. Using _____ improves my performance in my communication with buddies.
- PU3. Using _____ improves my productivity in my communication with buddies. (dropped)
- PU4. Using _____ improves my effectiveness in my communication with buddies. (dropped)
- PU5. Using _____ makes it easier for me to interact with buddies.
- PU6. I find _____ useful for my interaction with buddies.

Perceived Enjoyment (PE) [adapted from Davis, Bagozzi, and Warshaw 1992; Agarwal and Karahanna 2000]

- PE1. The actual process of using _____ is pleasant.
- PE2. I have fun using _____.
- PE3. Using _____ bores me. (dropped)
- PE4. Using _____ provides me with a lot of enjoyment.
- PE5. I enjoy using _____. (dropped)

Behavioral Intention (BI) [adapted from Agarwal and Karahanna 2000]

- BI1. I intend to continue using _____ in the future.
- BI2. I expect my use of _____ to continue in the future.
- BI3. I plan to use _____ in the future.

Note: The blank was filled out with "Instant Messenger" for the US sample and "QQ" for the CN sample

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