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THE IMPACT OF CULTURAL VALUES ON EMAIL ACCEPTANCE:
EVIDENCE FROM THE PRC

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DOCTOR OF PHILOSOPHY

LINGNAN UNIVERSITY

SEPTEMBER 2003

THE IMPACT OF CULTURAL VALUES ON EMAIL ACCEPTANCE:
EVIDENCE FROM THE PRC

by
HUANG Linjun

A thesis
submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

Lingnan University

September 2003

ABSTRACT

THE IMPACT OF CULTURAL VALUES ON EMAIL ACCEPTANCE: EVIDENCE FROM THE PRC

by

HUANG Linjun

Doctor of Philosophy

Global deployment in information technology (IT) requires understandings of the cultural constraints in technology acceptance and usage behavior. Prior research indicates that the salient technology acceptance models may not be applicable to all cultures since empirical support was mainly obtained from North America. Cultural impact on user acceptance is still at the early stage of research. There has been little research done on technology acceptance and usage behavior in the context of China, which exhibits distinctive cultural differences from countries in North America. The purpose of this thesis is to test the cross-cultural applicability of Technology Acceptance Model in the People's Republic of China (PRC), and to investigate the influence of cultural values on user acceptance of IT.

Based on a synthesis of technology acceptance and cultural theories, this study incorporates work related cultural values into Technology Acceptance Model (TAM). The four cultural values of individualism/collectivism, power distance, uncertainty avoidance, and masculinity/femininity identified by Hofstede are posited to either directly influence or to moderate user acceptance to email in the context of the PRC.

Data were collected from the banking industry in the PRC. Cultural values were measured at the individual level to avoid over generalizations of cultural typology and to remedy the inadequacy of post hoc explanation in conventional IS cultural studies. Instead of using the scores of national culture proposed by Hofstede's cultural study in 1980, this study measures cultural values in terms of personal traits to reflect the changes in and the complexity of cultural values in face of a two-decades of societal change.

Structural equation models (SEMs) and moderated structural equation models (MSEMs) are used in the study to explore the direct impact and the moderating effect of cultural values. Confirmatory factor analysis and structural path analysis using LISREL were performed to analyze data collected.

The findings show that cultural values have both direct impact and moderation effect on user acceptance to email. The TAM general model was found to be applicable in the Chinese context. Collectivism was found to be an antecedent of Subjective Norms, while Masculinity has no significant influence on Perceived Usefulness. In addition, Power Distance was found to moderate the relationship between Subjective Norms and Intention to Use email; while Uncertainty Avoidance moderates the relationship between Perceived Ease of Use and Perceived Usefulness of email.

The findings are expected to provide insights that can help international businesses to enhance technology acceptance across national boundaries. An understanding of the relationship between cultural values and technology acceptance should help organizations understand the influence of core societal values on email acceptance and so to better utilize social and cultural practices in organizational technology diffusion. This study suggests a few guidelines for better utilizing computer mediated communication technology in regard to the cultural challenges.

I declare that this thesis << The Impact of Cultural Values of Email Acceptance: Evidence from the PRC >> is the product of my own research and has not been published in any other publications.

HUANG Linjun
September 2003

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LIST OF ABBREVIATIONS

AGFI	Adjusted Goodness-of-Fit Index
AMTAM	Advanced Manufacturing Technology Adoption Model
C	Collectivism
CFA	Confirmatory Factor Analysis
CMC	Computer Mediated Communication
CFI	Comparative Fit Index
CMSI	Computer-based Media Support Index
CST	Critical Social Theory
Df	Degree of Freedom
EFA	Explanatory Factor Analysis
GFI	Goodness-of-Fit Index
GSS	Group Support Systems
IFI	Incremental Fit Index
IRT	Information Richness Theory
IT	Information Technology
M	Masculinity
MI	Modification Index
MSEM	Moderated Structure Equation Modeling
NNFI	Non-Normed Fit Index
PCI	Perceived Characteristics of Innovation
PEOU	Perceived Ease of Use
PD	Power Distance
PU	Perceived Usefulness
RMSEA	Root Mean Square Error of Approximation
SEM	Structure Equation Modeling
SIPT	Social Information Processing Theory (SIPT)
SN	Subjective Norms
SIPT	Social Information Processing Theory
SPIR	Social Presence and Information Richness
SPT	Social Presence Theory
SRMR	Standard Root Mean Square Residual
TAM	Technology Acceptance Model
TID	Theory of Innovation Diffusion
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UA	Uncertainty Avoidance

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CHAPTER 1 INTRODUCTION

1.1 Global IT Diffusion

Information technology (IT) has become one of the top concerns of modern organizations and multi-national corporations. Effective IT diffusion is critical for organization both as a key driver for business and as the business *per se* in some instances. At the same time, the ever-increasing changes in flexibility, adaptability and diffusion of IT have rendered the understanding of what influences global IT adoption a critical issue for both IT vendors and user organizations. As IT has diffused outside the boundary of the originating countries, the dearth of research on cultural influences on IT adoption could lead to invalid conclusions when using North American IS theories to explain IT acceptance behavior in different cultural contexts. Without understanding the role of cultural values in user acceptance, it could be hard for international IT developers to design products or guide systems development in ways that are appropriate to, and acceptable in, different cultures. Effective global IT diffusion depends on user acceptance across culturally diverse environments. However, user acceptance of IT is not guaranteed and culturally specific resistance to IT use may exist. Therefore, another consequence of the lack of cultural awareness may be ineffective organizational IT training activities and low IT acceptance rates.

In recent years, computer-mediated communication (CMC) technologies has become an essential IT investment to support internal communication in organizations of the developed economies. Technological innovations in computers and telecommunications have created a wide array of new communication media. These technologies include electronic mail (email), computer conferencing, group support systems (GSS) and etc. The continued development, diffusion, and application of new organizational communication media enabled by the convergence of computers and telecommunication networks have been one

productive area of communication research (Rice, 1987, 1992).

Since effective communications are essential to successful business collaboration, user acceptance of innovations such as CMC technologies pose unique challenges for businesses. While relying on CMC technologies has become an operational commonplace in organizations in Western economies (Ross, 2001), diffusion of CMC technologies in Eastern economies is still at an early stage of development. As firms expand their global reach, a conscious attention to the influencing factors of CMC technology acceptance becomes imperative (Ross, 2001).

One important and maybe the most frequently used CMC technology, email, has become the primary medium of timely and cost-effective interpersonal communication in most organizations in western developed countries (Case, 1996; Kettinger, 1997; Markus, 1994). However, its successful adoption in other social-cultural context may be dependent on culturally proper management intervention (Straub, Keil and Brenner, 1997). Despite email's apparent value as an efficient and cost saving communication channel, it is important to recognize that its successful implementation in organizations should not be taken for granted. For example, for various reasons, the adoption of email has been found to be ineffective in non-Western countries such as Japan (Straub, Keil and Brenner, 1997). One suggested reason for the unsatisfactory user adoption is that email may embody culture-bound values leading to different communicative preferences (Ess, 2001).

Recently, the relationship between new media and culture has been an important concern for both businesses and researchers. However, since the conceptual and theoretical foundations of CMC technology acceptance have been largely based upon North American concepts of communication behavior, its applicability in other cultures remains questionable. Tan et al. (1998) pointed out that the major underlying disciplines of IS research - management and social

psychology theories - are basically dependent on North American research and observations. As a result, many theories and practices in IS research have been deeply rooted in North American culture and therefore strongly reflect North American values, because Management and IS theories based on North American norms and research do not necessarily apply to a dissimilar culture (Watson, Ho and Raman, 1994).

Cultural issues in global IT transfer have received attention from scholars. For example, Lu and Lu (1995) maintain that IT deployment, development and use may be problematic in global IT transfer processes if cultural factors are not taken into account. This cultural issue is addressed as follows (Lu and Lu, 1995):

Since IS deployment, development, and use are often dictated by an organization's environment, management practices, and users' attitudes, value systems, etc., understanding culture's impact on IS is necessary to effective IS application. Research with the intent to benefit IS applications in one cultural environment, therefore, should take its unique characteristics into account. Simply transferring technology of IS methodologies and practices from one culture to another will be problematic.

Traditionally, IT has been designed with the cultural assumptions of North America, the originating environment. Accordingly, IS research on IT adoption has been primarily directed at understanding how IT is accepted by users in North America. However, as IT transfer has become a global phenomenon, it remains a puzzling question if the relevant IT acceptance theories are transferable across cultures. According to Kedia and Bhagat (1988), as behavior norms may resist change and eventually override any technological effects, culture plays an important role in technology adoption. Watson, Ho and Raman (1994) believe that the effectiveness of technology transfer is most affected by variations in societal cultures. Indeed, culturally-based resistance to IT adoption often occurs if there is no proper managerial intervention. Thus, understanding the effects of cultural values on technology adoption is critical for global effective IT deployment.

The world is moving rapidly toward corporate multinationalism and IT investment has been essential for organizations. In this context, it is important for managers to know as much as possible about the impact of culture on technological innovation. IS researchers have proposed that “existing theories on CMC should incorporate a cultural dimension so that culture-specific knowledge can be distinguished from universal knowledge (Tan et al., 1998).” However, culture related issues that exist when IT is transferred to a different cultural setting have generally been under-researched. This study is motivated by a lack of empirical support of the culture-technology acceptance relationship and the pressing need to investigate how cultural values may influence an individual’s behavioral intention to use a technology.

1.2 Research Objectives

The primary objective of this study is to investigate the influences of cultural values on technology acceptance in the Chinese mainland. The general and specific research questions to be investigated in this study are stated as follows.

General Research Question: Does culture influence user acceptance of email?

Specific Research Question: (1) Is the Technology Acceptance Model (TAM) applicable in the context of the Chinese culture? (2) Do work-related cultural values influence user acceptance of email in the context of the Chinese mainland?

TAM has been a powerful and widely accepted theoretical model to explain user acceptance of technology. This study aims to examine the applicability of TAM and the influence of cultural values on email acceptance in Chinese mainland based on the TAM and its expanded version, TAM2 (Davis, 1989; Davis, Bagozzi, and Warshaw, 1989; Venkatesh and Davis, 2000). The major objective of this

study is to establish a research model by incorporating the expanded TAM explicitly with cultural values in an attempt to better understand culture's role in IT user acceptance in Chinese mainland. Cultural influence will be operationalized within the framework of Hofstede's (1980) four cultural dimensions. These four work-related cultural values, known as collectivism, power distance, uncertainty avoidance and masculinity, are of particular importance for email research because of their theoretical connection to communication behavior. To be specific, this research attempts to investigate how these four cultural values are related to user acceptance of IT.

Similar to the early stage of IT development in the US, the phenomena of low IT adoption has been plaguing businesses in developing economies such as the Chinese mainland, which is on the receiving end of global IT transfer and has a relatively short IT development history. Therefore, technology acceptance is an issue of particular importance in the People's Republic of China (PRC), the world's largest importer of information technologies, and the nation regards IT as one of the key drivers for sustainable economic growth. In terms of hardware, the PRC has become one of biggest players in the market for electronic communication technologies (Li and Wong, 2001). However, although IT and communication industries in the PRC have achieved a high rate of growth in the last two decades as a result of the proliferation of the PC in the governmental, educational and business sectors, it should be noted that Internet penetration is still quite low (about 5.3% in 2003). This limitation results in a low usage of email in workplaces. Consequently, the diffusion of email is still at an early stage of development and the study on its user acceptance could help organizations in the country better leverage the technology to improve communication efficiency.

Among other environmental factors, the low email usage in Chinese organizations could be culture specific. Understanding how cultural factors may affect email use at its early stage of development could be conducive to improving

technology diffusion. Findings are expected to provide valuable inputs to managerial strategies for conducting successful introduction of CMC technologies in different cultures.

1.3 Significance of the Research

The significance of this study lies in the investigation of two virtually overlooked areas of IT adoption – IT acceptance in a technology-proliferating setting of the Chinese mainland; and the relationship of cultural values to IT acceptance beliefs. Given the globalization of world economies, there is a pressing need to understand whether TAM applies in other cultures. The results of a study by Straub, Keil and Brenner (1997) indicate that TAM holds for both the US and Switzerland, but not for Japan, suggesting that the model may not predict technology use across all cultures. The justification for extending TAM also lies in its inherent lack of cultural considerations. This research could be an important step in advancing technology acceptance theory.

China has become the world's largest importer of IT products in contrast to the fact that little is known about IT adoption and use in China in terms of academic investigation. For an IT market with seemingly infinite potential, generated from a population of about 1.3 billion, practitioners have probably outpaced academics in the understanding of this phenomenon. There has been limited scholarly inquiry into IT acceptance (or email acceptance specifically in this case) in the Chinese mainland. An examination of TAM's applicability in Chinese mainland could support the theory's validity in Chinese culture and help parties involved in IT diffusion to understand the key determinants of technology acceptance so that predictions of how users will respond to the technology could be made. Based on this knowledge, the process of CMC technology implementation could be modified and user acceptance could be improved by nature. In addition, this study empirically establishes a link between cultural factors and technology acceptance. Prior studies are of an exploratory nature and do not directly measure cultural

dimensions (Straub, Keil and Brenner, 1997; Straub et al., 2002).

Understanding the adoption of a technology at its earlier stage is of particular importance for its successful diffusion. Email usage in the workplaces in Chinese mainland is relatively new. Only 5.3% of population were identified as Internet users in 2003, among whom only 43% use Internet in their work place (Statistical Report on Internet Development in China, 2003). Email use in the workplace could be even slimmer than that figure suggests, since only 3.2% of the users use the Internet primarily for communication (receive/send emails, short messages, faxes). Due to the low accessibility of facilities necessary for email use and a resultant inadequate “critical mass” of users, email is a less popular communication medium in the workplaces of Chinese mainland as compared to developed economies. In view of the low penetration rate, we are justified in concluding that intra-organizational email use in Chinese mainland is still at the beginning of the diffusion curve. Similarly, in a survey of Chinese executives conducted by Lu and Jiang (2001) with respect to communication media used for both internal and external businesses, email was rarely used while telephone and fax were singled out as the most popular. Only about half of the surveyed enterprises have access to the Internet or have built local area networks (LANs), yet email utilization could be less than that figure suggests. Among executives of those enterprises with Internet access, only 14% of the respondents stated that their primary requirement for Internet access is to send and receive email. However, the positive side of this picture is that there is great potential for growth in email adoption in organizations, as was the case in developed economies – a slow beginning, and gradual increase into dominance. The findings of this study should provide insights into improving organizational email diffusion in Chinese mainland.

The findings of this study should contribute, at the theoretical level, to IS literature on how cultural values account for the process of CMC technology adoption at the individual level. Culture has been treated as an invariant factor in

conventional information systems (IS) research, usually using national culture as a proxy for cultural factors to explain observed user acceptance patterns. As cultural factors have been considered a pre-assumption at national or group level rather than at the individual level, the examination of culture-technology relationships in prior studies has been basically *post hoc* explanations on observed phenomenon. The absence of a vigorous research methodology may explain the poor understanding of the relationship between cultural values and TAM variables. As a theoretical advancement, this study's treatment of cultural values at the individual level in the framework of TAM makes studying culture-technology interactions within the same cultural group possible, and should generate a new theoretical perspective on technology adoption. The four cultural values studied are regarded as the essential aspects of work-related societal values, and have been widely validated in management and IS research. The theorization of their connections with TAM would contribute to the accumulation of knowledge on the nomological net of technology acceptance theories.

The influence of culture on technology acceptance is found to be mainly mediated or interacted through the subjective norms of using the technology. Specifically, collectivism is found to be an antecedent of subjective norms, a variable capturing social influence on email use; while power distance interact negatively with one's subjective norms so that the effect of the persuasive force to use email will be dependent on a perception of social power status. In addition, for individuals with a cultural tendency to favor certainty, the perceived ease of use of the technology contributes more importantly to an increase in the perception of usefulness. Lastly, this study does not support the proposition that the masculine value is a significant predictor of the perceived instrumentality of email. This may imply that feminine value (i.e., low masculine value) is also likely to be related to the perceived usefulness of email, since email is also used for social relationship building, which is more of a concern of individual with feminine value. These findings indicate that individual differences in cultural values generally have

significant impact on the process of CMC technology adoption.

At a practical level, this study should help organizations in the PRC understand the key determinants of IT acceptance and help organizations diffuse CMC technology more effectively by taking the consequences of different cultural tendencies into consideration. Understanding of the influence of societal values on email acceptance could enable better utilization of social systems to facilitate organizational technology diffusion. Multinational corporations may make *a priori* predictions on the possible barriers to CMC technologies acceptance based on new understandings of culture-IT relationships. IT design and implementation could be modified to improve compatibility with the central cultural tendency in organizations or individuals involved. To be specific, in a cultural setting with high power distance and collectivism, persuasive impact from superiors and the collective group can be effective in promoting email diffusion. In a context where uncertainty and ambiguity leads to anxiety, emphasizing the ease of use of email could enhance the users' confidence in its benefits.

1.4 Organization of the Dissertation

This dissertation consists of six chapters. Chapter 1 introduces the background, research objectives, and the significance of the study. Chapter 2 reviews CMC research, technology acceptance theories, and cultural research relevant to IS and technology acceptance. Chapter 3 develops the proposed research model and formulates the hypotheses. Chapter 4 discusses the general research methodology and tests the instrument used in the research design via a pilot study. Statistical findings are reported in Chapter 5. Chapter 6 presents a summary of conclusions, discussions, contributions and limitations of the study, as well as implications for future cultural CMC research.

CHAPTER 2 REVIEW OF RELEVANT LITERATURE

2.1 Introduction

The last decade has seen phenomenal development in information, computer and telecommunication (ICT) technologies. As a result of technological innovations in ICT technologies, a wide array of computer-mediated communication (CMC) technologies has been created. Email is among one of the most widely diffused CMC technologies. In order to understand impact of cultural values on email adoption and cultural values' impact, multidisciplinary theories need to be reviewed. This chapter therefore reviews the relevant IS literature in the following areas:

- CMC research.
- Technology acceptance theories.
- Hofstede's cultural model.
- Cultural IS research.

2.2 CMC Research

2.2.1 Review on CMC and Email Research

Computer-mediated communication (CMC) systems are broadly defined as the electronic exchange of information using computer terminals joined via communication links (Sproull and Kiesler, 1986). In U.S. businesses, CMC has been adopted as a major means to facilitate more timely and cost-effective interpersonal communication, utilized primarily for information presentation, transmission of internal data, and administrative purpose, internal discussion; it is therefore not intended to be a mechanism for urgent communication (Case, 1996).

As one of the most popular CMC systems, email has become an integral part of

the office and has been widely accepted in developed countries. Email is defined as a computer system for exchange of messages and other information, which may include textual and numerical data, computer programs, video, graphics and sound (Kettinger, 1997). Earlier CMC research indicates that email is mainly used for such task-oriented applications as exchanging information, asking questions, and sharing opinions (Kerr and Hiltz, 1982; Rice and Case, 1983). Typically, email may be considered to be a blend of both technical and social facilities to improve communication efficiency, and its usage is generally classified into two categories: task-related usage and social related usage. Romm and Pliskin (1998) believe the the most fundamental goals of email are to support the exchange of work-related tasks and to strengthen social coalition in organizations.

Task-related information exchanges are found to be used more frequently in email, including coordinating activities, distributing information, seeking information, and giving and receiving feedback on reports or ideas. Other task-related email uses include: coordinating activities of projects; carrying on negotiations/bargaining; distributing/providing information; brainstorming/generating ideas; resolving conflicts/disagreements, monitoring progress on projects; scheduling meetings/appointments; sending a message in place of a phone call; giving and receiving feed back on reports and ideas; sending/receiving directions concerning files or programs; organizing/coordinating organizational activity; keeping a record of interactions/agreements. Social-related usage of email includes keeping in touch/maintaining a relationship, learning about interesting things, or keeping track of company social events (Steinfeld, 1985).

2.2.3 Social Presence Theory (SPT)

Social Presence Theory (SPT) maintains that the most important difference among different media is their social presence. Social presence refers to “the degree to which a medium permits users to experience others as being psychologically present” (Fulk et al., 1987). Media such as face-to-face meetings and telephone

have been found to be high in social presence, whereas media like email and FAX have been found to be relatively low in social presence. The theory maintains that when a task involves inter-personal relations and is sensitive, as in the case of a negotiation or a conflict resolution, then media with high social presence such as face-to-face interaction will be selected to “transmit information about facial expression, direction of looking, posture, dress and nonverbal cues” (Short et al., 1976). While for a less sensitive task such as a straightforward information exchange, the social presence of the medium is not as important as its efficiency; for sheer efficiency, email, FAX, and mail services should be used (Rice and Case, 1983; Steinfield, 1986; Sherblom, 1988).

Compared to face-to-face or telephone conversation, email communication is lower in social presence due to the limited amount of nonverbal information transmitted and the delay in feedback. This implies that users may not feel that receivers of messages are socially and psychologically “present” at the time of communication, and therefore will rely less on this medium for “interpersonally involving” task. Due to its filtering of social information, some researchers believe that email has a democratizing effect on organizations (Sproull and Kiesler, 1991).

2.2.3 Information Richness Theory (IRT)

Researchers in organizational communication behavior have identified uncertainty and ambiguity as principal factors in predicting media use. Information Richness Theory (IRT) (Daft and Lengel, 1984) posits that individuals choose media based on task characteristics of equivocality and ambiguity. Individuals select the most appropriate communication channel with the required level of information richness to accomplish a particular task, by matching information requirements concerning uncertainty and ambiguity of the task to the information richness of the media (Daft et al., 1987). Information richness in a medium depends on the interactive nature of the feedback, channel type (e.g., body language, facial expression, and tone of voice), the personal quality of the source, and the ability of

the interface to express linguistic innuendos. For tasks high in uncertainty and ambiguity, like negotiations and conflict resolution, it is thought that people will use face-to-face and telephone communications, which can convey a wider variety of social cues to the listener (Sproull and Kiesler, 1996). For tasks low in uncertainty and ambiguity, like information memos and simple information exchanges, communicators will choose leaner channels as they carry only verbatim information and not the personal presence or force of the communicator (Straub, 1994). Email is perceived to be lower in information richness since it cannot provide additional nonverbal cues for ambiguous information (Steinfeld, 1990).

2.2.4 Critiques of the IRT and SPT

SPT is similar to IRT in positing that media are chosen based on their suitability for specific types of interaction and how well media “fit” task information requirements (Short et al., 1976; Fulk et al., 1987). However, El-Shinnawy and Markus (1998) find that a complex set of social factors governs organizational media use in ways that IRT can not fully explain. Some research points out that information richness is not an invariant property communication media, rather, different individuals have different perceptions of media richness (Rudy, 1996).

Perceived email richness, which varies across individuals and covaries with relational social influences, also predicts individuals’ email usage (Schmitz and Fulk, 1991), because the social influences of colleagues have pervasive effects on one’s media assessments. The social influence (SI) model of technology use (Fulk et al., 1990; Fulk et al., 1987; Rudy, 1996) posits that individuals’ media perceptions and use are partly socially constructed and therefore media richness is subjective – influenced to some degree by attitudes, statements, and behaviors of others in the workplace. This is consistent with Critical Social Theory (CST) (Habermas, 1987; Markus, 1994; Ngwengyama and Lee, 1997) in that people are active interpreters rather than passive recipients of communication. Markus (1994) asserts that “[T]he adoption, use, and consequences of media use in organizations can be powerfully

shaped by social processes such as sponsorship, socialization, and social control, which require social perspectives to understand them.” Organizational context is emphasized in email adoption because it defines possibilities for action, power and status relations, and a frame of reference for organizational actors.

2.2.5 Cultural Factors Influencing CMCS Adoption

There are a few studies that have found cultural factors to explain differences in email adoption patterns. Straub, Keil and Brenner (1997) found that the TAM model of email acceptance holds for US and Switzerland but not for Japan due to its unique cultural characteristics. Straub (1994) uses the cultural dimension of uncertainty avoidance in collaboration with Information Richness Theory (IRT) and Social Presence Theory (SPT) to explain the different adoption pattern of email and FAX. The subjects include 209 Japanese and 711 U.S. knowledge workers. He found higher perceptions of social presence of email by U.S. respondents, but higher perceived social presence of facsimile by Japanese respondents. The resistance to use email by Japanese employees is attributed to the cultural tendency of uncertainty avoidance, since they perceive email to be less capable of delivering social cues to reduce the ambiguity and uncertainty in communication. Whereas the wider adoption of FAX in Japan is related to the utility of FAX in transmitting the visual symbols of the Japanese language, which is believed to convey more social presence. Karahana and Straub (1999) found that social presence (SP) and social influence (SI) significantly affect PU of email. Ross (2001) suggests that, when using CMC, the greater the gap in individualist/collectivist scores between the communicating parties, the more difficult the business collaboration would be in terms of sending messages, receiving accurate feedback and achieving cooperation.

In addition, there is a cultural difference in terms of gender inherent in CMC acceptance and usage behavior (Gefen and Straub, 1997; Venkatesh and Morris, 2000). Gefen and Straub (1997) state that communication patterns for males and females imply very different values that shape the need for social presence. Women

are found to be higher than men on the social presence of email, because “women tend to build a communication context of rapport and cooperative behavior” (Gefen and Straub, 1997). It is believed that while men tend to adopt a pattern of oral communication that is based on social hierarchy and competition, women have a proclivity to adopt a networking approach, using discourse to achieve intimacy, support, consensus, rapport and cooperative behavior (Coates, 1986; Tannen, 1990).

Prior research suggests CMC technology adoption fail when it interferes with subtle and complex social dynamics of groups (Bradner, 2001). A GSS, a typical CMC technology, has important similarities to email such as computer keyboard input, allowing parallel entry. Therefore, GSS studies may have some important implications for email research (Robinchaux and Cooper, 1998). Davison and Jordan (1998) call for greater sensitivity when attempts are made to transfer technology from one culture to another, as well as stress the need to develop local solutions that fit with cultural norms. They argue that the underlying assumption of an “overseas” GSS should be tested and reconceptualised according to local traditions. For “[P]eople should not be expected to adapt to a technology that conflicts with their own assumptions about how to work. The need to provide an indigenous solution for a group and its problems is paramount.” (Davison and Jordan, 1998) One example is that in a context where social-oriented communication is valued, a GSS may have negative effect on group performance because it could conflict with social-oriented information exchange, and therefore should be modified according to the environment (Tan et al., 1998). Similarly, Wei and Tan (1993) contended that a Chinese GSS “should be sensitive to the social and cultural peculiarities of the Chinese with the role of supporting, rather than altering, these social and cultural characteristics.”

In a comparative study in the US and Singapore, national culture is found to be a critical factor interacting the impact of GSS use (Watson et al., 1994). The authors

attribute national culture's interaction effects to culturally distinct notions on what appropriate uses of GSS are. For instance, people in a particular culture may see the use of GSS technologies as an opportunity to share opinions frankly. Contrary to that, people from a collectivist culture may see GSS as a threat to group cohesion because it allows the normative influence from the majority in the group to be challenged (Tan et al., 1998).

2.3 Technology Acceptance Theories

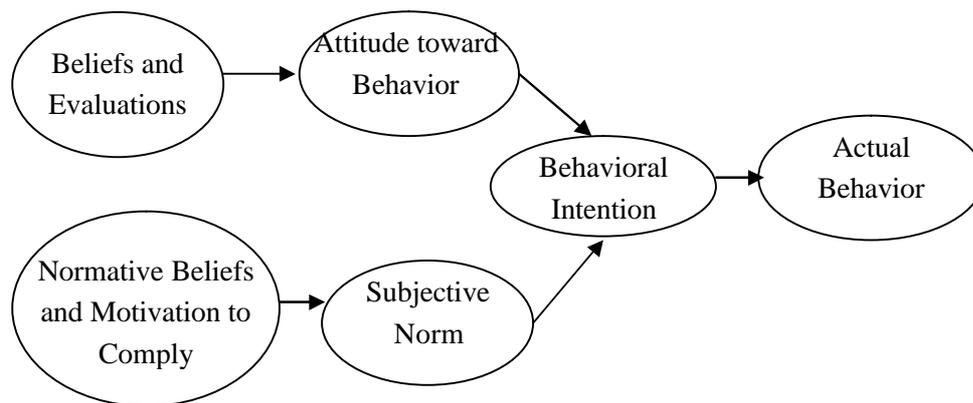
Overall, there are three broad areas in research on user acceptance of IT: user satisfaction, innovation adoption, and social psychology attitude/behavior perspectives (Gallion, 2000). Recently, a trend integrating the three area of research has emerged. Research on the social psychology perspective of IT acceptance has been productive. This line of research adopts concepts of Rogers' Theory of Innovation Diffusion (TID) and Fishbein and Ajzen's (1980) Theory of Reasoned Action (TRA), which has been further developed into two models – Theory of Planned Behavior (TPB) and Technology Acceptance Model (TAM). TAM-based research has gained the attention of IT researchers in recent years due to the model's simplicity and robustness. Basically, TAM is based on TRA, which explains the relationships between *beliefs*, *attitudes*, *intention*, and *behavior*. Since the basis of this thesis - TAM and its extension - are originated from and developed as an integration of different theoretical perspectives, the following part will review TAM together with TRA, TPB and TID.

2.3.1 Theory of Reasoned Action (TRA)

Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) is a social psychology theory explaining determinants of intended behaviors, which is the key underpinning theory for TAM. It assumes that human beings are basically rational and make systematic use of information available to them when making decisions. Based on empirical research, Ajzen and Fishbein (1980) theorized that people adopt a belief-attitude-intention-behavior line of

reasoning in the process of decision making. Figure 2.1 depicts the theoretical path of the TRA. According to TRA, a specific behavior can be predicted reasonably well from intentions to perform that behavior, while behavioral intention is influenced by one's attitude, which is determined by one's beliefs.

Figure 2.1 Theory of Reasoned Action



According to TRA, *behavioral intention* (BI) is a function of two factors: one's Attitude (A) toward BI and Subjective Norms (SN), with relative weights typically estimated by regression:

$$BI = A + SN$$

Attitude is defined as “a person's general feeling of favorableness or unfavorableness for that behavior”. It is a function of the product of one's behavioral belief that performing the behavior will lead to certain outcomes, and the evaluation of the outcomes. Beliefs about the consequences of performing a behavior are the individual's subjective probability that performing the target behavior will result in a desired consequence. Evaluation refers to an implicit evaluative response to the consequence (Fishbein and Ajzen, 1975). SN is defined as “a person's perception that most people who are important to him think he should or should not perform the behavior in question”. It is a function of the product of one's

normative belief and his/her motivation to comply with that referent (Ajzen and Fishbein, 1980). Variables that are external to the model are assumed to influence intentions only to the extent that they affect either Attitudes or SN (Fishbein and Ajzen, 1975).

Subsequent empirical studies found strong evidence for the predictive power of the model and TRA has been successfully applied to a large number of situations in predicting the performance of behavior and intentions (Karahana, Straub and Chervarny, 1999; Sheppard et al., 1988). Table 2.1 shows some of the TRA studies. Davis, et al. (1989) applied TRA to the IT acceptance context and built TAM by adopting the logical relationship in TRA, positing beliefs as perceived usefulness and perceived ease of use, and excluding Attitude from the final model. In a meta-analysis of research on the TRA, Sheppard et al. (1988) concluded that the predictive utility of the theory was strong across conditions. However, he also pointed out two problems of TRA: the accuracy of the prediction of behavior from intention and the lack of consideration of the probability of performance failure. He further cautioned that the performance of a behavior might be problematic if it is not under full volitional control, suggesting that there might be other factors determining whether the behavior is performed. Similarly, Liska (1984) pointed out that the parsimony of TRA may contribute to the theoretical problems.

Table 2.1 TRA Studies (1975-2003)

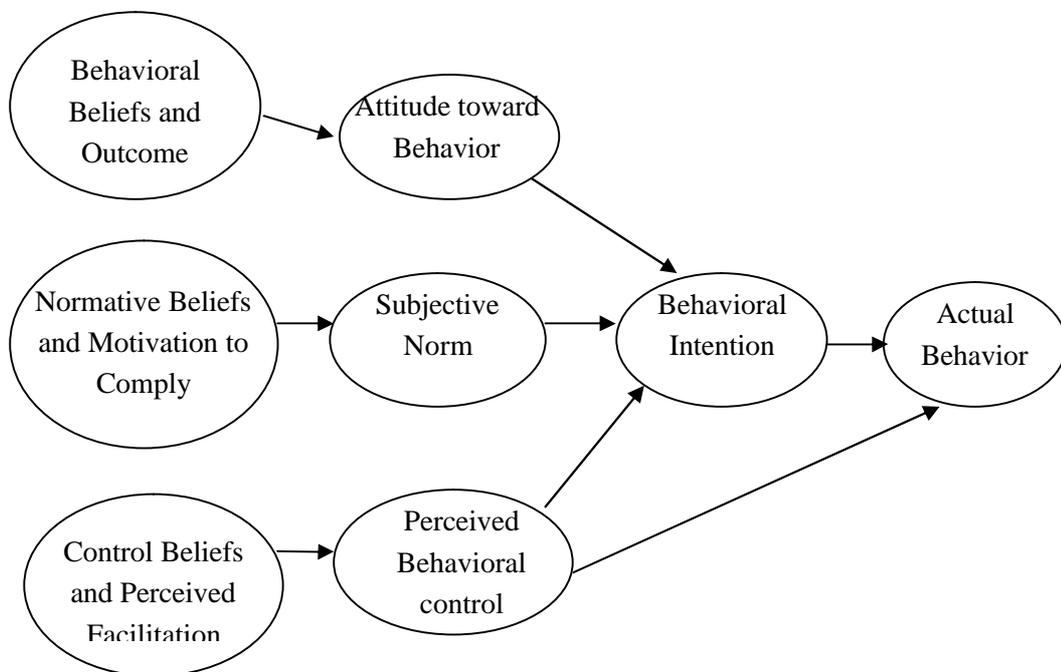
Year	Author (s)	Relationships	Findings	Subjects	Technology
1975	Fishbein & Ajzen	Attitude, Subjective Norms, Behavioral Intention	Support for the basic TRA model	-	-
1980	Ajezn & Fishbein	Attitude, Subjective Norms, Behavioral Intent	Support for the basic TRA model	-	-
1984	Liska	A critique of TRA	The parsimony of the model contributes to theoretical problems	-	-
1987	Christiansen	Basic TRA model, intentions to use and self-reported usage, user involvement, perceptions of system quality, and user demographics.	Attitude and normative beliefs determined behavioral intentions. Perceived system quality also had a significant effect	Organizational users	DSS
1988	Parvi	Attitude, subjective norms, management support, usage by upper level and peer managers, management support, and self-reported usage.	Usage was determined by attitude and subjective norms. Subjective norms were determined by management support, and usage by upper and peer managers.	Managers	Micro-Computer
1988	Sheppard, Hartwick, & Barki	Meta Analysis of TRA – Attitude, SN, Intention, Behavior + 3 moderators (measure of intention, goals and behavior, and choice among alternatives)	Meta Analysis found that in general the model and the moderators were supported	-	-
1999	Karahanna, Straub, &	Not a TRA study per se but a modification of TRA and Diffusion of Innovations with a distinction between	For potential adopters significant relationships were found between visibility, result demonstrability, and trailability with attitude: normative beliefs motivation to comply (NBMC) top management support, NBMC supervisor, NBMC peers, NBMC MIS department, and NBMC friends, with SN: and SN	Organizational Users at a Financial Institution	Win 95

	Chervany	pre- and post-adoption beliefs and attitudes	with BIU. For users significant relationships were found between image and PU with attitude; NBMC top management, NBMC supervisor, NBMC peers, and NBMC local computing specialists with SN; attitude and PU with BIU.		
2000	Hee	Attitude and subjective norms	Social attitudes were significantly related to subjective norms	Undergraduate students	-
2001	Bock & Kim	Attitude, intention and behavior of knowledge sharing	Positive attitude toward knowledge sharing is found to lead to positive intention to share knowledge and, finally, to actual knowledge sharing behaviors	Employees in public organization	Knowledge sharing
2002	Uddin & Gillett	Moral reasoning, self-monitoring and intention to report fraudulently	high moral reasoners are more influenced than low moral reasoners by their own attitude towards the behavior; low self-monitors are found to be more influenced than high self-monitors by subjective norms	client personnel	-
2003	Kolekofski & Heminger	Beliefs, attitudes and intention to share information	Attitudes play a complicated role	Employees in government	Information

2.3.2 Theory of Planned Behavior (TPB)

One major limitation of TRA lies in the lack of consideration of the probability of performance failure to account for situations in which an individual lacks substantial control over the targeted behavior (Ajzen, 1991). To account for behaviors not entirely under one's willingly control, Ajzen (1985) extended TRA to include an additional determinant of behavioral intention (BI), labeled as perceived behavioral control (PBC) and established an extended model of TRA -- Theory of Planned Behavior (TPB). Figure 2.2 depicts the theoretical relationships of TPB constructs.

Figure 2.2 Theory of Planned Behavior



The TPB model has generally been supported by empirical researches (Ajzen and Driver, 1992; Ajzen and Madden, 1986; Doll and Ajzen, 1990). Table 2.2 lists some TPB studies during 1986 to 2003. The model posited that three independent variables of *attitude* (A), *subjective norms* (SN) and PBC predict one's *behavioral intentions*, which in turn predict the individual's behavior, with relative weights estimated by regression:

$$\mathbf{BI} = \mathbf{A} + \mathbf{SN} + \mathbf{PBC}$$

Attitude is defined as an individual's positive or negative evaluation on performing a particular behavior. SN is formed when an individual decides to comply with the normative beliefs based on his or her perception of relevant others' opinions on whether or not she or he should perform a particular behavior (Chau and Hu, 2001). PBC refers to people's perception of the ease or difficulty of performing the behavior of interest, capturing "beliefs regarding access to the resources and opportunities needed to perform a behavior, or alternatively, to the intention and external factors (including requisite skills and other external factors) that may impede performance of the behavior" (Ajzen, 1985, 1991). PBC is a function of control beliefs and perceived facilitation. Control belief is the perception of the presence or absence of necessary resources and opportunities needed to carry out the behavior. Perceived facilitation is one's assessment of the importance of those resources to the achievement of the outcomes (Ajzen and Madden, 1986). Taylor and Todd (1995) later include innovation characteristics to extend TPB. Figure 2.3 depicts the conceptual model of the extended TPB.

Figure 2.3 An Extended Model of TRA -- Theory of Planned Behavior

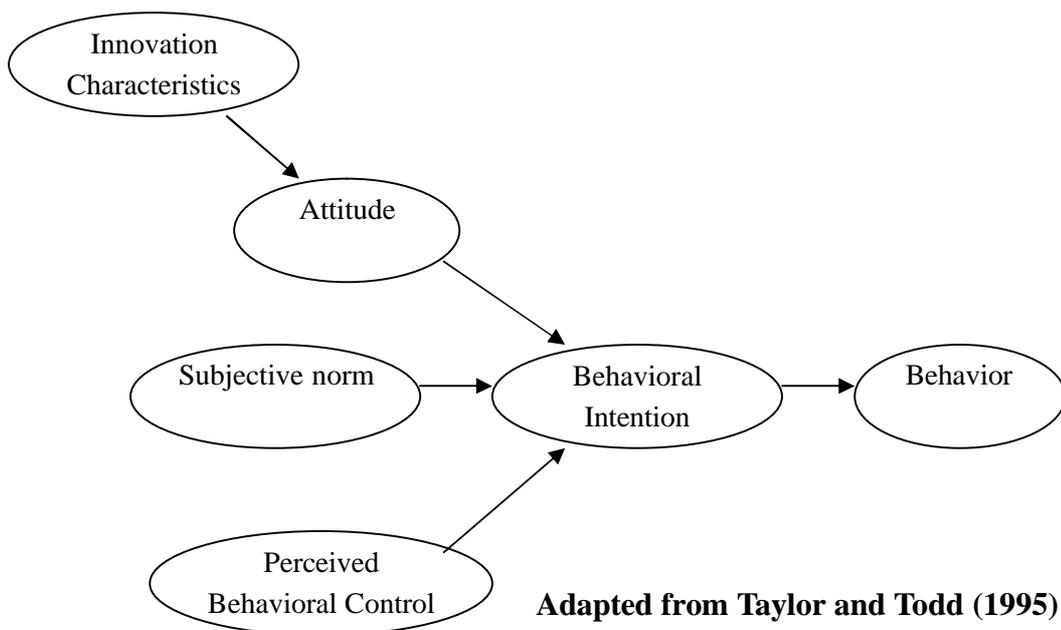


Table 2.2 TPB Studies (1986-2003)

Year	Author(s)	Relations	Significance
1986	Ajzen and Madden	TRA versus TPB	TPB found to be a better predictor of intentions
1990	Doll & Ajzen	Basic TPB Model	Found that attitude, SN, and PBC predicted intentions and that intentions and PBC predicted behavior
1991	Ajzen	Attitude, Subjective Norms, PBC, Intention, Behavior	A number of studies looked at, in general the relationships in the model were found to be significant
1992	Ajzen & Driver	Attitude toward the behavior, subjective norms, PBC, Leisure intentions, Leisure behavior	Found that attitudes, subject norms, and PBC predicted intentions and that intentions predicted behavior
1997	Harrison et al	TPB variables and firm and individual executive characteristics	Results indicate strong support for a decision process based on attitude, subjective norm, and perceived control regarding IT adoption
2001	Chau and Hu	TAM, TPB, DTPB	TAM and TPB exhibit relatively low explanatory power than prior studies
2002	Chau and Hu	TAM, TPB and an integrated model	TAM may be more appropriate than TPB for examining technology acceptance
2002	Griffin, et al	A combination between heuristic-systematic information processing and the theory of planned behavior	Deeper, more systematic processing of risk information is positively related to evaluation strength, attitude strength, and the number of strongly held behavioral beliefs
2003	Riemenschneider	TPB and TAM	The combined model provided a better fit than either the TAM or the TPB alone

2.3.3 Technology Acceptance Model (TAM)

User technology acceptance has attracted attention in IS research since PCs became widely available in the 1980s. The study of the adoption or rejection of IT has been variously labeled as information systems implementation, technology adoption and technology acceptance in IS literature for several decades (Agarwal and Prasad, 1998). Over the last decade, a distinct academic tradition of user acceptance and usage behavior has been established in IS literature, and the social psychological perspective in user acceptance research has become dominant since Davis (1989) proposed TAM. TAM adopts the reasoning logic of the TRA (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), which posits that human behavior is the result of rational reasoning by which information is processed along the logical chain of belief-intention-behavior. By the same logic, TAM states that it is only through internal beliefs that outside

factors can influence user intention to use a technology. The two key beliefs determining user Intention to Use (IU) are identified by TAM as Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (Davis, 1989; Davis, Bagozzi and Warshaw, 1989). In addition to directly influencing IU, PEOU also has a positive impact on PU since the easier a system is to use the more likely it is to be perceived as useful, given other things being equal. TAM-based research that aims to explain and predict user acceptance and usage behavior has proliferated and has further enhanced TAM's theoretical and statistical robustness (Venkatesh and Morris, 2000).

2.3.3.1 Theoretical Development of TAM

TAM was developed by Davis (1986) as a specialization of the TRA to model acceptance of IT. Davis' goal in developing TAM was to provide a theoretically justified explanation of the determinants of IT acceptance across a wide range of applications and user populations (Davis, 1989). A key purpose of TAM is to provide a basis for tracing the impact of external factors on internal beliefs, attitudes, and intentions as reference for managerial intervention. TAM was formulated in an attempt to achieve this goals by identifying a small number of fundamental variables dealing with determinants of computer acceptance, and, at the same time, adopting TRA's well-established logic chain of belief–attitude–intention–behavior as the basic theoretical relationships among these variables. One of the salient contributions of TAM is the development of the two key beliefs that specifically account for IT acceptance.

The critical step in employing TRA is to identify salient beliefs affecting user IT acceptance in a specific context. TAM theorizes PU and PEOU as the key determinants of (IU). PU is defined as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context. PEOU refers to the degree to which the prospective user expects the use of the target system to be free of effort.

Davis (1989) based the development of PU construct on many lines of research, including system utilization study (Robey, 1979), applied expectancy theory (DeSanctis, 1983), cost-benefit analysis research, relative advantage in innovation adoption (Rogers, 1983; Tornatzky and Klein, 1982), evaluation of information reports (Larcker and Iessig, 1980), and channel disposition model (Swanson, 1987). According to TAM, a system that is useful in performing the required tasks will allow the user to achieve better performance and benefit from its use (Davis, 1989). PU has been consistently found to be a strong indicator of intentions (Davis, Bagozzi, and Warshaw, 1992; Igarria et al., 1995).

The concept of “ease” is based strongly on self-efficacy theory, the cost-benefit paradigm, and the complexity attribute in innovation adoption (Davis, 1989). PEOU has a positive effect on attitude, as a person who finds a system easy to use will tend to have favorable feelings toward it. In early stages of IT use, the user’s perception of PEOU will be based on how comfortable the user feels using IT in general (self-efficacy). Empirical assessments by Davis (1989), Mathieson (1991), Taylor and Todd (1995), and Morris and Dillon (1997) confirm this element of TAM. Longitudinal studies have demonstrated that the PEOU has its strongest influence in early stages of IT adoption, but this influence weakens over time as the user gets more familiar and comfortable with the system (Davis, 1989; Szajna, 1996; Venkatesh, 2000). PEOU is also theorized to influence PU because, other things being equal, the easier the system is to use the more useful it can be.

The original TAM (Davis, 1986) postulates that actual usage behavior is solely affected by IU, which in turn is influenced by Attitude (A) and PU, with relative weights estimated by regression:

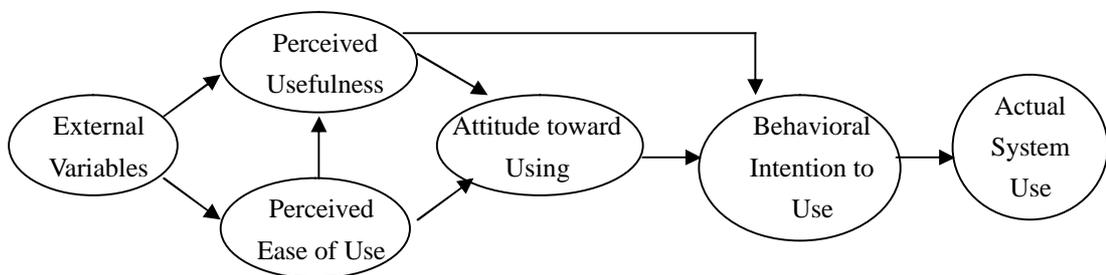
$$BI = A + PU$$

While attitude is jointly determined by PU and PEOU, with relative weights statistically estimated by linear regression:

$$A = PU + PEOU$$

However, the final model of TAM excludes the *attitude* of the user (Davis, et al, 1989), due to its weak influence on IU and its weak direct link with PU. The researchers argued that people might intend to use a technology because it was useful even though they did not have a positive attitude toward using. Their study tested the original version of TAM on the voluntary usage of a word-processing package by 107 first year full-time U.S. MBA students. Figure 2.4 depicts the key variables of the original TAM model. TAM constructs were measured using scales validated by Davis (1989). Measures were made at two points in time: after a one-hour introduction and after 14 weeks. Findings suggested that PU and PEOU fully mediated the influence of external variables; that PEOU affects PU, and that IU is an indicator of usage.

Figure 2.4 Technology Acceptance Model



TAM has been widely accepted as a robust and reliable model to explain and predict user acceptance of technology due to its validity, generality, and ease of applicability (Venkatesh and Davis, 2000). Substantial theoretical and empirical support has accumulated in favor of TAM through application, replication and extension (See Table 2.3). In general, PU has been consistently found to be a fundamental driver of IU, while the effect of PEOU has been less consistent across the many empirical tests of TAM; PU and PEOU are found to mediate the effects of external variables on IU (Hu, 1999; Gefen and Straub, 2000) such as system

characteristics, development process and IT training etc.

2.3.3.2 Critiques of TAM

Research on TAM has been plentiful but not adequate (Davis, 1989; Hu et al., 1999; Mathieson, 1991; Straub, et al., 1995; Venkatesh, 1999, 2000). TAM is well accepted since it shares comparable validity and predictability with other models and yet is the most parsimonious. While parsimony is TAM's strength, it is also its limitation. Similar to the TRA, TAM has the following limitations: (1) incompleteness of the theoretical model. Other contingency variables affecting acceptance need to be investigated so as to increase its explanatory power; (2) most empirical evidence came from North America. Thus, the applicability of the model in other cultures may be questionable; (3) weak implication for managerial intervention across cultures. This is due to its sole theoretical origin from social psychology without linking cultural factors and the model.

Researchers have observed that TAM may be incomplete when applied to real world organizational settings (Davis, 1989; Davis, Bagozzi and Warshaw, 1989). A concern is that since IU in TAM typically explained about 35% of the variance in usage behavior, there might be other predictors of actual usage behavior (Straub, Limayem and Karahanna, 1995; Venkatesh and Davis, 2000). Mathieson (1991) pointed out that while TAM is predictive, its generality does not provide understanding from the standpoint of how user acceptance can be increased. Hu et al. (1999) found that TAM exhibited relatively low explanatory power when applied to the adoption of telemedicine technology by physicians in the Hong Kong setting. These researchers suggested that integration of TAM with other IT acceptance models or incorporating additional factors may improve its specificity and explanatory utility in a specific area (Hu et al., 1999). These inherent limitations of the TAM model partly explains the numerous variants of TAM in IS literature tailoring to specific contexts. It is reasonable to expect room for TAM research to go beyond social psychology consideration.

In addition, TAM has modeled IT acceptance and usage behaviors in the setting of voluntary use. However, the use and acceptance of IT may not always be voluntary in view of the prevalence of mandatory IT adoption in organizations. It is not clear how problematic the belief-intention-usage line of reasoning for user acceptance will be when the use of IT is mandatory. The actual usage of mandatory IT in the work place may be close to 100% percent since often time employees' work is required to be carried out on computers. However, some researchers argue that mandatory IS use does not necessarily result in 100% acceptance, since even when users perceive the system use to be organizationally mandated, usage intentions vary because some users are unwilling to comply with such mandates (Hartwick and Barki, 1994; Venkatesh and Davis, 2000). Thus, users would vary in intention to use even in the case of mandatory use, making IU a meaningful dependent variable for the TAM model.

Table 2.3 Published TAM Studies (1986-2003)

Year	Author(s)	Constructs& Relationships	Significant Results	Respondents	Technology
1986	Davis	PU, PEOU, attitude, self-predicted use	Model found significant	Organizational users and MBA students	Email & graphics systems
1989	Davis	basic TAM model, 2 studies	PU and PEOU related to Usage	Computer company users & evening MBA students	Email & graphics systems
1989	Davis, Bagozzi, & Warshaw	compares TRA and TAM	TAM more predictive than TRA	MBA students	Word-processing
1991	Mathieson	TAM(with Attitudes) compared to TPB	TAM more predictive than TPB	Undergraduate business students	Spread-Sheets
1992	Adams, Nelson, & Todd	2 Replications of TAM (PU, PEOU, Use)	Mixed results	Organizational employees & MBA students	Email, Voice mail & software
1993	Straub et al.	basic TAM, PU and PEOU directly into Use (Computer reported and Self-Reported usage)	PU and PEOU explain significant variance in self-reported usage but little variance in computer-recorded usage	Users in a financial institution	Voice-mail
1993	Segars & Grover	usefulness, effectiveness, ease of Use	Antecedents to usefulness are making job easier., useful, increased productivity. Antecedents to effectiveness are job performance and effectiveness. Antecedents to ease of use are easy to use, easy to learn, and easy to become skillful	Organizational users & student users	Voice- mail and email & software packages
1993	Davis	TAM model with attitudes, system as an antecedent, actual use	Relationships found significant	Professional and managerial employees	Software systems
1994	Szajna	TAM replication (PU, PEOU, USE)	Supports the TAM relationships	MBA students	Biblio-graphic software
1995	Chin & Todd	PU and PEOU	Reconfirmed the original measures of PU and PEOU had good psychometric properties	Organizational users	Voice Mail
1995	Igbaria, Guimares,	Basic TAM(PU, PEOU, Use) with antecedents (user training, user	The five variables had an effect on PEOU, user training, system quality, end-user computer support, and computer	Part-time MBA students	Micro-Computer usage

	&Davis	computer experience, system quality, & end-user computer support, & management support)	experience had an effect on PU, user training, computer experience, and end-user computer support had an effect on usage and variety of use		
1995	Keil, Beranek, & Konsynski	Relationship between PU and PEOU	PEOU a function of task/tool fit	Computer company's users	Expert support system
1995a	Taylor & Todd	Compared 3 models, TAM with attitudes, TPB, and Decomposed TPB	Decomposed TBP showed the most predictive power but only slightly, TAM validated as parsimonious and almost as good.	Business school students	PC use
1995b	Taylor & Todd	PU, PEOU, Attitudes, SN, PBC, BIU, Behavior. Model examined for both experienced and inexperienced users	The augmented TAM model provide an adequate model for IT usage. All direct determinants of BIU were significant except Attitude. Stronger link between BUE and Behavior for experienced users.	Business school students	PC Use
1995	Igbaria & Ilvaria	PU, PEOU, Use, Computer Anxiety, Self-Efficacy. Computer Experience, & Organizational Support	Computer Experience on Self-Efficacy, Organizational Support on Self-Efficacy, Self-Efficacy on Computer Anxiety, Computer Experience on Computer Anxiety. Self-Efficacy on PEOU, Computer Anxiety on PEOU, Computer Experience on PEOU, Organizational Support on PEOU, Organizational Support on PU, Computer Experience on PU, and basic TAM model were all significant.	Corporate users in Finland	Computer Use
1996	Kim	Antecedents of PU & PEOU	Antecedents affect IES indirectly through PE& PEOU	Organizational employees	EIS
1996	Szajna	Revised TAM	Pre-implementation phase – PU and PEOU lead directly into BIU, Post-implementation phase – PU mediates the PEOU-BIU relationship	Graduate business students	Email
1996	Venkatesh & Davis	PEOU, Computer Self-Efficacy(CSE), Objective Usability, Direct Experience	Support was found for CSE being an antecedent to PU, and for Objective Usability as an antecedent only after direct experience	MBA's and undergraduates	Graphics, Word, and Lotus
1996	Montazemi, Cameron, & Gupta	PU & PEOU between IS Professionals and End-Users	PEOU same for both groups but PU higher for IS Professionals	Manufacturing Company Employees	39 Software Packages
1996	Igbaria, Parasurama, & Baroudi	PU, PEOU, Use, Social Pressure, Perceived Complexity, Skills, Organizational Support,	PU rather than PEOU or Social Pressure is the principle motivator of use. Perceived Complexity is a mediator between skills, organizational support, and organizational	Professionals and Managers	Micro-Computers

		Organizational usage	usage, and PU, PEOU, and Social Pressure		
1996	Chau	modified TAM(PEOU,PU near-term, PU long-term, & BIU	PU near-term and PU long-term on BIU were significant.	Administrative and Clerical Staff	Software Packages(Word and Excel)
1997	Geffen & Straub	PU, PEOU, Use, Social Presence Information Richness(SPIR), and the interacting effect of gender	Gender found to be a significant antecedent to SPIR, PU, and Use, SPIR was found to be and antecedent to PU and PU significantly affected USE.	Knowledge workers	E-mail
1997	Agarwal & Prasad	Innovation Characteristics(relative advantage, EOU, compatibility, trialability, visibility, result demonstrability, trialability, visibility, result demonstrability, & image), Voluntariness, Acceptance Outcomes(current use & Future use)	Significant relationships were Usage to Voluntariness, visibility, compatibility, and trialability, and Intentions to relative advantage, result demonstrability	MBA students	WWW
1997	Jackson, Chow, & Leitch	basic TAM model extended with situational involvement, intrinsic involvement, argument for change, prior usage, and attitude antecedents to PU and PEOU	Significant effect of situational involvement on BIU and Attitude. Attitude is also a mediator in the situational involvement – BIU relationship. Intrinsic involvement is a significant predictor of perceptions	Organizational employees at all levels from a number of organizations	IS development projects
1998	Gefen & Keil		Developer responsiveness effects PEOU	Computer company users	Expert system
1998	Karahanna & Limayem	basic TAM and antecedents to PU and PEOU(physical accessibility, informational accessibility, media style, social presence, social influence)	Basic TAM model was significant. Significant predictors of PU and PEOU were physical accessibility, informational accessibility, media style, social presence, social influence, and support. Social influence also a significant predictor of Use.	Organizational Employees	Voice mail and e-mail
1998	Doll, Hendrickson & Deng	replication of TAM	Generally supported	Undergraduate students	Software
1998	Agarwal & Prasad	Awareness, Channel Type(mass media of interpersonal), Perceptions(relative advantage, ease of use, compatibility), Personal Innovativeness,	General support for the model, Personal Innovativeness found to be a moderator of the perception-adoption decision relationship	Corporate	IS applications

		Adoption Decision			
1998	Mathotra	social influence, intrinsic motivation, voluntariness of use, quality of use	General support for TAM and the extended Model.	Healthcare organization	IS application
1998	Wang	social influence, computer self efficacy (CSE)	CSE could be antecedent of both PU & PEOU		
1999	Lucas & Spittler	TAM + extensions (social norms, user performance, workload, and prior performance)	PU and PEOU did not predict usage, Social norms and job requirements useful in predicting use but in predicting PEOU.	Brokers and sales assistants at an investment bank	Unix workstations for transaction processing and accounting data
1999	Agarwal & Prasad	individual difference antecedents (technology provider/user, length of tenure, level of education, prior experience, and participation in training) to TAM	Technology provider/user, level of education, and prior experience were significant predictors of PU and PEOU	IT vendor employees	PC
1999	Venkatesh	Intrinsic Motivation (game based as opposed to traditional training) as an antecedent to PEOU, BIU.	Game-based training had a higher rate of acceptance than traditional. Game-based training had higher levels of PEOU	Business professionals	Telecommuting software
1999	Karahanna & Straub	PU and antecedents (social presence, social influence, availability of user training and support) & PEOU and antecedents (availability of user training and support and perceived accessibility) and Use	Basic TAM model found significant. Social Presence and Social Influence were significant predictors of PU. Perceived Accessibility found to be a significant predictor of PU. Perceived Accessibility found to be a significant predictor of PEOU.	Organizational employees	Email
2000	Venkatesh & Davis	PU and antecedents (SN, image, job relevance, output quality, result demonstrator)	TAM 2 found voluntariness & experience significantly interact relationship between SN & BI	Organizational users	Information systems
2000	Venkatesh	PEOU and antecedents (computer self-efficacy, perception of external control, computer anxiety, computer playfulness, perceived enjoyment, objective usability,)	The proposed antecedents are found to significantly affect PEOU, explaining up to 60% of the variance		
2002	Thatcher	Individual traits (personal	Hypothesized relationships supported.	Undergraduate and	Online shopping

		innovativeness) as antecedents of computer anxiety and computer self-efficacy.		graduate students	
2003	Gefen, Karahanna & Straub	trust, PU and PEOU, intention to shop online	Trust significantly affect PU and Intended Use in explaining intention to shop online	Undergraduate and postgraduate students	Online shopping
<p>Key: BIU = Behavioral Intention to Use PBC = Perceived Behavioral Control PEOU = Perceptions of Ease of Use PU = Perceptions of Usefulness SN = Subjective Norms TAM = Technology Acceptance Model TPB = Theory of Planned Behavior TRA = Theory of Reasoned Action</p>					

2.3.3.3 Theoretical Extensions of TAM

2.3.3.3.1 Antecedents to Major TAM Variables

One major criticism of the TAM model is that its parsimony gives only vague guidance for organization intervention to improve user acceptance. Recently, researchers have found it necessary to explore TAM antecedents in an attempt to find greater nomological validity and enhance its practical significance, i. e. to help augment user perceptions of technology usefulness and ease of use (Venkatesh and Davis, 2000). The simplicity of TAM renders numerous variants or supplements of the model possible, and studies have been conducted to explore the possible antecedents of PU and PEOU. Extensions of TAM include: (1) other variables that affect actual usage directly in addition to intention; (2) other variables that affect IU directly in addition to PU and PEOU; (3) antecedents of PU and antecedents of PEOU; (4) new measures of user acceptance. Table 2.4, Table 2.5 and Table 2.6 list antecedents of IU, PU and PEOU respectively.

For example, Igarria, Guimares and Davis (1995) found evidence from North America and New Zealand that management support, external computer support, inter-organizational and external computing training affect PU and PEOU. On the basis of three experiments, Venkatesh and Davis (1996) found general computer self-efficacy and objective usability of the system to be antecedents of PEOU. Kim (1996) proposed eight variables (age, education, computer experience, computer self-efficacy, cognitive style, vendor support, top management support, and information center support) as antecedents of PU and PEOU, which were found to affect Executive Information Systems indirectly through PU and PEOU. Jackson et al. (1997) incorporated situational involvement and intrinsic involvement into TAM, and found intrinsic involvement, defined as the association between objects, actions, or events and self-relevant goals and values, to be positively related to PU and Attitude. Gefen, Karahanna and Straub (2003) incorporated a new construct of Trust into TAM as an important antecedent of PU. Gefen and Keil's (1998) study showed that

developers' responsiveness in the system development process affected PU, PEOU and self-reported system use significantly. Malhotra (1998) included *social influence*, *intrinsic motivation* and *quality of use* into his proposed model based on TAM, and regarded the added variables as critical to the success of IS implementations in real world organizational settings. This TAM-based model was supported by a ten-month longitudinal field study in a major U.S. healthcare organization.

Wang (1998) incorporated *computer self-efficacy* (CSE) and *social influence from peers* into TAM, and developed four protocols to enhance potential users' perception of new IT in user pre-training technology introduction. CSE was found to be an antecedent to both PU and PEOU. Gallion (2000) incorporated into TAM new constructs when examining the use of more complex information systems in an actual data production organization. IT acceptance was measured by usage, relative frequency of use, user performance and completion ratio of work on previous work. Organizational relative advantage, which refers to users' consideration of how their system use affects the organization in deciding to use a system, was found to be a significant factor in forming attitude towards use. Only Attitude and SN were found to predict intentions to use the system. Surprisingly, intentions were not found to affect usage.

In another study, Venkatesh (2000) integrated *control*, *intrinsic motivation*, and *emotion* as anchors that determine early perceptions about PEOU in a study of 246 employees in three different organizations over a three-month period. Constructs identified as anchors are expected to have relatively stable influence across time and experience. With regard to the control variable, Venkatesh theorized a bidimensionality of control construct proposed by Ajzen (1985, 1991) to include internal control and external control. Internal control relates to knowledge/self-efficacy, while external control relates to the environment (Terry, 1993), conceptualized as computer self-efficacy (CSE). CSE refers to an individual difference variable that represents one's belief about her/his ability to perform a

specific task/job using a computer. Specific issues related to external control include organizational responses to help users overcome barriers to technology use. With regard to the motivation construct, intrinsic motivation is conceptualized as *computer playfulness*, defined as “the degree of cognitive spontaneity in microcomputer interactions”, and regarded as system-independent and motivation-oriented. In conceptualizing the emotion-related variable, those who are more “playful” with technologies in general are expected to indulge in using a new system just for the sake of using it, rather than just the specific positive outcomes associated with use (Venkatesh, 2000).

Table 2.4 Antecedents to Use

Construct	Authors (year)
Attitude	Gallion (2000)
Compatibility	Agarwal & Prasad(1997)
Computer Experience	Igbaria, Guimares, & Davis (1995)
End User Computer Support	Igbaria, Guimares, & Davis (1995)
Gender	Gefen & Straub (1997)
Image	Agarwal & Prasad (1997); Karahanna et al (1999); Moore & Benbasat(1991)
Job Requirements	Lucas & Spitler (1999)
Perceived Behavioral Control (PBC)	Taylor & Todd (1995)
Result Demonstrability	Agarwal & Prasad (1997); Karahanna et al (1999); Moore & Benbasat (1991)
Social Influence	Karahanna & Limayem (1998)
Social Norms	Lucas & Spitler (1999); Gallion (2000)
Subjective Norms	Taylor & Todd (1995)
Trialability	Agarwal & Prasad (1997); Karahanna et al (1999); Moore & Benbasat (1991)
User Training	Igbaria, Guimares, & Davis (1995)
Visibility	Agarwal & Prasad (1997); Karahanna et al (1999); Moore & Benbasat (1991)
Voluntariness	Agarwal & Prasad (1997)

Table 2.5 Antecedents to Perceived Usefulness

Construct	Authors (year)
Computer Experience	Igbaria, Guimares, & Davis(1995); Igbaria & Ilvaria (1995)
Computer Self-Efficacy	Venkatesh & Davis (1996)
Developer Responsiveness	Gefen & Straub (1998)
End User Computer Support	Igbaria, Guimares, & Davis (1995)
Gender	Gefen & Straub (1997)
Image	Venkatesh & Davis (2000)
Informational Accessibility	Karahanna & Limayem (1998)
Job Relevance	Venkatesh & Davis (2000)
Level of Education	Agarwal & Prasad (1999)
Media Style	Karahanna & Limayem(1998)
Organizational Support	Igbaria & Ilvaria (1995)
Output Quality	Venkatesh & Davis (2000)
Physical Accessibility	Karahanna & Limayem(1998)
Prior Experience	Agarwal & Prasad(1999)
Result Demonstrability	Venkatesh & Davis (2000)
Social Influence	Karahanna & Limayem (1998); Karahanna & Straub (1999)
Social Presence	Karahanna & Limayem (1998); Karahanna & Straub (1999)
Social Presence Information Richness (SPIR)	Gefen & Straub (1997)
Support	Karahanna & Limayem (1998)
Subjective Norms	Venkatesh & Davis (2000)
System Quality	Igbaria, Guimares, & Davis (1995)
Technology Provider /User	Agarwal & Prasad (1999)
Trust	Gefen, Karahanna & Straub (2003)
User Training	Igbaria, Guimares, & Davis (1995)

Table 2.6 Antecedents to Perceived Ease of Use

Construct	Authors (year)
Antecedents / Extensions	Supporting Studies
Computer Anxiety	Igbaria & Ilvaria (1995)
Computer Playfulness	Venkatesh (2000)
Computer Self-Efficacy	Venkatesh (2000)
Gender	Gefen & Straub (1997)
End User Computer Support	Igbaria, Guimares, & Davis (1995)
Informational Accessibility	Karahanna & Limayem(1998)
Job Requirements	Lucas & Spitler (1999)
Level of Education	Agarwal & Prasad (1999)
Management Support	Igbaria, Guimares, & Davis (1995)
Media Style	Karahanna & Limayem(1998)
Objective Usability	Venkatesh (2000)
Organizational Support	Igbaria & Ilvaria (1995)
Perception of External Control	Venkatesh (2000)
Perceived Accessibility	Karahanna & Straub (1999)
Perceived Enjoyment	Venkatesh (2000)
Physical Accessibility	Karahanna & Limayem (1998)
Prior Experience	Agarwal & Prasad (1999)
Self-Efficacy	Igbaria & Ilvaria (1995)
Social Influence	Karahanna & Limayem(1998)
Social Norms	Lucas & Spitler (1999)
Social Presence	Karahanna & Limayem (1998)
Support	Karahanna & Limayem (1998)
System Quality	Igbaria, Guimares, & Davis (1995)
Technology Provider/User	Agarwal & Prasad (1999)
User Computer Experience	Igbaria, Guimares, & Davis (1995); Igbaria & Ilvaria (1995)
User Training	Igbaria, Guimares, & Davis (1995)

2.3.3.3.2 Technology Acceptance Model 2 (TAM2)

Venkatesh and Davis (2000) introduced a revised model that explicitly weaves the key antecedents of PU into the mono-logical net of TAM. The researchers argued that although boiling everything down to internal beliefs makes the TAM model parsimonious, its usefulness is limited because environmental factors are not considered. In an attempt to reveal the role of social influence in the process of technology user acceptance, TAM is extended to TAM2 to include SN as an additional determinant of user acceptance (Venkatesh and Davis, 2000). The construct of SN is adapted from the TRA, *image* (I) and *result demonstrability* (RD) from the TID, and *job relevance* (JR) and *output quality* (OQ) adapted from prior IS research. In TAM2, both SN and Voluntariness are deemed to be constructs of social forces.

In the context of IT acceptance, SN is operationalized as a person's perception that people who are important to him or her think that him or her should use a technology. TAM2 proposes and finds that SN has an indirect effect on IU through PU and this effect is termed as internalization. Internalization effect refers to "the process by which, when one perceives that an important referent thinks one should use a system, one incorporates the referent's belief into one's own belief structure." (Venkatesh and Davis, 2000). Internalization effect operates when one incorporates the referent's belief into one's own belief structure (Kelman, 1958). The underlying rationale of the internalization effect is that "if a superior or co-worker suggests that a particular system might be useful, a person may come to believe that it actually is useful, and in turn form an intention to use it" (Venkatesh and Davis, 2000).

In a mandatory use setting, SN is also found to have a positive direct effect on IU through compliance effect, which operates whenever an individual perceives that a social actor wants him or her to perform a specific behavior, and when the social actor has the ability to reward behavior or punish non-behavior. However, in a voluntary setting, SN is posited to have no significant direct effect on IU since in such setting the compliance-based effect of SN on IU above PU and PEOU will not occur (Venkatesh and Davis, 2000). TAM2 also proposes that SN has a positive effect on *image (I)* through the process of identification effect. *Image* is defined as "the degree to which use of an innovation is perceived to enhance one's...status in one's social system" (Moore and Benbasat, 1991).

2.3.4 Comparison of TAM, TRA, and TPB

Comparative studies have been done to find out the relative strengths of the models of user acceptance in IS literature. Table 2.7 summarizes some of the comparative studies. There have been three major studies comparing TAM with TRA and TPB (Davis, Bagozzi and Warshaw, 1989; Mathieson, 1991; Taylor and Todd, 1995). Davis, Bagozzi, and Warshaw (1989) found that TAM was more predictive of

intentions than TRA. Mathieson (1991) concluded that TAM performed moderately better than TPB in predicting intention in a study of a sample of 262 students. Taylor and Todd (1995) contrasted TAM with TPB and Decomposed DTPB (DTPB) on PC acceptance using business school students as subjects. Results demonstrated that TAM and DTPB were fairly comparable, while TAM explained intentions the best. They also found that adding the constructs of SN and Perceived Behavioral Control (PBC) did not substantially increase the amount of variance of usage behavior already explained by TAM (36% compared to 34%). Scannel (1999) found that both TAM and TPB explained a substantial amount of variance in behavioral intentions in a research of the Advanced Manufacturing Technology Adoption Model (AMTAM). Gallion (2000) built a comprehensive model based on TAM and TPB, and compared the new model with TAM. TAM was found to be the preferable model in early stages of system development while the comprehensive model work better in later stages. Overall, the comparison in this section shows that TAM exhibits superiority to other models in terms of exploratory power and validity. However, in a study comparing the explanatory power of TAM and TPB based on subjects of individual professionals in Hong Kong, both TAM and TPB exhibit relatively low R-square compared with prior comparative studies (Chau and Hu, 2001). The authors thus suggested that TAM and TPB may require the inclusion of additional factors in the respective models to improve explanatory power.

Table 2.7 Comparative Studies

Year	Authors	Models Compared	Significant results	Respondents	Technology
1989	Davis, Bagozzi & Warshaw	TRA & TAM	TAM more predictive than others	Full time MBA students	Text-editor
1991	Mathieson	TPB & TAM	TAM more predictive	Undergraduate students	Spreadsheet
1995	Taylor & Todd	TPB & TAM & DTPB	Comparable but TAM most predictive on intention	MBA and undergraduate students	University computer resource center
1998	Venkatesh	TAM & DTPB	TAM most predictive	Students and organization employees	Data production information systems
1999	Scanell	TAM & TPB & AMTAM	TAM & TPB both substantially predictive	Organization employees	Manufacturing information Technology
2000	Gallion	TAM & TPB & modified TAM	TAM better than others	Organization employees	Information systems
2001	Chau & Hu	TAM, TPB & DTPB	DTPB better than TAM, TAM superior to TPB	Physicians	Telemedicine

2.3.5 Theory of Innovation Diffusion (TID)

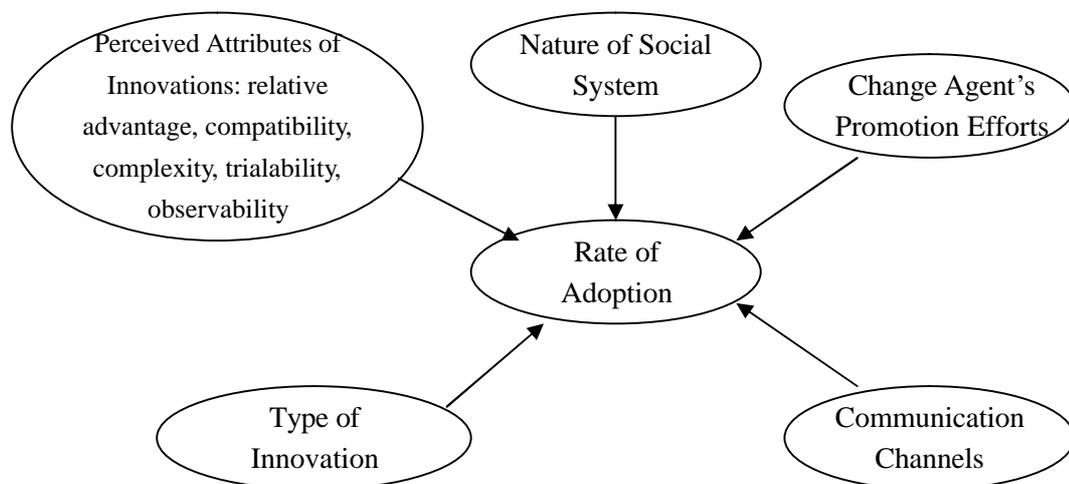
Innovation adoption has been a research concern in various disciplines such as marketing, organizational theory, social psychology and IS literature (Agarwal, and Prasad, 1998; Ajzen and Fishbein, 1980; Zaltman et al., 1973). The conceptualization of IT innovation adoption by individuals started with Rogers' (1983) Theory of Diffusion of Innovation (TID). While TAM has conceptualized its two major perception constructs – PU and PEOU with reference to TID, TAM2 further includes more constructs as antecedents of PU based on concepts in TID.

TID's conceptualization of the adoption of new IT by individuals is based on an information-centric view (Rogers, 1983). It posits that a potential adopter will process the information of an innovation to form perceptions on the characteristics of that innovation. Based on this assumption, the theory proposes that innovation diffusion is primarily the outcome of a learning or communication process where an innovation is

“communicated through certain channels over time among the members of a social system” (Rogers, 1995). To examine the process of innovation diffusion, researchers started from the identification of factors related to information flow. These factors include an individual’s general propensity to adopt an innovation, personal innovativeness, as well as the congruence between innovation and the social, economic and psychological characteristics of the potential adopter. Information about the existence of innovations is possessed by adopters to form perceptions about their characteristics. Such perceptions serve as the drivers for innovation adoption decisions (Rogers, 1995).

According to Rogers (1995), an innovation is “an idea, practice, or object that is perceived as new by an individual or other units of adoption.” In the context of IT acceptance, an innovation is any new software, computer system, or any information technology that is available to a user. Of particular interest to technology acceptance is the analysis of the attributes of the innovation and the predictive value of these properties on the rate of adoption of the innovation (Gallion, 2000). Figure 2.1 summarizes the factors seen to influence innovation diffusion.

Figure 2.5 Theory of Innovation Diffusion



Adapted from Rogers (1995)

In their meta-analysis of 105 published innovation adoption research papers, Tornatzky and Klein (1982) identified three attributes that were consistently found to be important in determining the rate of adoption: compatibility, relative advantage and complexity. Rogers (1983) later identified five general attributes of innovation, *relative advantage, compatibility, complexity, trialability and observability*, as the key attributes influencing the rate of adoption of any innovation. The five characteristics along with their possible relationships with the rate of innovation adoption are defined as follows:

1. Relative advantage: “the degree to which an innovation is perceived as being better than the idea it supersedes”. Relative advantage requires the adopter to analyze the costs and benefits of using an innovation, which can be expressed economically, socially, etc. Moore and Benbasat (1991) claimed that this construct is similar to the notion of usefulness in TAM (Davis, 1989).
2. Compatibility: “the degree to which an innovation is perceived as consistent with the existing values, past experiences and the needs of potential adopters”. Compatibility is evaluated relative to the adopter’s sociocultural values and beliefs, previously introduced ideas, and client needs for innovation. It is suggested to be associated with behavioral intention to use (Moore and Benbasat, 1991).
3. Complexity: “the degree to which an innovation is perceived as relatively difficult to understand and use”. Individuals tend to choose the option that is easier to understand and use. *Complexity* parallels *ease of use* characterized by Moore and Benbasat (1991).
4. Trialability: “the degree to which an innovation may be experimented with on a limited basis.” This trial use gives meaning to the innovation, as the adopter has the chance to handle the innovation.
5. Observability: “the degree to which the results of an innovation are visible to others”. The more the innovation can be seen and communicated to others, the higher the visibility.

(Rogers, 1995)

The important assertion that Rogers makes in his work is that the potential adopters' perceptions of the characteristics of innovations are what drive the rate of adoption, rather than the primary characteristics themselves (Rogers, 1995; Moore and Benbasat, 1991). Innovation research has shown that people's subjective evaluations of an innovation are more influential than scientific data (Rogers, 1995).

To meet the need for an instrument with strong psychometric qualities to measure an adopter's perceptions of attributes of an innovation's attributes in order to predict its adoption, Moore and Benbasat (1991) extended the five constructs into seven perceived characteristics based on Rogers' work (1983).

In addition to the five characteristics of innovations (complexity was described as ease of use), Moore and Benbasat included image (social approval) and voluntariness of use ("the degree to which use of the innovation is perceived as being voluntary, or of free will") and labeled as the seven attributes of the Perceived Characteristics of Innovation (PCI).

Image refers to the perception that using an innovation will contribute to enhancing the social status of a potential adopter. Venkatesh and Davis (2000) included *image* into TAM2, and posited that image has a positive effect on PU and is influenced by SN.

After rigorous testing of the PCI for reliability and validity, Moore and Benbasat recommended dividing the *observability* construct into two distinctly constructs, i.e., *result demonstrability* and *visibility*. *Result demonstrability* refers to "the tangibility of the results of using an innovation", and *visibility* refers to "the extent to which potential adopters see the innovation as being visible in the adoption context." Agarwal and Prasad (1998) found a significant correlation between usage intentions

and *result demonstrability*, which is later theorized as a determinant of PU in TAM2. It is argued that even an effective system can fail to enhance user acceptance if people have difficulty attributing gains in their job performance specifically to their use of the system (Venkatesh and Davis, 2000).

Whereas most of the technology acceptance models address user acceptance and usage behavior issues from a social psychology perspective, cultural influence on technology use has been overlooked. Since user acceptance research is substantially based on North American organizations and subjects, whether these models can be applied to other countries or cultures is an issue calling for further inquiries. As information technologies are diffused beyond country boundaries, user acceptance theories face the challenge to maintain their validity and usefulness internationally.

2.4 Review on Culture and Cultural IS Research

Cultural differences have been observed in IS research, the lack of cultural orientation of TAM risk neglecting an important aspect of technology user acceptance and usage behavior. The significance of cultural differences in influencing and explaining behavior has long been recognized in anthropology, sociology, psychology, management and accounting literature. However, cultural influences have not been investigated vigorously in technology acceptance literature.

2.4.1 Definition of Culture

The importance of culture on various aspects of management and organizational behavior has long been recognized, along with being a major concern in much of the earlier work in anthropology. The cultural environment for certain behavior is found to have a significant impact on one's values, beliefs, and attitudes (Brislin, 1993). Various disciplines have defined culture differently. Over 150 different definitions of culture have been proposed in the literature according to Kroeber and Kluckhohn's (1952) review of culture. Often time, most definitions boil down to culture being the characteristics, values, and ideas that distinguish one human group from others, and

cultural differences generally manifest themselves in symbols, heroes, rituals, and values. The wide range of connotations in culture includes the beliefs, value system, norms, traditions, myths, and structural elements of a given organization, tribe, or society, that exists at different social levels. An individual usually belongs to cultural groups at different levels at the same time. One may carry many layers of “mental programming” depending on situational states. The different levels of culture include: (1) national or country level; (2) a regional and/or ethnic and/or religious and/or linguistic affiliation level; (3) a gender level; (4) a social class level; (5) an organizational level; (6) an individual level (Hofstede, 1991; Lu and Lu, 1995).

From a sociological perspective, Kluckohn (1965) describes culture as learning acquired as a result of membership in a particular group. Similarly, Foa and Chemer (1967) define culture as “a complex function of social norms and habits guided by various societal institutions.” In the field of management research, culture’s definition has been widely quoted as “the collective programming of the mind which distinguishes the members of one human group from another” or “such patterns of thinking, feeling, acting mental programs.”(Hofstede, 1980). Larkey (1996) believes that cultural differences are rooted in attitudes, which is less observable, manifesting themselves through beliefs, values and communication patterns.

In spite of the great wealth of the definitions on culture, its influence on individual and organizational perception, motivation and performance are imprecise in explaining differences in worker attitudes (Mejias, 1995). Pragmatically, researchers in different academic disciplines define culture based on their respective backgrounds. As a result of this practice, the effects of culture on human performance have been generally described rather than precisely defined.

In view of this, cultural frameworks are considered useful as theoretical reference or basis for research. One of the first attempts to define the dimensions of national cultures was by Inkeles and Levinson (1954). Culture is hypothesized to vary on three

dimensions: (1) relation to authority; (2) conception of self; and (3) ways of dealing with conflicts. Based on these three dimensions, Hall (1977) distinguishes culture as (1) the people's use of time (punctual - not punctual); (2) spatial orientations (when to interact with each other); and (3) low or high context communication (i.e., low or high level of information actually coded into the transmitted part of the message).

Kluchhohn and Strodtbeck (1961) suggested a model based on six dimensions in which value orientations differ: people-nature (i.e., subjugation to, harmony with, mastery over); time (i.e., past, present, future); human nature perception (i.e., unchangeable, changeable; evil, mixed, neutral, good); activity (i.e., being, containing and controlling, doing); relational (i.e., hierarchical, group, individualistic); and space orientation (i.e., private, mixed, public). These value orientations are believed to have specific impacts on management behavior.

The most widely accepted cultural framework is based on the research of Hofstede (1980). Hofstede posited that cultural differences manifest themselves through different aspects of the national culture. He looked at values and attitudes of workers and managers in over forty countries in a multinational company. Based on a survey using nationality as a precursor of culture, he identified Individualism, Power Distance, Uncertainty Avoidance and Masculinity as significant cultural value dimensions. After a decade of further study, he proposed a fifth dimension-- time orientation (Hofstede, 1991).

2.4.2 Hofstede's Framework of Societal Values

Based on a statistical analysis of 116,000 questionnaires completed by IBM employees in about 40 countries through surveys in about 20 languages between 1967 and 1973, Hofstede's (1980) work provides a rigorous framework for studying core societal values. Most of the cultural research in IS literature has adopted the framework of Hofstede's (1980) cultural dimensions or cultural values because of its extensive validating support (Kumar et al, 1993). According to Hofstede, culture is a

set of shared assumptions representing the system of socially constructed meanings and preferences of a group (Hofstede, 1980; Schein, 1985). Culture is parsimoniously defined as “the collective programming of the mind which distinguishes the members of one human group from another” (Hofstede, 1980). The core of culture, societal values, defined as “a broad tendency to prefer certain states of affairs over others”, are acquired early in youth through one’s family and schooling (Hofstede, 1980, 1984). Due to the wealth of data and depth of theoretical interpretation drawing on a review of sociological and anthropological theories and work, this framework has received much attention in the IS field as well as in other fields (Jordan, 1994). In particular, Hofstede’s research on cultural dimensions has been regarded as a major theoretical foundation for exploring the impact of cultural differences on the adoption and diffusion of IT-based innovations such as email (Straub, Keil and Brenner, 1997).

2.4.2.1 Individualism versus Collectivism

This dimension is addressed by Hofstede (1984) as follows:

Individualism versus Collectivism

Individualism stands for a preference for a loosely knit social framework in society wherein individuals are supposed to take care of themselves and their immediate families only. Its opposite, Collectivism, stands for a preference for a tightly knit social framework in which individuals can expect their relatives, clan, or other in-group to look after them in exchange for unquestioning loyalty. The fundamental issue addressed by this dimension is the degree of interdependence a society maintains among individuals. It relates to people’s self-concept: ‘I’ or ‘we’.

Generally, Individualism refers to the extent to which members of a culture view themselves as distinct persons, rather than as part of a collective (Hofstede, 1994). Erez and Earley (1987) suggested that "the individualistic versus collectivistic orientation of a society has profound implications for how individuals work". Individualism-collectivism has consistently featured in many empirical studies as the most important dimension of cross-national culture.

Hofstede (1984) notes that in individualistic cultures people tend to place greater emphasis on personal time, emotional independence from their work. Individualists usually value challenge and autonomy on the job and encourage individual initiative. Paralleling with their search for personal fulfillment, individuals high in individualist value tend to be more non-conformist and less loyal to the group than people from collectivistic cultures. In conclusion, a more individualistic culture tends to encourage personal initiative, where people tend to be more non-conformist, searching for personal fulfillment and emotional independence.

The opposite of individualism is collectivism. Collectivism is the degree to which people focus more on working together in groups rather than working as individuals. This cultural dimension is believed to be highly enduring. For example, different ideologies have done little to break down the traditional collectivist Chinese culture (Head and Sorensen, 1993; McGrath et al., 1992). Tan et al. (1998) found that the collectivist culture persisted even with the use of GSS, while the more individualistic Western managers took advantage of the technology to practice independence on decision making.

Triandis's (1995) extensive literature review summarizes four attributes of the individualist/collectivist dimension: conceptions of the self; goal relationships; attitudes and norms; and emphasis on relationships. Among these attributes, the difference in conception of the self is fundamental. Individualist cultures see the self as somehow autonomous and independent. By contrast, collectivist cultures view the self as part of an interconnected social web (Heine and Lehman, 1997; Kitayama et al., 1997). Typically, a conception of the "self" in a collectivist culture is developed as an individual learns about connectedness to others and responds to others' expectations as the criteria of correct and incorrect behaviors (Kitayama et al., 1997).

For example, Tan et al (1994) describe the US, a individualistic culture, as one where ties between people are loose so that they base their self-understanding on their

own actions, which are usually taken independently of what others think (Earley, 1994); while in Singapore, a collectivistic culture, people are integrated into strong cohesive groups (Bond, Leung and Wan, 1982) so that they base their self-understanding on the reactions of others around them (Earley 1994).

Singelis and Brown (1995) contend that individualism versus collectivism is a basic distinction among cultures. They proposed and tested a model stating that "culture affects the development of an individual's psychological makeup (such as the self conception), which, in turn, affects communication behavior". Independent self-conception tends to result in "being direct in communication" with less concern about the more general contexts and the thoughts, feelings, or actions of others (Rice et al., 1998), while the opposite is true with dependent or collectivist self-conception.

2.4.2.2 Power Distance

This dimension is addressed by Hofstede (1984) as follows:

Large versus Small Power Distance

Power Distance is the extent to which the members of a society accept that power in institutions and organizations is distributed unequally. This affects the less powerful as well as the more powerful members of society. People in large Power Distance societies accept a hierarchical order in which everybody has a place, which needs no further justification. People in small Power Distance societies strive for power equalization and demand justification for power inequalities. The fundamental issue addressed by this dimension is how a society handles inequalities among people when they occur. This has obvious consequence for the way people build their institutions and organizations.

PD is a core cultural value distinctive in the workplace (Hofstede, 1980), capturing the extent to which unequal distribution of power in organizations is accepted. High PD societies tend to be hierarchically ordered, while low PD societies tend to be egalitarian (Ho et al., 1989). In a high PD culture, superiors and subordinates consider each other as unequal in power, and contacts between superiors and subordinates are to be initiated only by superiors. It is common that subordinates

defer to superiors and avoid questioning their authority (Watson et al., 1994). Status differences among individuals are pronounced in high PD countries, but are less significant in low PD cultures (Tan et al., 1998). For example, Chinese mainland has generally been classified as a society with high PD (Cheung and Chow, 1999), as the Chinese people have historically been a culture which puts high value on the respect for a hierarchy of authority. This high PD value can be traced back to the Confucian value of loyalty between sovereign and ministry (Von Glinow and Teagarden, 1988).

In a low PD culture, equality between subordinates and superiors is assumed and superiors are accessible to subordinates (Hofstede, 1980; Robichaux and Cooper, 1998). According to Hofstede (1980), high PD values indicate that hierarchical structures and centralized decision making are the organizational norm that help preserve the existing social order and its related distribution of power.

For example, Teng, Fiedler and Grover (2000) found that while decision decentralization appears to facilitate BPR success in a low PD culture (i.e., the U.S.), decision centralization is related to success in a high PD culture (i.e., Taiwan). This finding suggest that innovation diffusion in a high PD culture may depend on certain mandate from the top management.

2.4.2.3 Masculinity versus Femininity

This dimension is addressed by Hofstede (1984) as follows:

Masculinity versus Femininity

Masculinity stands for a reference in society for achievement, heroism, assertiveness, and material success. Its opposite, Femininity, stands for a preference for relationships, modesty, caring for the weak, and the quality of life. The fundamental issue addressed by this dimension is the way in which a society allocates social roles to the sexes.

Masculinity/femininity is linked to the sex roles society assigns to its people. It captures the extent to which “masculine” values such as assertiveness and success

prevail over “feminine” values that focus more on the quality of life. Hoffman (1972) points out that men are motivated by achievement needs to a greater extent than women. Hofstede (1980) found men usually rate the two classic extrinsic motivators of “advancement” and “earning power” as more important than women, while women rate the importance of service aspects and physical environment more highly than men. This is consistent with Milton and Schneider’s (1980) conclusion that men may be more task-oriented than women, paralleling the finding that men’s work role, accomplishment or eminence is typically their most prominent concern, while the family role is often of only secondary importance (Barnett and Marshall, 1991; O’Neill, 1982).

Socio-linguistic research has also shown that men tend to focus discourse on hierarchy and independence, while women focus on intimacy and solidarity. Supporting evidence indicates that women are more strongly motivated by affiliation needs (Hoffman, 1972). People from feminine cultures tend to be more concerned with maintaining personal relationships and with getting along with others than people from masculine cultures (Hofstede, 1984).

Mejias (1995) pointed out that the masculinity-femininity dimension indicates the relative trade-off between an assertive environment versus a supportive or nurturing environment. High masculinity implies an emphasis on power, assertiveness and achievement. Low masculine value indicates a greater emphasis on people, quality of life, providing nurturing support and cooperation. Drawing on the view that gender is a fundamental aspect of culture, Gefen and Straub (1997) studied a sample of 392 female and male respondents via a cross-sectional survey to test gender differences that may relate to beliefs and use of computer-based media. Findings indicate women and men differ in their perceptions but not in the use of e-mail.

2.4.2.4 Uncertainty Avoidance

This dimension is addressed by Hofstede (1984) as follows:

Strong versus Weak Uncertainty Avoidance

Uncertainty Avoidance is the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. This feeling leads them to beliefs promising certainty and to maintaining institutions protecting conformity. Strong Uncertainty Avoidance societies maintain rigid codes of belief and behavior and are intolerant towards deviant persons and ideas. Weak Uncertainty Avoidance societies maintain a more relaxed atmosphere in which practice counts more than principles and deviance is more easily tolerated. The fundamental issue addressed by this dimension is how a society reacts on the fact that time only runs one way and that the future is unknown: whether it tries to control the future or to let it happen. Like Power Distance, Uncertainty Avoidance has consequences for the way people build their institutions and organizations.

Since extreme uncertainty creates intolerable anxiety, human society has developed ways including technology to alleviate this anxiety. Uncertainty avoidance captures the level of risk accepted, which could be a source of anxiety. Hofstede (1984) operationally conceptualizes uncertainty avoidance as: "...the extent to which the members of a culture feel threatened by uncertain or unknown situations. The feeling is, among other things, expressed through nervous stress and in a need for predictability..." A typical question used by Hofstede to measure uncertainty avoidance is "[H]ow often do you feel nervous or tense at work?", along with another question asking about long-term job security. Hofstede (1991) finds that anxiety levels are relatively low in weak uncertainty avoidance cultures.

Uncertainty avoidance is believed to lead to a reduction of ambiguity and predictable structures. In uncertainty avoiding societies there are many formal laws and/or informal rules controlling the rights and duties in the work place. Individuals with weak uncertainty avoidance tend to have low stress and therefore higher in their subjective feeling of well-being, while individuals with strong uncertainty avoidance tend to have high stress levels and therefore the subjective feeling of anxiety (Hofstede, 1991).

2.4.3 Culture and IT Diffusion

Straub (1994) suggested that cultural factors have a significant effect on technology diffusion process ranging from evaluation to adoption, use and performance. Burn (1995) believed that cultural values affect the efficacy of technology transfer across national boundaries. Particularly, culture is considered to be the most important factor in technology transfer from industrialized countries to developing ones. As the way IT is perceived and used in organizations is embedded in certain cultural environment, successful IT implementation across cultures addresses both the technological readiness and the “wider cultural and national setting within which the organization operates” (Cummings and Guynes, 1994; Tricker, 1988; Robey and Rodriguez-Diaz, 1988).

However, a different view on culture’s influences exists. Martinsons and Hempel (1995) believe that global competition and the pervasive IT use will rapidly erode the differences between cultures and thus lead to a converging set of business strategies, organization structures and management practices (Martinsons and Hempel, 1995). Teng, Fiedler and Grover (2000) similarly contend that the principles and mechanisms of organizations underlying modern businesses may transcend cultural differences and organizational characteristics may be conducive to innovation adoption regardless of certain differences in people’s value systems in different national cultures.

Nevertheless, in the field of IS, Limaye and Victor (1991) argue that although IT in business organizations around the world would converge, the conveyed meaning and the outcomes of IT use may remain culture specific. There have been ample evidences in IS literature on cultural differences regarding to the perception and use of IT, and the way IT is managed and transferred (Nowell et al., 1998).

Since IT design conveys the cultural elements inherent in its environment, successful IT deployment, development, user acceptance and use in a different culture

would require understanding of the cultural factors that account for the possible gaps in related behaviors (Lu and Lu, 1995; Hill, 1998). Hofstede (1984) has specifically addressed the culture-technology relationship:

Technologies developed in western individualist settings more or less presuppose an individualist mentality in entrepreneurs, managers, and workers which is part of the “modernity” (Stinchcombe, 1965, Triandis, 1973). Introducing such technologies in a more collectivist countries represents one of the main forces toward a shift of societal norms in those countries. On the other hand, the collectivist value patterns in more traditional societies set a limit to the technology transfer.

2.4.4 Review on Culture and Cultural IS Studies

Watson et al. (1994) cautioned that since many theories in psychology, sociology and organizational behavior are culturally specific, their applicability in a culture is not guaranteed due to the unique IT conditions and issues in distinct cultural environments. For example, current theories supporting GSS research are primarily derived from North American work using local subjects for empirical research to drive theories, and the usefulness of such GSS theories in another culture is therefore questionable.

Although studies have been published in international journals on IT implementation in such diverse nations or cultures as Africa, Egypt, Russia, India, Pakistan, Hong Kong, and Singapore (Palvia, 1998), cultural IS research is still inadequate and piecemeal in terms of depth and breadth. In a survey of research themes related to *global information management* conducted by Gallupe and Tan (1999), only 15 (3.7%) of the total sample of the 314 articles surveyed address the cultural dimensions and elements. Table 2.8 lists some examples of cross-cultural studies in IS.

Table 2.8 IS Studies in Cultures other than North America (1989-2002)

Authors	Year	Country Studied	Area of Research
Lu, Hsieh and Pan	1989	Taiwan	DSS use
McCubbrey and Gricar	1995	Slovenia	Adoption of EDI
Mahmood and Gemoets	1995	Mexico	Diffusion of technology
Tung, Palvia, Huei, Ye-Meng, and Yee	1997	Singapore	Telecommuting usage
Hassan	1994	Pakistan	IT use
Khalil and El-Kordy	1997	Egypt	IS use
Straub, Keil and Brener	1997	Japan and Switzerland	Email use
Straub, Loch and Hill	2001	Jordan, Egypt, Saudi Arabia, Lebanon, and the Sudan	IS use scenarios
Sechi and Koh	2000	Singapore	BPR
Kucuk and Arslan	2000	Britain, Denmark and Tukey	Web marketing
Chau and Hu	2002	Hong Kong	Use of telemedicine

Cultural differences have been receiving attention in the extant IS research (see Table 2.9 for a list for examples of cultural IS studies). Ko and O’Leary (1987) proposed that the design, development, and use of expert systems should take cultural differences into consideration because the cognitive process of using the system is influenced by cultural differences in a variety of ways. In an investigation of DSS use in Taiwan, Lu, Hsieh and Pan (1989) found that the non-use of DSS was linked to culturally dependent management practices and decision-making styles. Lu and Farrell (1990) pointed out that cultural conditions of developing nations may come in conflict with the transplanted IS applications from developed nations. Hill et al. (1998) studied the complex socio-cultural constructs (beliefs and values) that influence the level of IT transfer in Arab nations. Straub (1994) investigated the effect of culture on the use of email and fax technologies in Japan and the U.S. Philips (1994) et al. explored the influence of culture on international technology adoption and found cultural affinity to be a significant and positive influence on TAM through perceived ease of the technology.

Harvey (1997) conducted a study of national cultural differences in IT theory and

practice between Germany and the U.S. using Hofstede's (1980) framework. Straub, Keil and Brener (1997) compared the TAM across three different countries: Japan, Switzerland, and the US. The study was conducted by administering the same instrument to employees of three different airlines using email. The results indicate that TAM holds for both the US and Switzerland, but not for Japan, suggesting that the model may not predict technology use across all cultures.

Cultural problems in BPR process are found to be significant in Singapore, suggesting that BPR strategies cannot be adopted without taking into account local cultural values (Sechi and Koh, 2000). The researchers suggest that, typically, the BPR tools and techniques could not be adapted to the Asian culture and environment directly because a high value was placed on conformity thereby inhibiting creativity.

Kucuk and Arslan (2000) carried out a cross-cultural comparison of consumer's acceptance of web marketing facilities based on TAM in Britain, Denmark and Turkey. Findings show that the differences of acceptance of Web marketing facilities largely originate from problems of IT infrastructure in Turkey rather than cultural background. However, Straub, Loch and Hill (2001) propose a Cultural Influence Model of Information Technology Transfer and finds that resistance to IT is strongly predicted by Arab cultural beliefs. Chau et al. (2002) studied the cultural differences in the online behavior of consumers and found that consumers in different countries with different ethnic origins use the Web for different purposes and with different perceptions of the same Web sites.

Table 2.9 Examples of Cultural Studies in IS (1987-2002)

Year	Author	Content
1987	KO & O'Leary	Design, development, use of expert systems should consider cultural difference.
1989	Lu, et al	Non-use of DSS is found to be related to cultural factors.
1990	Lu & Farrel	Cultural conditions of developing countries may conflict with IS application for developed countries.
1998	Hill, et al	Complex socio-cultural constructs influence the IT transfer level in Arab nations.
1994	Straub	Effects of culture on the use of email and fax technologies.
1997	Harvey	An ethnographic study of national cultural differences in IT theory and practice between Germany and US.
1997	Meijas, et al	Subjective norms is more prevalent in collectivistic subjects concerning GSS application.
2000	Srite	Culture with higher power distance is found to be less innovative and higher in subjective norms.
2001	Straub, Loch and Hill	Cultural beliefs were very strong predictors of resistance to information technology transfer to the Arab world.
2002	Chau, et al	Cultural differences in the online behavior of consumers.

2.4.4.1 IS Studies Using Hofstede's Framework

The validity of Hofstede's (1980) cultural model lies in the wealth of collected data and the numerous studies supportive to the stability of these dimensions (Tan et al., 1998; Venkatesh and Morris, 2000). The four cultural dimensions have been shown to be useful and prevalent in explaining behaviors in several disciplines. For example, scholars in social psychology and management have successfully used these dimensions to account for empirical observations (Harvey, 1997; Ho et al., 1989; McGrath et al., 1992; Watson, Ho and Raman, 1994; Wong and Birnbaum-More, 1994). In the field of IS, Watson, Ho and Raman (1994) have used the individualism-collectivism dimension to account for differences in the way GSS affected group decisions in the United States and Singapore.

A comparative study on the effect of culture on IT diffusion in Japan and the U.S. found that email use in Japan was very low (Straub, 1994). The cultural dimension of uncertainty avoidance is believed to be the key factor explaining the low email usage rate in Japan and why leading Japanese employees favor a richer communication medium (i.e., FAX). FAX is "richer" because it can easily incorporate pictures, signatures and special characters and thus is seen as being able to reduce uncertainty

and ambiguity as compared to email (Straub, 1994). Straub, Keil and Brenner (1997) have used the uncertainty avoidance dimension to explain why the diffusion of information technologies differed in the United States and Japan.

In a study of GSS in the U.S. and Mexico, Meijas, et al. (1997) found that subjective norms regarding the use of the technology were more prevalent in collectivistic subjects (i.e., Mexicans) compared to their individualistic counterparts (i.e., Americans). Based on the Hofstede's cultural model, Robichaux and Cooper (1998) concluded that the level of cultural values a group held had significant impact on the ability of GSS to increase participation. They called for additional research propositions to be developed to explore cultural influences as these would affect TAM components. They also suggested that GSS and email have some important similarities in terms of computer keyboard input, parallel entry and anonymous entry, and that Hofstede's cultural theory could be drawn upon for both technologies. Srite (2000) found that individuals from cultures with higher power distance were less innovative and less trusting towards IT. It was also found that people from collectivistic cultures were higher in terms of subjective norms to use IT.

Tung and Quaddus (2002) pointed that, in the context of GSS, almost all the studies used Hofstede's dimensions. However, they also acknowledge that Hofstede's cultural dimensions have been developed using subjects of individual employees in one organization and the data set is also old. Despite these limitations, the substantial body of research supportive of the stability of Hofstede's cultural dimensions explain the model's dominance in management and IS research.

2.4.4.2 Cultural Technology Acceptance Studies

Recently, scholars have begun to explore the link between culture and IT user acceptance and have indicated that national culture affect user technology acceptance (Gefen and Straub, 1997; Rose and Straub, 1998; Srite, 2000; Straub, 1994; Straub, Keil and Brenner, 1997; Straub et al., 2002). Ho, Raman, and Watson (1989) found

that TAM did not explain user acceptance in a study conducted in Asia, along with Straub, Keil and Brenner's finding of the non-applicability of TAM in Japan, contrary to the generally supportive evidence reported in North America.

Although the importance of culture in IS research has been universally recognized, research on the effect of cultural factors on IT acceptance is still in its infancy (Straub et al., 2000). Since different technology acceptance patterns existed when cultural differences are taken into account, IT must adapt to new cultural environments to be accepted (Gefen and Straub, 1997; Kedia and Bhagat, 1988; Straub, 1994; Straub, Keil and Brenner, 1997; Venkatesh and Morris, 2000). TAM-based studies also found that gender difference, viewed as part of cultural difference, has significant impact on IT user acceptance (Gefen and Straub, 1997; Venkatesh and Morris, 2000). Gefen and Straub (1997) found that men and women differ in their perceptions of email acceptance. The authors called for future research to include gender in IT diffusion models along with other cultural effects.

2.5 Conclusion

This chapter reviews CMC research, technology acceptance theories, and Hofstede's cultural theory and cultural IS research. In this chapter, CMC research has been reviewed to clarify the definition, usage type and characteristics of electronic communication, and of email specifically. The two theories of IRT and SPT delineate the limited bandwidth of email in conveying information. The development path of technology acceptance theories is also reviewed to assess theoretical bases of the TAM model.

Various theoretical models have been proposed to conceptualize the psychological, social and behavioral process of technology adoption, where TAM enjoys academic acceptance over a decade of research. Widely cited technology user acceptance models include TAM, TRA, TPB and TID. TAM has been regarded as dominant for its simplicity and validity in explaining technology acceptance across technologies

and across settings. Different sets of determinants of user IT acceptance intention and behavior have been presented in IS literature based on TAM. It can be concluded that the theoretical and empirical validity of TAM makes it a solid basis for explaining technology user acceptance.

Studies on the effect of culture on IT user acceptance are then reviewed. Hofstede's framework of cultural values is selected due to its dominance and relatively stable validity in IS research. In his classic study of the values held by employees of a multinational company, Hofstede (1980) identified four cultural dimensions, known as individualism, power distance, masculinity and uncertainty avoidance.

However, so far it is still not clear how culture is related to the beliefs of IT user acceptance since empirical research in this area is still limited. It therefore remains an empirical question whether the cultural dimensions assumed to explain differences in user acceptance across cultures are indeed the causes of these observed differences.

CHAPTER 3 RESEARCH MODEL

3.1 Introduction

Since management research is substantially based on North American organizations and subjects, theories arising from such work may not apply in other cultures (Boyacigiller and Adler, 1991). As more organizations expand beyond national boundaries, management theories must incorporate cultural dimensions to remain useful. In particular, due to inconsistent findings and observed differences in user acceptance of CMC, the applicability of TAM2 across cultures is still unclear (Straub, 1994; Gefen and Straub, 1997). Though it is widely recognized that the culture of the PRC is distinctively different from that of North America where TAM2 originates, studies on TAM's applicability in the PRC are rare. Therefore, examining whether the general propositions of TAM2 hold in the PRC would contribute to the understanding of the TAM model's applicability across cultures.

With the growing global economy, the delineation of links between culture and technology acceptance is essential. The few existing cross-cultural studies on information systems have retrospectively used cultural factors to account for observed differences in different countries (Straub, 1994; Watson et al., 1994). Researchers have called for more vigorous research on cultural influence on technology adoption. (Straub, 1994; Gefen and Straub, 1997). Researchers further suggest that confirmatory research should measure Hofstede's cultural dimensions directly, rather than assuming that study participants do not differ significantly from Hofstede's cultural norms. Corresponding to this research direction, this study attempts to isolate cultural factors that may directly impact or interact with the impact of CMC, and to advance a theory that takes cultural values explicitly into consideration at the individual level.

The proposed research model is developed based on the rich theoretical bases

reviewed in Chapter 2. An extension of the TAM model is integrated with Hofstede's framework of cultural values. The research model aims to address the following research questions: Does culture influence user acceptance to email? Is the TAM model applicable in the context of Chinese culture? Do the salient cultural values influence user acceptance to email in the context of Chinese mainland?

3.2 A Parsimonious TAM2 Model

TAM theorizes that an individual's behavioral intention to use a system is determined by two beliefs: perceived usefulness (PU) and perceived ease of use (PEOU). PU is also influenced by PEOU based on the rationale that, other things being equal, the easier the systems is to use the more useful it can be. PU is defined as the extent to which a person believes that using the system will enhance his or her job performance, while PEOU is defined as the extent to which a person believes that using the system will be free of effort. The final TAM model (Davis, 1989) excluded the construct of Attitude due to the statistical insignificance of this construct. The underlying argument of this change is that people may be willing to use IT if they perceive it as useful even if they do not have a positive attitude towards it. Studies with various settings and technologies have been proposed or validated the antecedents of the two beliefs. The construct subjective norms (SN) is incorporated into TAM2 by Venkatesh and Davis (2000) to count for social influence on technology acceptance.

Although researchers have also found direct linkage between usefulness and usage (Adams et al., 1992; Subramanian, 1994), Intention to Use (IU) rather than actual usage is selected as the dependent variable of the model. Antecedents of these two beliefs are referred to as "external variables". TAM theorizes that the influences of external variables on IU can be fully mediated by PU and PEOU (Davis, 1989). Technology acceptance is viewed as an individual's psychological state with regard to his or her voluntary or intended use of a particular technology (Chau and Hu, 2001).

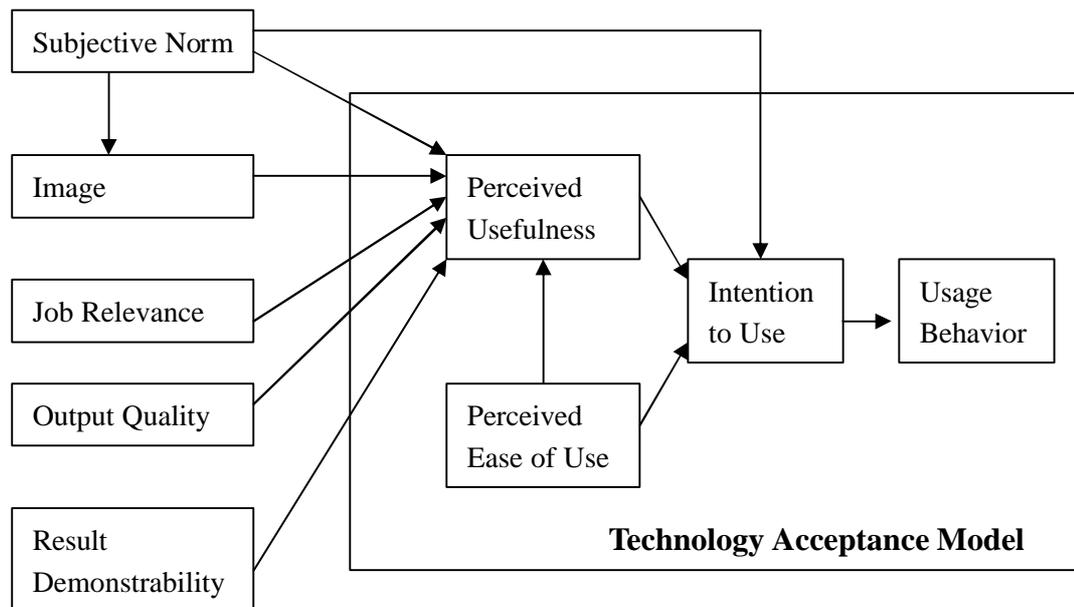
In this study, IU, rather than actual usage, is chosen to indicate user acceptance for the following reasons. At the theoretical level, the use of intention to explain or predict behavior has an established theoretical foundation and has accumulated sufficiently strong empirical support (Agarwal and Prasad, 1998; Chau and Hu, 2002). For a given strong causal link between intention and actual behavior, using intention as

an approximation to actual usage is not a serious limitation (Mathieson, 1991). Intention to use may be a better indicator of users' intention to use a technology than actual usage. As is shown in the behavior perspective theories, intentions to engage in a behavior is also a stronger indicator of acceptance in itself (Gallion, 2000). Consistent with the findings of Davis et al. (1989), Straub, Limayem and Karahanna-Evaristo (1995) found that TAM predicted self-reported usage behavior, but did not predict actual usage behavior. The authors further called for a reconceptualization of the usage construct, as both self-report and objective measures may be inadequate. Researchers have acknowledged the difficulties associated with objective measurement of behavior due to the lack of access to such information and privacy violations. Furthermore, in many modern organizations, IT use has been mandatory, which means 100% usage. In other words, as technology usage is often a function of the user job tasks, a user that is indifferent to the technology may need to use it as a function of his or her job, while a user that is enthusiastic about the technology may only need to use it sparingly. Under such circumstances, the users' true acceptance of the technology may not be reflected. As a result, the users may not be actually willing to accept the technology, which in the long run could lead to low usage of the technology and even IT implementation failure. Therefore, the concern of IT management should not focus only on the actual usage in the short run but also on strengthening employees' intention to use the technology in the long run. At the practical level, email use in the workplace of Chinese mainland is generally at an early stage of development and studying the intention to use it may provide insights to facilitate its diffusion at a time when Internet development is experiencing growth in the nation.

The objective of the proposed model is to investigate the influences of culture on user technology acceptance by explicitly incorporating Hofstede's cultural dimensions into TAM2. Figure 3.1 depicts the comprehensive TAM2 model. The proposed research model is based on a simplified TAM2 derived from a rich literature in social psychology and cultural work. Specific hypotheses are posited to investigate how

cultural dimensions influence perceptions about email acceptance. As can be seen from Figure 3.2, the proposed model excludes actual usage and the antecedents of PU in TAM2.

Figure 3.1 Extension of Technology Acceptance Model (TAM2)



Hofstede’s research on cultural dimensions provides a theoretical foundation for exploring the impact of cultural differences on the adoption and diffusion of IT-based innovations such as email (Straub, Keil and Brenner, 1997). This study uses Hofstede’s work at two levels. First, at a macro level, the impact of societal culture on the applicability of TAM2 in Chinese mainland is discussed. The communication pattern and acceptance of a certain CMC technology in a society is believed to be closely related to its dominant cultural values. When a CMC technology is compatible with or supportive to the dominant cultural values, then the general rules of psychological process of technology acceptance should apply. Second, at a micro level, the impact of cultural values on the TAM2 variables is investigated. A cultural TAM explicitly illustrating the culture -- IT perception relationships would be much more useful if we know which TAM components are subject to cultural influence.

This study proposes that the simplified TAM2 model is applicable in the context of the PRC. The relationships between the two psychological beliefs (i.e., PU and PEOU) and IU have been found to be largely stable across technologies and settings (Taylor and Todd, 1995; Venkatesh and Davis, 2000). The rationale supporting this stability is that the influences of external factors on IU are fully mediated through the two key internal beliefs. As for the impact of SN on IU, the high Power Distance (PD) and high collectivism of the Chinese society render social influence prominent in forming one's decision to adopt a technology. Some researchers have gone so far as to assert that IT is often used to maintain power and control in the Chinese context (Martinsons and Westwood, 1997, p223).

The high context nature of communication among Chinese people in general also justify the statement that social norms will have a significant impact on one's beliefs and behaviors of IT use. Hall (1977) notes that: "a high context communication... is one in which most of the information is either in the physical context or internalized in the person, while very little is coded, explicit, transmitted as part of the message. A low context message is just the opposite; i.e., the mass of the message is vested in the explicit code." Highest context, or full channel communication, is "face-to-face" communication in the sense that it is based upon personal relationships and formal etiquette. Least context, or partial channel communication (i.e., email), omits subtleties of understanding, intentions, and feelings present in face-to-face encounters and formal protocol may be less important (McGrath and Hollinghead, 1994). Typical high context countries include Japan and China, while low context countries include Germany and the United States. China is a high context culture in which people are socially-oriented and situation-centered, resulting in the dominance of more implicit and indirect communications. The researchers have predicted pessimistically on the acceptance of CMC systems and MIS in Chinese society because "[C]omputers do not convey the necessary richness of meaning in a high context communication

environment. Electronic information exchange would also erode status-based hierarchies by diminishing the social context and dynamic communication cues” (Martinsons and Westwood, 1997).

According to Ross (2001), the influences of Masculinity (M) and Uncertainty Avoidance (UA) on computer mediated communication (CMC) technology acceptance are neutral. Table 3.1 shows Straub, Keil and Brenner’s (1997) illustration on the implications of cultural dimensions on the quality of electronic communications with a comparative example of the US and the PRC based upon Hofstede’s (1991) framework of cultural values. In conclusion, since the impact of the cultural dimensions of Masculinity and UA on a society’s prevalent use of CMC technology is minimal, and the cultural dimensions of Collectivism and PD would have some social influence, it would be reasonable to believe that TAM applies in the context of Chinese mainland.

However, according to propositions of TAM applicability in different cultures provided by Straub, Keil and Brenner’s (1997), TAM may not be strongly supported in the context of Chinese mainland. As it is, Hofstede has created an index score for each dimension ranging from 0 to 100, with a high score for Individualism, PD, Masculinity and UA. Straub, Keil and Brenner (1997) combined Hofstede’s indices at the national level to create a “Computer-based Media Support Index” (CMSI) to mathematically express the simultaneous effect of all four Hofstede dimensions on the acceptance of email by different cultures. CMSI is calculated by adding up the indices for Collectivism (i.e., 100-Individualism), PD, Masculinity and UA. The authors contend that through the ordinality of the CMSI scores, it is possible to predict whether a given culture would support a TAM description of email use. This proposition is then empirically examined and supported by their three-country test on email use, finding that TAM holds for both the U.S. and Switzerland but not for Japan. Given that Switzerland represents a middle position on the continuum of cultural values, the distance between CMSIs for Switzerland and the U.S. (absolute value of [Swiss-U.S.:

204 - 157] = 47) is closer than the distance between Switzerland and the PRC (absolute value of [Swiss-PRC: 204 - 270] = 66). Thereby, based on Chinese mainland's position in the CMSI ordinality, TAM may not strongly predict email use in Chinese mainland, because its CMSI score is lower than that of Switzerland, where TAM is moderately supported. In other words, TAM may not hold in the context of Chinese mainland. However, the authors also call for caution when using the CMSI index since it should only be viewed as a useful approximation (Straub, Keil and Brenner, 1997).

Table 3.1 Cultural Dimension Scores and CMSI

Dimensions/Countries	C	PD	M	UA	CMSI **	Supportive of TAM? ***
USA	9	40	62	46	157	Strongly supportive
Switzerland*	32	34	70	58	204	Moderately supportive
Hong Kong	75	68	57	29	229	Sparely supportive?
Taiwan	83	58	45	69	255	Sparely supportive?
Chinese mainland	80	80	50	60	270	Non-supportive
Japan	54	54	95	46	287	Non-supportive

Note: Modified based on Straub, Keil and Brenner (1997).

* Switzerland represents a middle position on the continuum of cultural values

** Calculated based on the formula: $CMSI = C + PD + M + U$

*** Inferred based on the position in the ordinality

In view of Ross's (2001) work which supports TAM's applicability in Chinese mainland, and the explanatory nature of the CMSI index, this study would replicate the parsimonious TAM2 model in the context of Chinese mainland. To be specific, the conceptual research model in this study is based on TAM2 in which PU, PEOU and SN are the key determinants of IU (Venkatesh and Davis, 2000). PU and PEOU are posited to have a positive impact on IU, while PEOU and SN are the antecedents of PU. Case (1996) found that PU and PEOU were positively related to the positive attitudes toward email.

SN would positively influence PU through the mechanism of internalization effect. In the process of internalization, an individual is influenced to accept information from

another as evidence about reality, because the target agent attributes expertise and credibility to the influencing agent (Venkatesh and Davis, 2000). SN has found to be a direct determinant of IU in TRA and the subsequent TPB, and is defined as a “person’s perception that most people who are important to him think he should or should not perform the behavior in question (Fishbein and Ajzen, 1975).” The rationale for a direct effect of SN on IU is that people may choose to perform a behavior, if they believe that important referents think they should, even if they are not themselves favorable toward the behavior or its consequences.

However, user acceptance research has shown mixed results concerning the direct effect of SN. Davis, Bagozzi, and Warshaw (1989) omitted SN from the original TAM in their empirical comparison of TAM and TRA due to SN’s insignificant direct effect on IU. Mathieson (1991) found no significant effect of SN, whereas Taylor and Todd (1995) found a significant effect. Hartwick and Barki (1994) identified a contingency underlying the mixed findings which is termed “voluntariness”, defined as “the extent to which potential adopters perceive the adoption decision to be non-mandatory”. They found that subjective norm had a significant effect on IU in mandatory settings but not in voluntary settings. This is consistent with the finding of TAM2, where the direct compliance-based effect of SN on IU would occur in mandatory, but not voluntary, system usage settings (Venkatesh and Davis, 2000). Later, Venkatesh and Davis (2000) theorized that this causal mechanism as a compliance effect.

Since SN is determined by peer and superior influences (Mathieson 1991; Taylor and Todd 1995b), this study posits that SN will have a direct positive effect on IU in the context of Chinese mainland where compliance effect of SN on IU would occur even in a voluntary setting. The rationale is that PD and Collectivism are high in China and Chinese people tend to maintain social harmony through compliance to their social referents and internalize this tendency, rendering social norms to be an influential factor in decision making to accept a technology. Based on the above argument, a summary of hypotheses is provided as follows:

H1a: Perceived Usefulness (PU) will positively affect Intention to Use email (IU) in the context of Chinese mainland.

H1b: Perceived Ease of Use (PEOU) will positively affect IU in the context of Chinese mainland.

H1c: PEOU will positively affect PU in the context of Chinese mainland.

H1d: Subjective Norm (SN) will positively affect PU in the context of Chinese mainland.

H1e: SN will positively affect on IU in the context of Chinese mainland.

3.3 The Cultural Model

Kedia and Bhagat (1988) propose that management theories developed primarily in a Western context must incorporate cultural elements to remain useful in Eastern context, especially when the originator of the technology development is a developed nation and the recipient is a developing nation. Email use in Chinese mainland is one such this scenario. Since individuals are shaped by their environment, cultural factors or societal values are believed to have direct or interaction effects on an individual's perception of CMC (Gefen and Straub, 1997; Harvey, 1997; Robichaux and Cooper, 1998; Straub, 1994; Tan et al., 1998; Watson, Ho and Raman, 1994). Following this line of thought, this study develops hypotheses to examine direct or interacting relationships between cultural values on email acceptance variables.

Hofstede's (1980) research on cultural dimensions provides a theoretical foundation for exploring the impact of cultural differences on the adoption and diffusion of IT-based innovations (Straub, Keil and Brenner, 1997). It is recognized that cultural dimensions identified by Hofstede could have a specific bearing on technology acceptance, especially for communications support technologies (Straub, 1994; Straub, Keil and Brenner, 1997). However, the deficiency of prior studies is that when applying the TAM model, cultural factors have only been taken into account conceptually, but not empirically.

Email is characterized as low context-dependent and informal (Ross, 2001) communication medium. The gap in PD and Collectivism may cause misunderstandings in communications, due both to the culture and to the nature of the medium. For example, individuals in Chinese mainland are likely to prefer a relatively high level of formalism in relations and in communications. As a result, electronic communication media with fewer cues may lead to increase chances of inaccurate communications (Ross, 2001). Thus, the four cultural values are incorporated in theoretical framework of email acceptance in this study.

3.3.1 Collectivism (C)

For collectivists, there is generally an extensive set of expectations about interpersonal behavior. Violating these expectations threatens social norms. Maintaining harmony is usually preferable to independence as the latter may lead to discord (Watson et al., 1994). Individuals with low collectivist values tend to have more personal initiatives, be more non-conformist, and are more likely to search for personal fulfillment and emotional independence (Hofstede, 1980; Srite, 2000). Given so, such individuals maybe less dependent on SN when making acceptance decision. Technology use that complies with important social actors is therefore likely to be accepted.

Collectivist values reflects a strong sense of dependency on a particular social group by maintaining a web of relationships based on mutual understandings about mutual obligation and has been regarded as a pertinent factor for CMC research (Tan, Wei and Watson, 1998). Srite (2000) found that individualism/collectivism has a significant effect on SN. Due to the conformist tendency, individuals high in collectivist values perceive a higher social pressure to use a technology, since intrinsically they tend to place more emphasis on the opinions of social referents.

Therefore, for individuals with high collectivist values, social influence will play

a greater role and the desire for conformity to societal norms would lead to more concern about the opinions of social referents. Empirical research has found that social norms to be more important in collectivistic cultures. Srite (2000) finds that a high Collectivism score will result in a high SN score and a high Individualism score will result in a low SN score. Thus, this study posits that Collectivism has a positive impact on SN.

H2: Collectivism will positively affect SN.

3.3.2 Power Distance (PD)

PD refers to the extent to which unequal distribution of power in an organization is accepted by members of the organization (Hofstede, 1980). PD has been found to be important in determining an individual's reactions in the workplace by affecting interaction and association among individuals (Erez and Earley, 1987; Hofstede, 1980; Hofstede, 1991). People from high PD culture tend to place greater value in conformity, preferring closer supervision and fearing the disagreement with superiors (Hofstede, 1984).

As social influences inherent in an organizational power structure have pervasive effects on media assessments (Fulk, Schmitz and Steinfield, 1990; Schmitz and Fulk, 1991), it is reasonable to assert that the influence of SN on IU could interact with PD perception in the context of email use.

Social Information Processing Theory (SIPT) maintains that communication attitudes and behaviors are determined by social influence of significant supervisors (Salancik and Pfeffer, 1978). Markus (1994) reports that in an organization where email was heavily used, if anyone did not use email, the boss would pressure him or her to do so. Pinsonneault and Kraemer (1990) found that the ability of GSS to influence participation depends on the established patterns of communication and the power within a group. Karahanna and Straub (1999) found that email use is affected

by the degree of social influence exerted by supervisors, and this is consistent with empirical findings which indicate that the variations in subordinate CMC usage patterns can be explained by supervisor usage patterns. Schmitz and Fulk (1991) found that supervisors' perceptions of email have a significant impact on employees' evaluation and use of email. Based on the fact that employees in organizations have status differentials and different perceptions of PD, PD is proposed as a salient variable influencing email use in the process where social actors shape an individual's media assessment and selection.

Social Presence Theory (SPT) suggests that email is generally perceived to be less capable of delivering information with rich social cues (Daft and Lengel, 1984, 1986; Daft, Lengel, and Trevino, 1987). This filtering out of social cues is referred to as a leveling or equalizing effect (Short, Williams, and Christie, 1976; Straub, Keil, and Brenner, 1997). Individuals with higher PD value are sensitive to power status or power position, and therefore tend to use social cues to express their respect for social hierarchy because they tend to believe that communication patterns are established on the basis of power structures in organizations. The relative inability of email to deliver "rich" information could narrow down social status and result in the equalizing effect, which in turn may decrease the individual's intention to use it. Often, when using email, people tend not to be as aware of social hierarchy and may be more apt to assume equality (Sarbaugh – Thompson and Feldman, 1998). Therefore, individuals with a higher PD value may prefer communication media which are capable of carrying more social presence to deliver social cues. Hence it is possible that the higher the PD value one holds, the less desirable email will be. In other words, PD could interact with the SN-IU relationship negatively.

H3: Power distance will negatively interact with the relationship between SN and IU.

3.3.3 Masculinity (M)

Masculinity is defined as pertaining to societies in which social gender roles are clearly distinct. A culture is masculine if it tends to have unequal role distribution between the genders, while a feminine culture defines more overlapping social roles for both genders. Qualities ascribed to different gender roles are derived with a layer of abstraction forming masculine values. This inferential leap is made based on the reason that “It has been found that in all countries in the world, an unequal role distribution between men and women coincides with a tougher society in which there is more emphasis on achievement and fighting than on caring and compromise.”(Hofstede, 2002). At an individual level, masculinity is associated strongly with importance attached to earnings, recognition, advancement and challenge (Hofstede, 1991).

In organizations, this dimension reflects whether the organization will be task-oriented (i.e. high masculinity) or people-oriented, emphasizing the quality of life and the environment (i.e. low masculinity). The masculine emphasis on tasks suggests that people with high masculine values are more concerned with the usefulness of a given technology, regardless of whether it is easy or difficult to use (Srite, 2000).

Masculinity pertains to being assertive, tough, task oriented and focusing on material success (Hofstede, 1980; Robinchaux and Cooper, 1998). From this perspective, PU is related to masculinity through assessment on the instrumentality of performing a behavior. Perceived usefulness of a technology has been closely related to mental representation that links goals to specific actions that are instrumental for achieving those goals (Davis 1989, 1993; Davis, Bagozzi, and Warshaw 1989, 1992; Venkatesh and Davis, 2000). Masculinity captures goal orientation and affects usefulness perception through an assessment process linking instrumental acts (i.e., using a technology) to goals (i.e., improving task performance). Venkatesh (2000) found that PU is determined through the cognitive instrumental process where people use a mental representation for assessing the match between important work goals and

the consequences of performing the act of using a technology as basis for forming judgments about perceived usefulness. Taylor and Hall (1982) indicate that masculine scales correlate highly with instrumental behaviors. Therefore, individuals with high masculine value may be more concerned with usefulness or work goals than those holding lower masculine value. This study proposes that masculinity is positively related to perceived usefulness of using an email, so that those who hold higher masculine value would perceive email to be more useful based on instrumentality assessment on email use. An individual with higher level of masculine value tends to be task oriented and therefore would concern more with the usefulness of a technology. While the feature of email as a cost-saving, quick and accurate communication media could be more explicitly perceived by an individual with higher masculine value, as he or she is more sensitive to the instrumentality provided by a given technology to accomplish a task. Therefore, for individuals with higher masculinity, email would be perceived as more useful because of its task-technology-fit nature. Hence, the hypothesis is stated as follows.

H4: Masculinity will positively affect PU.

3.3.4 Uncertainty Avoidance (UA)

Uncertainty Avoidance (UA) refers to the degree to which a person prefers structured versus unstructured situations, reflecting a culture's lack of tolerance for ambiguity. According to Hofstede (2002), the basic problem of UA is "...how people in a culture cope with the unpredictable and the ambiguous. It has to do with anxiety as a basic human feeling, or in other words with fear of the unknown." People with high uncertainty avoidance tend to feel threatened by unknown situations, resulting in anxiety or stress.

Therefore, in a culture with high UA, rules, structures and formalization in organizations are preferred so as to avoid uncertainty. As a result, a great many rules,

regulations and structures are expected in the work place (Srite, 2000). These control and facilitating facilities are design to reduce uncertainty and anxiety. According to resource allocation theory (Kanfer et al., 1994), anxiety typically has an negative effect on the attention devoted to the task at hand. Facilitating control can prevent some of the attentional resources being directed to the off-task activity of anxiety reduction, and thus increasing the effort required to accomplish tasks (Venkatesh, 2000). There is supportive evidence in prior TAM research (Venkatesh, 2000; Venkatesh and Davis, 1996) that external control is a determinant of PEOU. External control is captured in PEOU through resource facilitating conditions (Taylor and Todd, 1995); the more external control a users prefers, the more ease of technology use is desired so as to reduce off-task anxiety and improve performance.

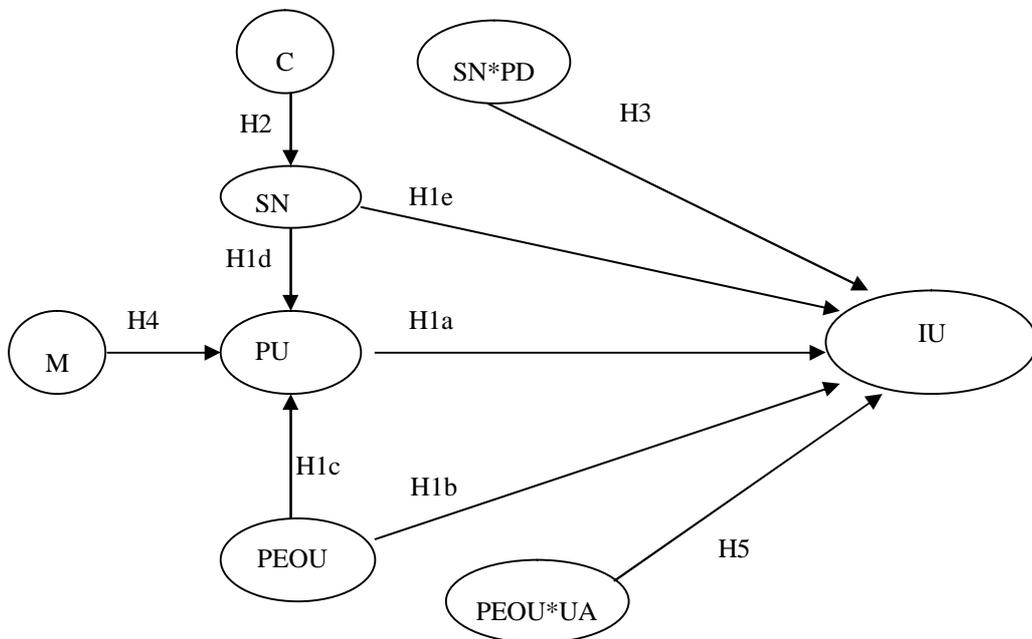
TAM has stated that the easier a technology is to use, the more useful it can be. Enhancing external controls, such as technical support, rules and procedures, is considered to be part of PEOU of a technology. For example, in the context of workplace email use, specific issues related to external control include the availability of clear rules and procedures of the management and legal aspect of email use, as well as technical support. For those with higher UA, the preference for structured situation and predictability may lead to dependence on rules and external support. Therefore, the perception of external control and PEOU will be more important for those with higher rather than lower UA in terms of the contribution of PEOU to PU. Thus this study posits that email is perceived to be more useful for individuals who are high rather than low in uncertainty avoidance, assuming that both find email equally easy to use.

H5: Uncertainty avoidance will positively interact with the relationship between PEOU and PU.

Table 3.2 A Summary of Hypotheses

Hypotheses
H1a: Perceived Usefulness (PU) will positively affect Intention to Use email (IU) in the context of Chinese mainland.
H1b: Perceived Ease of Use (PEOU) will positively affect IU in the context of Chinese mainland.
H1c: PEOU will positively affect PU in the context of Chinese mainland.
H1d: Subjective Norm (SN) will positively affect PU in the context of Chinese mainland.
H 1e: SN will positively affect on IU in the context of Chinese mainland.
H 2: Collectivism will positively affect SN.
H 3: Power distance will negatively interact the relationship between PU and IU.
H4a: Masculinity will positively affect PU.
H5: Uncertainty Avoidance (UA) will positively interact the relationship between PEOU and IU.

Figure 3.2 Structural Equation Model of the Hypothesized Relationship



3.4 Conclusion

Based on a parsimonious TAM2 model and Hofstede's model of cultural values, this chapter proposes a model of the influence of cultural values on user acceptance to email. See Table 3.2 for a summary of the hypotheses developed. The rationale of the hypothesized relationships has been discussed and PU, PEOU and SN are posited to directly influence IU, while PU is positively influenced by PEOU and SN. Collectivism is hypothesized to have a positive direct effect on SN, while Masculinity is posited to a positive effect on PU. PD and PEOU are theorized to have interaction effects on the SN—IU relationship and the PEOU – PU relationship respectively.

CHAPTER 4 RESEARCH METHODOLOGY

4.1 Introduction

Based on the theories and concepts reviewed in Chapter 2, a research model was proposed in Chapter 3 to study the influence of cultural values on the acceptance of email in the context of the Chinese mainland. Cultural values at the individual level are examined so that cultural factors can be directly measured and an empirical cultural study of TAM can be carried out in one cultural setting. The unit of analysis is an individual's intention to use email.

Cross-sectional surveys are carried out to address the research objectives. The instrument measuring the construct in the proposed model is modified based on prior cultural work by Hofstede (1980). Factor analysis is applied to test the research instrument. In addition to removing certain items, the instrument is modified to include more items to measure corresponding constructs based on further theoretical review. The reliability and validity of the instrument are tested using factor analysis and a Structural Equation Modeling (SEM) approach. The hypothesized theoretical relationships in the model are examined using both SEM and Moderated SEM approaches. To assess the superiority of the proposed research model, analyses for alternative path model are also carried out for comparison purpose.

Data for the pilot study are collected from employees in a governmental organization and state-owned enterprises in Guangzhou and data for the main study are collected from employees in 16 banks in Shanghai. The selection of the research setting ensures working environment context that is more appropriate than academic environment used in most technology acceptance research literature. The workplace setting is also consistent with the subject matter since Hofstede's cultural dimensions address typically work-related cultural values.

4.2 Research Design

4.2.1 Level of Analysis

To understand how cultural values may impact user acceptance perceptions, this study measures cultural values at the individual level. Rice, D'Ambra, and More (1998) have suggested that cultural values might better be assessed and analyzed as individual traits when measuring cultural influence on communication media. Straub et al. (2002) argued that even though culture is assumed to be a group-level phenomenon, it must be measured at an individual level. According to a theory-based view of culture based on Social Identity Theory (SIT) proposed by Straub et al. (2002), each individual is influenced by a complexion of cultures and sub-cultures. SIT states that members of a cultural group vary in the extent to which they hold the values of the group. Again, it is stressed that culture must be measured at an individual level even though it is assumed that it is a group-level phenomenon. It is further argued that the individual unit of analysis is both appropriate and meaningful, since "culture can only manifest itself through the individual" and "there is no way to query or probe into the collective unconscious of an entire culture (Straub, et al., 2002)." Therefore, this thesis will develop and test the research model based on an individual-level analysis.

Two major reasons justify the selection of an individual level of analysis for this study. First, when studying individual level variables such as individual beliefs, group-level constructs may create problems of measurement validity upon aggregation (Lam, Schaubroeck, and Aryee, 2002). According to the authors, "to the extent there is within-culture variation in perceptions of societal norms, treating individuals' reports about the nature of their culture as group-level variables creates potentially serious problems of misspecification." When studying the interacting effects of culture, country has been used as a proxy to measure the influence of culture on user acceptance of IT (Straub et al., 2002). However, aggregating individual reports of personal beliefs would permit only categorical measures to indicate central tendencies (Hofstede, 1991). The inadequacy of treating cultural values as group or country level

variables is also pointed out by cross-cultural scholars. Straub, Keil and Brenner (1997) found that it is premature to conclude that cultural difference alone explains observed differences in email usage patterns since cultural dimensions are not directly measured.

Second, when examining individual perceptions in the framework of the TAM model, it is more practical to focus on individual variations in cultural beliefs than on national averages. To take power distance (PD) as an example, it is well known that employees within the same organization differ substantially in their beliefs about how authority figures should be treated, irrespective of the general cultural tendency in their society (Lam, Schaubroeck, and Aryee, 2002). An additional concern over Hofstede's country level measurement of culture is that it is quite possible that cultures have changed from twenty years ago. For example, it has been proposed that PD is more malleable and can shift in the face of ideological pressures (McGrath et al., 1992). Hence, instead of using national culture to generate explanatory arguments, this study measured individual differences in cultural values. In the surveys, subjects rate their individual perceptions of societal values namely, Collectivism, Uncertainty Avoidance (UA), Power Distance (PD), and Masculinity (M) based on scales developed by Hofstede (1980).

4.2.2 Research Context

The Chinese mainland has already become one of the largest markets in the world for technology products (Li and Wong, 1991). However, the under-utilization of IT in work places has plagued many organizations. This phenomenon may be partly explained by Kedia and Bhagat's (1988) theory on the relative importance of influencing factors as determinants of the successful transfer of technology across nations, factors such as societal culture, organizational culture and the strategic management process. The effectiveness of technology transfer is most affected by variations in societal cultures when one of the nations is an advanced industrialized country and the recipient is a developing country.

As a typical developing country, the PRC is also classified as a collectivist culture that is low on individualism, high on PD and Masculinity, and moderate on UA. Historically, the PRC practiced centralized decision-making, which is also reflected in authoritarian management systems with centralized control patterns found in the state-owned enterprises (Jin, 1993). These dominant values have always characterized China, a culture of high context (Cheung and Chow, 1999). Consequently, the primary means of communication in Chinese society is private meetings rather than written memos or reports because face-to-face contacts may sensitize the boss to the opinions and feelings of his subordinates, and employees prefer getting closer to superiors so that they can better understand their intentions (Martinsons and Westwood, 1997). Another evidence of Chinese culture being of high context can be found in the dominance of face-to-face meeting as the primary communication pattern in work places (Lu and Jiang, 2002).

There has been concern over the stability and validity of Hofstede cultural classification of cultural characteristics of Chinese mainland in the face of globalization. The influx of foreign investment has brought about rapid evolution in not only economic but also social and cultural aspects of the macro-environment, especially in the coastal areas. Different management styles and models transferred from the US, Japan, and European countries have also generated a variety of distinctive organizational cultures in work places. However, some scholars believe that cultural uniqueness persists. For example, Martinsons and Westwood (1997) reports that despite an increase in inter-cultural interactions, the Chinese continue to employ a unique approach to business. Although the trend towards globalization will lead to the integration of societal cultures, the management systems of the Chinese are likely to reflect the inertia of their deeply-rooted values for many decades to come.

Hofstede responds that the value and validity of his cultural model is strengthened by comparing the four dimensions of culture to other factors identified by other

researchers. Hofstede has found a significant correlation between the four dimensions and similar cultural factors identified by other researchers. Based on the experimental results of studies carried out over different time periods, Hofstede claimed that the cultural dimensions would hold stable, since “There is no evidence that the cultures of present-day generations from different countries are converging (Hofstede, 1991).”

As Chinese societies are based on networks of relationships, which can be traced back to the Confucian tradition, the Chinese people tend to be socially-oriented and situation-centered rather than individually-oriented and self-centered. The mainland Chinese have retained much of the Confucian tradition even after experiencing drastic social changes (Cheung and Chow, 1999). The individualist versus collectivist orientation is believed to be the fundamental difference between the Chinese and the Anglo-Americans (Martinsons and Westwood, 1997). Chinese organizations tend to be modeled on the pattern of a family, where a person is seen as a member of the family rather than an individual and harmony at work is found by maintaining “face”. Harmony and stability is believed to depend on keeping the order of hierarchical relationships among people (Ping and Grimshaw, 1992).

When it come to the nature of communication, the Anglo-American perspective views communication as explicit, low context and function-oriented; while the Chinese perspective views it as implicit, high context and relationship-oriented. Most Westerners tend to use low context forms of communications since they believe that the intended meaning of a message can be largely conveyed by explicit and elaborate codes such as words and numbers. Furthermore, the distinctive collectivism in the PRC may be expected to encourage IT applications that are conducive to maintaining in-group relationships (Martinsons and Westwood, 1997).

4.2.3 Data Collection

Data are collected using a survey questionnaires to address the research objectives. The objectives of this study are two-fold: (1) test TAM’s applicability in the context of

Chinese mainland; (2) explore cultural values' influence on email acceptance. Thus, the sample of interest of this study should

- (1) have the chance to be exposed to IT and email. Markus (1987) has argued that communication technologies require a sufficient base of electronic correspondents, i.e., a "critical mass," for the media to be effective. This factor is controlled by surveying employees in the banking industry, where IT is intensively used and employees generally have higher computer literacy.
- (2) experience evolving social dynamics to reflect possible deviations from the traditionally held cultural values. This factor is controlled by the selection of research setting in Guangzhou and Shanghai. These two cities are currently the most economically and culturally active cities in Chinese mainland. Employees from the banking industry in Shanghai are selected as the subjects of this study. Questionnaires were distributed mainly via hand delivery, mail and FAX to the major banks in Shanghai. Validated scales are used in the questionnaires to measure perceived ease of use, perceived usefulness, subjective norms and behavioral intention to use, as well as cultural values.

4.3 Construct Operationalization

4.3.1 The Constructs of the TAM Model

Instrument measuring TAM2 constructs are adapted from Venkatesh and Davis (2000). Minor changes are made to address the perception of e-mail use. Intention to use is restricted to the intention to use work-related email since email is used primarily for work-related purposes in organizations (Kerr and Hiltz, 1982; Rice, 1987; Steinfield, 1986). Task-related email information exchanges are used most frequently in organizations as compared to social usage. Tasks involved include coordinating activities, distributing information, seeking information, and giving and receiving feedback on reports or ideas (Steinfield, 1986).

4.3.1.1 Perceived Usefulness (PU)

PU is defined as "the prospective user's subjective probability that using a specific

application will increase his or her job performance within an organizational context” (Venkatesh and Davis, 2000). Operationalization of this construct will use a Likert type scale to allow respondents to indicate the extent to which they agree or disagree with statements related to the PU construct. The responses ranges from 1 (very strongly agree) to 7 (very strongly disagree). The items that make up this scale are shown in appendix 1.

4.3.1.2 Perceived Ease of Use (PEOU)

PEOU is defined as “the degree to which the prospective user expects the target system to be free of effort” (Davis, Bagozzi, and Warshaw, 1989). Operationalization of this construct is based on an instrument from prior literature (Venkatesh and Davis, 2000). This instrument uses a Likert type scale to allow the respondents to indicate the extent to which they agree or disagree with statements related to the PEOU construct. The responses ranges from 1 (very strongly agree) to 7 (very strongly disagree). The items that make up this scale are shown in appendix 1.

4.3.1.3 Intention to Use (IU)

IU is defined as “a measure of the strength of a person’s intention to use a specific IT (Ajzen & Fishbein, 1980)”. Operationalization of this construct is based on the scales from prior literature (Venkatesh and Davis, 2000). This instrument uses a Likert type scale to allow the respondents to indicate the extent to which they agree or disagree with statements related to the IU construct. The responses ranges from 1 (very strongly agree) to 7 (very strongly disagree). The items that make up this scale are shown in appendix 1.

4.3.1.4 Subjective Norms (SN)

SN refers to “the person’s perception that most people who are important to him think he should or should not perform the behavior in question” (Fishbein and Ajzen, 1975). In the context of IT, SN is operationalized as a person’s perception that people who are important to him or her think that he or she should use a technology

(Venkatesh and Davis, 2000). This construct will use a Likert type scale to allow the respondents to indicate the extent to which they agree or disagree with statements related to the construct of behavioral intention to use. The responses ranges from 1 (very strongly agree) to 7 (very strongly disagree). The items that make up this scale are shown in appendix 1.

4.3.2 Constructs of Cultural Values

This study modifies and re-develop Hofstede's measures of cultural values for several reasons. One reason is that there has been little attempt to replicate and validate Hofstede's dimensions at an individual level in IS research, and the validity of directly measured cultural values needs to be tested. Also, some dimensions of culture may be malleable in the face of time and changing institutional factors. For example, some scholars argue that managers from collectivistic cultures have increasingly endorsed individualist values as their economies develop towards openness and growth, so demand more innovative development.

The operationalizations of the four cultural constructs in the proposed research model were all based on scales developed by Hofstede (1980) and Srite (2000). Collectivism captures a strong sense of dependency on a particular social grouping and these cultures maintain a web of relationships based on implicit understandings about mutual obligation. PD is the extent to which inequality of power distribution is seen as an irreducible fact of life (Hofstede, 1984). UA refers to the degree to which people in a culture prefer structured over unstructured situations (Hofstede, 1984). Masculinity concerns the extent of emphasis on work goals (earnings, advancement) and assertiveness, as opposed to personal goals (friendly atmosphere, getting along with the boss and others) and nurturance. The responses ranges from 1 (very strongly agree) to 7 (very strongly disagree). The items that made up this scale are shown in appendix 1.

4.4 Structural Equation Modeling (SEM) Approach

Structural Equation Modeling (SEM) techniques are a second-generation multivariate technique (Bagozzi and Fornell, 1982). Compared with first-generation techniques such as regression, SEM has the following advantages: (1) explicitness of the research theory in terms of assumptions, constructs and hypothesized relationships; (2) more precision of the research theory in terms of clear definitions of constructs, operationalizations, and the functional relationships between constructs; (3) more complete representation of complex models; and (4) a formal framework for testing both theories and measures simultaneously.

4.4.1 The Basics of the SEM Approach

SEM is well documented as being able to test the causal relationships among variables (i.e., the structural model) and the relationships among measurement items and the latent construct (measurement model) at the same time. In other words, SEM is capable of testing the measurement model and the structural equation model simultaneously. LISREL is one of the most widely used techniques to test SEM models. By attempting to reproduce the observed covariance or correlation matrix using maximum likelihood, LISREL uses covariance structure analysis to estimate parameters in the model. Generally, SEM enables analysis of a set of relationships between dependent variables and independent variables with the function of purification for measurement items of significant variables. Model fit is measured primarily by overall goodness-of-fit indices that assess how well the hypothesized model fits the observed data (Gefen, Straub and Boudreau, 2000).

As one member of the Confirmatory Factor Analysis methods family, LISREL generally requires strong theoretical knowledge, multivariate normal distribution and large sample sizes. The SEM approach is appropriate for this study because (1) there is strong theoretical support for the proposed model - TAM based models have been widely applied and validated in a large number of studies; (2) this study is designed to examine the theoretical relationships as well as the validity of construct measures, and

SEM can test the measurement model and path model simultaneously. As a result, the effects of all the shared variance, correlation and regressions in the model are considered when the significance level and coefficient of a path are calculated. A rigorous method is needed to study cultural factors, and since SEM allows the simultaneous examination of the fit of the entire model to the data, and the significance of individual paths, it is considered as an ideal choice. The statistical program LISREL is used to perform the structural modeling analysis.

The loadings of the indicators of each construct in LISREL can be interpreted approximately as loadings in a principal component factor analysis in SPSS. Path coefficients are interpreted similarly as standardized beta coefficients in a regression analysis. The significance of the path coefficients is determined by T-statistics (Gefen, Straub and Boudreau, 2000).

4.4.2 Post Hoc Analysis of the Measurement Model

Post hoc model modification can be carried out to compare alternative models so that a “best” data-model fit can be achieved through statistical significance (Joreskog and Sorbom, 1993; Chau, 1997; Segars, 1997). Model misspecification problem can be tackled in the framework of Confirmatory Factor Analysis (CFA). The source of model misfit can be identified by examining the residuals between the estimated and observed correlation matrices. The difference between the elements of the estimated matrix and the observed correlation matrix are fitted residuals. A standardized residual is a fitted residual divided by its asymptotic standard deviation. If a standardized residual exceeds 2.58 in absolute value, it can be considered as a “large” standard normal deviate (Segars and Grover, 1993). Model fit can be improved by deleting these items and re-specifying the model. To avoid affecting other parts of the model, only one item is discarded each time and the model is re-estimated until the “best-fitting” measurement model is achieved (Segars and Grover’s, 1993; Chau, 1997). The non-existence of significant residuals in the LISREL output indicates no significant misfit in the studied scales.

Model modification is typical in CFA (Kelloway, 1995, 1996). LISREL provides a modification index (MI) to compare the tested model to potential alternative models. MI measures the increase in chi-square value if the model is reestimated with the fixed parameter set free. Although using an MI index can help improve model fit, the change of model specification should be justified and changes should be made one at a time (Segars and Grover, 1993).

An MI is associated with every path missing in the original model. A large MI value signifies that model fit is expected to improve if the corresponding path is added. Technically, MI measures predicted decrease of chi-square if a fixed parameter is relaxed and the model reestimated, as the improvement in fit is measured by a reduction in chi-square. The amount of reduction in chi-square is equal to that of the MI. Usually, an MI of approximately 4.0 signifies that a statistically significant ($p < 0.05$) decrease in the chi-square value probably will occur if the parameter is freed and the model is re-estimated (Jaccard and Wan, 1996). By default, LISREL considers MI larger than 7.882 as large. The model modification stops when the LISREL output shows no additional large standardized residuals and MI.

According to Joreskog and Sorbom (1993), freeing the parameter corresponding to the largest MI will improve model fit maximally. Although this procedure seems to work well in practice, the researchers call for caution when using MI, suggesting that it should be applied only when relaxing a parameter is supported by substantive reasoning and interpretation.

4.4.3 Assessment of Goodness-of-fit

The SEM literature reports a number of fit indexes to measure model fit. This study adopts some of the widely used indexes proposed by Gefen, Straub and Boudreau (2000) for IS research. The chi-square statistic measures the distance between the sample covariance or correlation and the fitted covariance or correlation matrix

(Joreskog and Sorbom, 1993). As a result, significant chi-square values indicate poor model fit while nonsignificant values indicate good fit. However, since in large samples, the chi-square statistic will almost always be significant (Hartwick and Barki, 1994), researchers propose the measure of chi-square/degree of freedom, with a threshold of less than 3.0 indicating good model fit (Gefen, Straub and Boudreau, 2000). Multiple fit criteria are therefore recommended to attenuate measuring biases. Goodness-of-fit (GFI) indicates the proportion of the observed covariances explained by the model-implied covariance. Adjusted GFI (AGFI) includes a built-in adjustment for model complexity by correcting downward the value of the GFI as the number of parameters increases (Kline, 1998). The Normed Fit Index (NFI) indicates the proportion in the improvement of the overall fit of the researcher's model relative to a null hypothesis which assumes no correlation among observed variables, while the Non-NFI (NNFI) includes a correction for model complexity. The Comparative Fit Index (CFI) is a modified version of NFI, interpreted in the same way but less affected by sample size. Standardized Root Mean Squared Residuals (SRMR) is a standardized summary of the average covariance residuals which are the differences between the observed and model-implied covariances (Kline, 1998). Table 4.1 shows the recommended values for these measures based on the rule of thumb.

Table 4.1 Recommended Values of Goodness-of-fit Measures

Goodness-of-fit Measure	Recommended Value
Chi-square	P >= 0.50
Chi-square/degree of freedom	<= 3.0
Goodness-of-fit Index (GFI)	>= 0.90
Adjusted Goodness-of-fit Index (AGFI)	>= 0.80
Normed Fit Index (NFI)	>= 0.90
Non-Normed Fit Index (NNFI)	>= 0.90
Comparative Fit Index (CFI)	>= 0.90
Root Mean Square Error of Approximation (RMSEA)	<= 0.10
Standardized Root Mean Squared Residuals (SRMR)	<= 0.08

(Adapted from Hartwick and Barki, 1994; Segars and Grover, 1993; Gefen, Straub and Boudreau, 2000)

4.5 Moderated Structural Equation Modeling (MSEM)

From the standpoint of theoretical development, it is important to identify factors that will interact key theoretical relationships (Ho et al., 1989). According to Kline (1998), an interaction effect is indicated if the relationship of two variables changes as a function of a third variable. The third variable is called a moderator variable because of its moderator effect on the first two variables. The term moderator effect is sometimes used to refer to an interaction effect (Kline, 1998). To examine interaction effects among variables, methodologists have developed Moderated Structural Equation Models (MSEMs) which refer to structural equations models with product terms (Cortina, Chen and Dunlap, 2001). Based on the seminal work of Kenny and Judd (1984), a variety of techniques have been proposed to test interacting relationships within the SEM framework, among which the most commonly utilized approach is to introduce product terms as indicants of interaction variables. The techniques include those developed by Kenny and Judd (1984), Joreskog and Yang (1996), Ping (1995), Mathieu, Tannenbaum and Sala (1992), Jaccard and Wan (1995), and Ping (1996). Among the available techniques, the Ping (1995) procedure is considered to be “likely the easiest to implement and the least likely to produce problems with convergence (Cortina, Chen and Dunlap, 2001).”, and it is therefore selected to analyse interaction relationships in this study.

According to Cortina, Chen and Dunlap (2001), the product terms in most moderator analysis carry no conceptual meaning and the multiplicative combination of constructs only suggests that the influence of one variable on the behavior in question depend on the level of the others. When the maximum likelihood (ML) is applied in data analysis, the inclusion of a product term tend to lead to violations of the assumptions that requires that continuous variables in the model are distributed multivariate normal (Kenny and Judd, 1984). Ping (1995) suggests that the skewness and kurtosis tests can be used to assess the normality of the interaction indicants. Skewness refers to the degree to which a distribution is asymmetrical about its means. Kurtosis refers to the proportions of scores in the middle of a distribution or in its tails

relative to those in a normal curve. Results of these tests can be obtained in PRELIS, a computer program that accompanies LISREL.

However, there is a growing body of literature suggesting that ML is reasonably robust in analysis of data that violate multivariate normality. Therefore, it is reasonable to apply ML estimation to test interacting relationships unless there is extreme non-normality in the data set (Cortina, Chen and Dunlap, 2001). Kline (1998) suggests that because it is usually impractical to examine the joint frequency distributions of more than three variables, univariate normality, rather than multivariate normality, is tested to detect if extreme non-normality exists in data sets. Although there are few clear guidelines on how much non-normality is problematic, based on prior research, Kline (1998) states that data sets with absolute values of univariate skew indexes greater than 3.0 and univariate kurtosis index greater than 10.0 may be problematic.

Ping's (1995) procedure is adopted in this study to examine the interaction effect for the following reasons. First, Ping's procedure is found to be more straightforward both conceptually and operationally among the MSEM techniques proposed in the literature. Second, it is among the least likely to produce problems with convergence. Last but not least, it produces identical results with other techniques testing interaction effects (Cortina, Chen and Dunlap, 2001).

Ping (1995) suggests the use of a sole indicator of the latent product. The single indicator for an interaction variable such as XZ is calculated as the product of the averaged sums of the indicators for variable X and the averaged sum of the indicators for variable Z (Ping, 2000). Ping (1995) proposes the following steps to test interaction effect. First, after centering the data, measurement parameters for indicator loadings and errors of linear latent variables are estimated in a measurement model that excludes the interaction variables. Next, these estimates are used to calculate values for the indicator loadings and error variances of the interaction latent variables.

The indicator loading for the latent interaction variable XZ is calculated as the product of the sum of the indicator loadings for X and the sum of the indicator loadings for Z. The error variance for XZ is calculated as follows:

Error Variance of XZ = (sum of indicator loadings for X) * Variance(X) * (sum of indicator error variances for Z) + (sum of indicator loadings for Z) * Variance(Z) * (sum of indicator error variances for X) + (sum of indicator error variances for X) * (sum of indicator error variances for Z)

Then these calculated values are specified as constants in the structural model containing the interaction variables. The two-step model testing approach is believed to be well justified, as Anderson and Gerbing (1988) point out that the fixing of certain parameter values in a structural model based on estimates from the measurement model is perfectly justified when the latent variables are unidimensional. If the constructs are unidimensional, the paths and values associated with their indicators are unaffected by the presence of other variables in the model.

4.6 Construct Reliability and Validity

4.6.1 Construct Validity

Whereas reliability tests the degree of random variance in an observed score, construct validity evaluates systematic variance in an item corresponding to the target construct (Davis, 1986). Construct validity is generally defined as the degree to which a concept achieves theoretical and empirical meaning within the overall structure of one's theory (Bagozzi, 1980), or "the degree to which the measures' true score corresponds to the conceptual variable that the measure is intended to operationalize" (Cook and Campbell, 1979). Six criteria have been proposed to test construct validity (Bagozzi (1980):

1. Theoretical meaningfulness of concepts (content validity)
2. Observational meaningfulness of concepts (content validity)

3. Internal consistency of operationalizations (reliability)
4. Convergent validity
5. Discriminant validity
6. Nomological Validity

The first two criteria are generally referred to as content validity. The third criterion concerning reliability has been discussed in the Reliability section. The four perspectives of content validity, convergent validity, discriminant validity and nomological validity are discussed as follows.

4.6.1.1 Content Validity

Content validity refers to the extent to which the measurement items of a construct actually represent the theoretical meaning of that construct (Srite, 2000). Content validity generally has two perspectives: theoretical meaningfulness of concepts and observational meaningfulness of concepts. The first requires that the theoretical definition of each concept adequately describes that concept and be based on theory. The second perspective of content validity touches on the observational meaningfulness of concepts capturing the relationship between the theoretical concepts and their measures. The measure should correspond to their underlying constructs. To ensure content validity of the scales, the definitions and items of the constructs in this study are (1) adapted from prior studies and substantiated by rich literature review; (2) refined through the interviews in the pilot study.

Since content validity is usually subject to researchers' subjective judgement rather than to empirical, Karahanna (1993) proposes that content validity can be justified by examining how these scales were derived and validated in prior studies. In this study, the TAM constructs have been validated by Davis (1989), and are generally found to be robust in subsequent studies (Venkatesh and Davis, 2000); while the cultural constructs have been validated by Hofstede (1980) and supported by numerous subsequent studies (Usunier, 1998).

4.6.1.2 Convergent Validity

Technically, convergent validity can be evaluated by three tests: item reliability, composite reliability, and average variance extracted (AVE) (Chau, 1997). The first measure, item reliability, captures the amount of variance in a measure due to the construct rather than the error. Item reliability is indicated if items have significant factor loadings of 0.50 or above (Hair et al., 1995). The second measure, construct composite reliability, is assessed based on the criteria that the indicator's estimated pattern coefficient is significant on its underlying factor (Nunnally's, 1978). The threshold value for construct reliability is 0.70 or above. The interpretation of the resultant coefficient is similar to that of Cronbach's alpha, except that it also takes into account the actual factor loadings rather than assuming that each item is equally weighted in the composite load determination. The third measure, average variance extracted (AVE) for each construct, similar to item reliability, indicates the amount of variance in the item explained by the construct relative to the amount due to measurement error. The threshold value for AVE is 0.50 or above.

4.6.1.3 Discriminant Validity

Discriminant validity refers to the degree to which measures of different constructs are distinct or unique from each other (Hair et al., 1995). If correlations among items of the same construct are higher than those across different constructs, discriminant validity is indicated. Discriminant validity can be assessed by two methods: (1) constraining the correlation between various constructs at 1.0 in the Confirmatory Factor Analysis (CFA) model, then reestimating the modified mode (Segars and Grover, 1993); then comparing the chi-square difference between the constrained and unconstrained model; (2) comparing the squared correlation between two constructs with their respective average variance extracted (AVE).

Using the SEM approach, the first method tests if significant differences in the chi-square statistics exist between the original and reestimated model, so that

discriminant validity can be concluded. Correlations between various constructs are fixed at 1.0 in a new model, and the chi-square of the new model is compared against that of the original model. If a significant lower chi-square of the unconstrained model is achieved (Bagozzi, Yi, and Philips, 1991; Segars and Grover, 1993), then discriminant validity is demonstrated.

4.6.1.4 Nomological Validity

Nomological validity refers to the degree to which a new measure fits lawfully into a network of expected relationships. Nomological validity is indicated if the predicted theoretical relationships containing the investigated constructs are significant. If a scale indeed measures its underlying construct, then predictions of the formal theoretical network should be proved by empirical data analysis.

4.6.2 Reliability

Reliability is used to measure the internal consistency of a measurement instrument, capturing the extent to which a measurement item is free from random error (Nunnally, 1978), or in other words, the proportion of variance in the observed score due to the true score. As the amount of random error increases, reliability decreases. Low reliability would increase the likelihood of making a type II error, which occurs if the null hypothesis is not rejected when in fact it is false and should be rejected. In addition, low reliability would also decrease estimates of correlation and regression coefficients (Davis, 1986).

Construct reliability can be evaluated by two measures: Cronbach's alpha and SEM estimates of construct reliabilities. The first measure, Cronbach's alpha, is one of the most widely applied coefficients in evaluating reliability. A high alpha value of close to 1 for the corresponding construct represents high reliability. The assessment of this value is usually judged on the rule of thumb. Nunnally (1967) suggests that an alpha value of 0.7 or higher is normally considered an acceptable level and a value of 0.6 or above is considered sufficient for exploratory research.

The second measure, composite reliability or construct reliability, assesses how the items of a scale reflect a common underlying construct (Spector, 1992). This measure is also used to evaluate convergent validity. Composite reliability is similar to Cronbach's alpha but is calculated differently. The formula of calculating a construct reliability is as follows: $\text{Composite Reliability} = \frac{(\text{square of summation of factor loadings})}{\{(\text{square of summation of factor loadings}) + (\text{summation of error variances})\}}$ (Chau and Hu, 2001).

4.7 Pre-testing and Translation of the Instruments

Instruments developed or validated in previous studies do not automatically guarantee satisfactory validity and reliability (Chau, 1997a; Chau and Hu, 2002). Pretests are conducted to examine if the survey instrument possesses acceptable psychological properties in terms of reliability and validity.

Reverse translation from English into Chinese and from Chinese to English. First, the English items were translated into Chinese by the researcher was employed. The Chinese items were then translated back into English by a translator who is a postgraduate student majoring in English at a university on the Chinese mainland. A comparison between the two English versions was then made. Any variation in the meanings of the items resulted in a refinement of the Chinese instrument. A third translator then translated the revised version of the Chinese instrument back into English. Several iterations of this procedure were carried out until it was clear that the meaning of the items in the Chinese version of the instrument were identical to those in the English version.

The questionnaire has three main parts. The first part explains the purpose of the study, guarantees confidentiality and defines the scope of email use as work-related. The second part asks questions on intention to use email, the perceptions of the usefulness and ease of use of email, subjective norms of using email, and cultural

values. The respondents are asked to express their agreement with statements, based on a seven-point Likert-type scale with anchors ranging from “strongly agree” to “strongly disagree”. The last section asks for personal information on the respondents. The instrument for TAM constructs is adapted from Venkatesh and Davis’s (2000), while the instrument for cultural values is based on prior cultural studies by Hofstede (1980) and Srite (2000) with modifications.

The instrument was developed in two stages. The first stage was scale development. Interviews with employees with experience of email use were undertaken to comment on the existing items. The objective of this step was to ensure *content validity* to make sure that the measurement items actually represent the meaning of their underlying construct. The refined measures were then tested on 4 employees from a municipal government agency and state-owned enterprises. The items were first examined to eliminate any inappropriately worded or ambiguous items, and then items that were not relevant to subjects’ understanding of the translation of the instrument were singled out and deleted. It was concluded that the content validity of the model constructs and measurement items were established on the basis of extensive literature review and the interviews.

In the second stage, the questionnaires were distributed to 15 students at universities in Guangzhou to test if the items were applied appropriately to the Chinese context before sending to the potential respondents in the state-owned organizations. The purpose of this pretest was to ensure clarity of wording and to make refinements accordingly. The results of the pretest indicated that all items were clearly worded at this stage. The refined measures were then tested on employees from the municipal government and state-owned enterprises to validate the instrument. Copies of the questionnaires were distributed through the government agency’s internal mail system.

The sample frame consists of state-owned enterprises in the city of Guangzhou. Due to its geographical and linguistic proximity to Hong Kong, Guangzhou has been

quick to accept new ideas and to adapt to changes. The use of email in Guangzhou is also more prevalent than in many other cities in the Chinese mainland. The context of such a city presents more obvious changes in societal values when studying the relationship between IT adoption and culture. Yet, at the same time, by selecting state-owned enterprises, the compounding effect created by the direct injection of western cultures through organizational management can be reduced.

When deciding the candidate items for deletion, the following rule proposed by Moore and Benbasat (1991) was replicated:

Items with low item-item and item-scale correlations, which would raise ALPHA if deleted, or which showed low variance (and hence would have low explanatory power in any model) were all candidates for elimination. Before any item was deleted, however, a check was made to ensure that the domain coverage (i.e. content validity) of the construct would not suffer.

The latent variables in the proposed model, including four TAM2 constructs and cultural value constructs were measured using a seven-point Likert-type scale ranging from 1 (strongly agree) to 7 (strongly disagree), with higher values indicating greater degrees of perception. Internal consistency was confirmed by Cronbach's alpha. All scales demonstrate acceptable reliability with values of Cronbach's alpha above 0.60 (Nunally, 1967).

4.8 Pilot Study Results

Two hundred (200) copies of the questionnaire were sent out and 145 (72.5%) returned. One hundred twenty-one (121) copies were identified as usable, with 73 (60.3%) of the respondents male and 48 (39.7%) female. The majority of those who responded were relatively young university graduates aged between 25 and 34 years and with monthly incomes in the range of 2000-3000 RMB, which is about the average for Guangzhou.

Principal component analysis of the SPSS procedure was used to test the 45 -items instrument. Three factors were drawn using eigenvalues greater than 1.5 after varimax rotation. The reliabilities of the factors range from 0.67 and 0.83 respectively, both reaching the acceptance level using the threshold of 0.60 for exploratory research. The finalized items are listed in Appendix 1.

According to Nunally (1978), the general rule for exploratory factor analysis is that there need to be seven to ten observations per item. The pilot study has added new measuring items for cultural values to Hofstede's original instrument and its refined version by Srite (2000). Hofstede's (1980) instrument was developed partly based on theoretical inference for items of Masculinity and UA, rather than derived directly from the collected data. Consequently, the validity of this inferential leap is subject to further tests (Srite, 2000).

The original items in the questionnaire at individual level used by Hofstede (1980) in his cultural survey to generate cultural scores for nations were excluded from his more widely accepted cultural questionnaire module, which relies more on theoretical reasoning (Srite, 2000). Since this study conducts an individual level analysis, it was decided that the originally used but later excluded question items in Hofstede's instrument would be included in the pilot study. Table 4.2 shows the instrument with new items added.

Table 4.2 Items by Construct in Pilot Study

IU	Intention to Use
1	Assuming I have access to email, I intend to use it.
2	Given that I have access to email, I predict that I would use it.
PU	Perceived Usefulness
1	Using email improves my performance in my job.
2	Using email in my job increases my productivity.
3	Using email enhances my effectiveness in my job.
4	I find email to be useful in my job.
PEOU	Perceived Ease of Use
1	My interaction with email is clear and understandable.
2	Interacting with email does not require a lot of my mental effort.
3	I find email to be easy to use.
4	I find it easy to get email to do the work I want it to do.
SN	Subjective Norm
1	People who influence my behavior think that I should use email.
2	People who are important to me think that I should use email.
C	Collectivism
1	Being accepted as a member of a group is more important than having autonomy and independence on the job.
2	It is more important for a manager to encourage loyalty and a sense of duty in subordinates than it is to encourage individual initiative.
3	Individual rewards are not as important as group welfare.
4	Group success is more important than individual success.
5*	I prefer to have a job which leaves me sufficient time for your personal or family life.
6*	I prefer to have considerable freedom to adopt my own approach to the job.
7*	I prefer to have challenging work to do– work from which you can achieve personal sense of accomplishment.
8*	I prefer to have training opportunities to improve my skills or learn new skills.
9*	I prefer to have good physical working conditions.
10*	I hope I can fully use my skills or abilities on the job.

PD Power Distance	
1	A manager should perform work which is difficult and important and delegate tasks which are repetitive and mundane to subordinates.
2	Higher level managers should receive more benefits and privilege than lower level managers and professional staff.
3	Managers should be careful not to ask the opinions of subordinates too frequently, otherwise the manager might appear to be weak and incompetent.
4	Managers should make most decisions without consulting subordinates.
5	Employees should not question their manager's decisions.
M Masculinity	
1	It is more important for men to have a professional career than it is for women to have a professional career.
2	Women do not value recognition and promotion in their work as much as men do.
3	It is preferable to have a man in high level position than a woman.
4	There are some jobs in which a man can always do better than a woman.
5	It is preferable to have a man in a high level position than a woman.
6*	As for an ideal job, it is important to have an opportunity for high earnings.
7*	As for an ideal job, it is important to get the recognition I deserve when I do a good job.
8*	As for an ideal job, it is important to have an opportunity for higher jobs.
9*	As for an ideal job, it is important to have a good relationship with direct superior.
10*	As for an ideal job, it is important to work with people who cooperate well with one another.
11*	As for an ideal job, it is important to have the security that you will be able to work for your company as long as you want to.
UA Uncertainty Avoidance	
1	It is important to have job requirements and instructions spelled out in detail so that people know what they are expected to do
2	It is better to have a bad situation that you know about, than to have an uncertain situation that might be better
3	Providing opportunities to be innovative is more important than requiring standardized work procedures
4	Rules and regulations are important because they inform workers what the organization expects of them
5	People should avoid making changes because things could get worse.
6*	I often feel nervous or tense at work.

7* Company rules should not be broken, even when the employees think it is in the company's best interest.

Note: * Newly added items.

Exploratory factor analysis (EFA) was carried out using SPSS. Due to the sample size (121) of the pilot study and number of items (45), it was statistically inappropriate to run a single factor analysis with all the constructs. Thus, it was necessary to split the analyses into two groups of related constructs, i.e., TAM2 constructs and constructs of cultural values. Table 4.3 and Table 4.4 show respectively the initial factor analyses for TAM2 constructs and the cultural constructs.

As Table 4.3 indicates, the results of factor analysis show that the newly added items do not fall into the same factors as the four cultural dimensions. Some items cross-load and some items do not load on any factor. Items were dropped one-by-one to eliminate the cross-loadings until the final factor matrices were achieved. The modified factor matrix is shown in Table 4.5 for cultural constructs.

Table 4.3 Rotated Component Matrix for C, PD, M & UA

	F1	F2	F3	F4	F5	F6	F7	F8	F9
C1								0.497	
C2					0.526				
C3					0.896				
C4					0.821				
C5	0.418								-0.418
C6	0.792								
C7	0.819								
C8	0.801								
C9	0.810								
C10	0.797								
PD1						0.446			
PD2						0.746			
PD3						0.705			-0.427
PD4									
PD5				0.670					
M1			0.686	0.763					
M2			0.574						
M3			0.827						
M4			0.752						
M5		0.687							
M6	0.493	0.604							
M7		0.778							
M8	0.625	0.592							
M9	0.412	0.703							
M10		0.456					0.621		-0.327
UA1		0.628							
UA2							0.741		0.671
UA3									
UA4		0.554							
UA5								0.759	
UA6				0.506					-0.511
UA7				0.835					
Variance	24.3%	12.3%	7.2%	5.9%	5.2%	4.9%	3.9%	3.5%	3.2%
Cumulative % of variance explained									
Note that only loadings greater than 0.4 are presented									
Notation									
C = Collectivism									
PD = Power Distance									
M = Femininity									
UA = Uncertainty Avoidance									

Table 4.4 Rotated Component Matrix for IU, PU, PEOU & SN

	Factor 1	Factor 2	Factor 3	Factor 4
IU1	0.828			
IU2	0.804			
PU1		0.855		
PU2		0.830		
PU3		0.719		
PU4		0.496		
PEOU1			0.852	
PEOU2			0.884	
PEOU3			0.864	
PEOU4			0.881	
SN1				0.923
SN2				0.924
% Variance	10.587%	12.199%	60.657%	5.414%
Cumulative % of variance explained				88.857%
Note that only loadings greater than 0.4 are presented				
Notation				
IU = Intention to Use				
PU = Perceived Usefulness				
PEOU = Perceived Ease of Use				
SN = Subjective Norms				

Another factor analysis was carried out with the newly added items deleted resulting in relatively distinct cultural factors (see Table 4.5), demonstrating that most of Hofstede’s inference of cultural values from the designed items is valid. This validity is also supported by substantial cultural research in social science and management (Usunier, 1998). The newly added items adapted from Hofstede’s questions to derive cultural values are therefore dropped. As is shown in Table 4.2, the constructs for PEOU, PU, IU and SN all have clean and distinct factor scores. Some problematic items relating to the cultural constructs were eliminated in the subsequent analysis. As can be seen from Table 4.5, PD1 and PD2 do not load onto the factor to which PD3, PD4 and PD5 belong. Under careful scrutiny, PD1 and PD2 are found to relate to job allocation and reward among employees and managers, while PD3, PD4 and PD5 relate to attitudes toward the authority of managers, which is closer to the definition of power distance. PD1 and PD2 were therefore dropped from the instrument to increase its content validity and the reliability of the PD construct. With further theoretical investigation, two new items measuring PD are adapted based on Erez and Early’s (1987) work. They operationalized PD as “the extent to which

Superior X can influence the behavior of Subordinate Y and that Subordinate Y can influence Superior X.” Based on Hofstede’s measuring items (Hofstede, 1984), Erez and Early (1987) use three items to measure PD: (1) powerful people should try to look less powerful than they are; (2) subordinates consider superiors as being of a different kind; (3) other people are a potential threat to one’s power and rarely can be trusted. The adapted items are utilized with some modifications for the purpose of clarity. The first two items are selected to be added in the final version questionnaire to measure PD construct. The third item is not selected because the “trust” concept introduced may compound subjects’ attitude towards power distribution equality.

Table 4.6 summarizes the reliabilities measured in Cronbach’s alphas and the number of items for each construct retained for future statistical analysis. As shown, scales of TAM2 constructs have displayed good reliabilities, while some of the cultural constructs exhibit less than desirable reliability. Specifically, the UA measures have low reliability and need to be modified.

Table 4.5 Rotated Component Matrix for Cultural Values after Revision

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
C1					0.432	
C2	0.526					
C3	0.855					
C4	0.809					
PD1		0.668				
PD2		0.751				
PD3		0.588	0.614			
PD4			0.876			
PD5			0.829			
M1				0.677		
M2				0.597		
M3				0.808		
M4				0.748		
UA1					0.735	
UA2						0.671
UA3					0.483	
UA4					0.717	
UA5						0.813
%	15.773%	6.612%	9.922%	20.623%	7.129%	5.777%
Variance						
Cumulative % of variance explained						65.835%
Notation						
C = Collectivism						
PD = Power Distance						
M = Femininity						
UA = Uncertainty Avoidance						

Table 4.6 Pilot Test Reliabilities

Constructs	Cronbach's alpha	Increaseed Alpha if item(s) deleted	No. of Items
Intention to Use	0.8660	--	2
Perceived Usefulness	0.9240	--	4
Perceived Ease of Use	0.9603	--	4
Subjective Norms	0.9314	--	2
Collectivism	0.6863	0.6877 (delete C1)	4
Power Distance	0.6146	0.6231 (delete PD1)	4
Masculinity	0.7501	0.7715 (delete M2)	4
Uncertainty Avoidance	0.2548	0.3333 (delete UA3)	5

Since the construct of UA exhibited unacceptable reliability (0.2548), with a careful examination of the items based the results from the factor analysis (see Table 4.5), UA3 was excluded from the instrument to measure UA. UA3 addresses attitudes toward innovation in workplace, which does not carry the same connotations as the UA reflecting fear towards ambiguity. A further examination of UA6 and UA7 reveals that they are primarily related to stress and compliance to rules, but not to adverse

attitudes towards the unknown. Thus, UA6 and UA7 were also discarded due to their low relevance to the UA concept.

UA1, UA2, UA4 and UA5 do not load on the same factor. However, since UA2 and UA5 are on attitudes to the unknown, and UA1 and UA4 are similarly on attitudes to ambiguity, and both are directly related to uncertainty avoidance, the four items are thus kept in the instrument.

Resulting from the above analysis, the items to be used in the main study are found to be similar to Hofstede's (1984) instrument and its refined version by Srite (200), with the exception of changes for items measuring UA (i.e., four items remained after deletion) and PD (i.e., two items added). The two added items for PD are PD6 and PD7, adapted from another prominent study of power distance by Erez and Earley (1987). See Appendix for a summary of the items in the final questionnaire.

4.9 Effect of the Common Method

This study uses a single data collection method (i.e., survey) to investigate the relationship between technology acceptance and cultural values. The concern of the negative effect of common method lies in the possibility that some variance may be caused by the use of the common method. On the one hand, convergent validity may be inflated if the common method has a significant effect. On the other hand, a significant common method effect may reduce potential inflation of discriminant validity, because when all data are collected by one method, it is likely that differences among measures are due to the differences in concepts and not to the data collection method employed.

Prior research has applied Harmon's one-factor test to evaluate the potential effect of common method variance (Podsakoff and Organ, 1986; Chau and Hu, 2002). The idea is to restrict all the items to a single-factor but not to their respective underlying constructs. According to Chau and Hu (2002), when the dominance of a single factor

is observed, the common method is considered to be the cause of the correlations among items. In this study, the analysis results shows that a single factor accounted for only 28 percent of the total variance, suggesting that the common method applied in this study may not have been significant.

4.10 Conclusion

This chapter describes the research methodology and the pilot study to refine the construct operationalization. Through refinement based on factor analysis results, items are deleted or added until the constructs are shown to be distinct factors. Some of the cultural constructs items are deleted based on the empirical testing, combined with consideration of the content validity of the construct in question. The final version of items for the instrument is determined based on pilot study. In addition, a description of the reliability and validity test of the constructs is presented, and will be drawn upon for a test of construct psychological properties in Chapter 5 of Data Analysis. Finally, the effect of the common method is discussed.

CHAPTER 5 DATA ANALYSIS

5.1 Introduction

This chapter first summarizes the demographic data of the survey. The reliability and validity of the measurement model are then evaluated. The revised measurement model was then developed based on the results of the assessment. The structural model assesses the explanatory power of the independent variables and examines the size and the significance of the estimated path coefficients. Both structural equation modeling (SEM) and Moderated SEM (MSEM) are used to test the hypothesized relationships in the structural model. The major statistical analysis technique chosen for this study is LISREL, a powerful approach to analyzing structural models involving constructs with multiple indicators.

5.2 Demographic Data

Table 5.1 depicts the response rate for the survey. Three hundred and fifty (350) copies of the questionnaire were distributed to the employees of 16 banks in Shanghai. Responses include 135 employees from the four major state-owned commercial banks (Industrial and Commercial Bank of China, China Construction Bank, and Agriculture Bank of China), 136 from the five shareholding commercial banks and civil commercial banks, and 31 from the seven foreign banks. The banks participated in this study have generally been equipped with good IT facilities, all having Local Area Networks (LANs) with each knowledge worker assigned an email address for communications of internal work. Due to the information intensive nature of the banking industry, the respondents generally have relevant IT experience to interact with email systems.

Three hundred and twelve (312) questionnaires were collected, mainly by field collection with a small number by mail or fax, resulting in a high response rate of 90%.

This unusually high response rate is related to the data collection method applied in this study. Postgraduate students from a university in Shanghai were assigned as distributors of the questionnaire copies. Each respondent was attached to their respective distributor, to whom they have promised to participate in the study when the distributors visited their banks to explain the purpose of the study. The distributor then followed up the collection of questionnaire copies either by field visits or via returned mails. Through the individual connections, a high response rate is ensured.

Ten questionnaires were excluded from data analysis due to incomplete answers, resulting in 302 usable ones. Anderson and Gerbing (1988) recommend a minimum sample size of 150 to generate parameter estimates with standard errors small enough to be of practical usefulness. Other researchers have recommended minimum sample size ranging from 100 to 200 for reliable LISREL analysis (Chau, 1996). Based on this rule of thumb, the sample size of this study is considered adequate. The selection of a sample from a single industry aims to better control variations and compounding effect across industries. In general, the sample setting and characteristics in the main study are similar to those of the pilot study in terms of young and well educated employees in coastal cities benefiting from the “opening-up” policy, being regional centers for foreign investment, in state-owned dominating industries.

Table 5.1 Questionnaire Response Rate

Questionnaire copies Distributed	350
Copies Returned	312
Response Rate	90%
Usable copies	302

Table 5.2 presents a summary of the demographic characteristics of the respondents. Among the participants, the majority falls into the age cohort of 25 – 34 years old, and have undergraduate degrees. The typical respondents hold non-managerial positions with a monthly income of RMB 1,000-4,000 and work for state-owned banks or transformed state-owned banks such as commercial share holding banks. The gender splits is 46% male versus 54% female.

Table 5.2 Demographic Data of Respondents

	Number of Respondents Involved	Percentage of Respondents Involved
Gender		
Female	165	54.6%
Male	137	45.4%
Age Group		
Below 25	70	23.2%
25 – 34	188	62.3%
35 – 44	33	10.9%
45 – 54	11	3.6%
Education		
High school or less	15	5.0%
Polytechnic diploma	113	37.4%
Undergraduate degree	164	54.3%
Postgraduate degree	10	3.3%
Income (monthly)		
Below RMB1000	8	2.7%
RMB1000 – 2,499	127	42.1%
RMB2500 – 3,999	118	39.1%
RMB4000 – 5,499	31	10.3%
RMB5500 and above	18	6.0%
Attached Organizations		
State-owned banks	135	45%
Commercial shareholding banks and city commercial banks	136	45%
Foreign banks	31	10%
Positions		
Managerial	22	7%
Non-managerial	280	93%

Non-response is a potential source of bias in survey research and needs to be properly addressed. Non-response bias is usually assessed by comparing surveys returned after a cutoff date against the rest of the sample. Respondents who return the questionnaire after the cutoff date are assumed to be representative of non-respondents (Chau and Hu, 2002). The sampling procedure employed in this study made it impossible to assess non-response bias. The surveys were distributed over a six-week period and were collected over an eleven-week period. Since the questions were not date-stamped on their distribution and return, the cutoff date for checking non-response rate could not be determined. Therefore, even though the subjects are representative of the employee in the banking industry in terms of sex, age and income, non-response bias could not be ruled out.

The minimums, maximums, means and standard deviations for all constructs are presented as follows. Overall, respondents in the sample strongly believed that email were useful (PU mean = 2.45) in the workplace and that it was easy to use (PEOU = 2.12). They planned to use email when they had access to email (IU = 1.85). They felt strong social pressure from their environment to use email (SN mean = 2.07). With respect to cultural values, the respondents felt that they were strongly collectivistic (C mean = 2.51), somewhat masculine (M mean = 3.11), not favoring a hierarchical workplace (PD mean = 4.36), and somewhat tolerant of uncertainty (UA mean = 3.51). For the eight constructs, a series of independent t-tests are carried out to test significance of mean differences between respondents of different sexes, above and below 30 years old, with monthly income above and below RMB 4,000, with education level above and below undergraduate degree level, and holding managerial positions or non-managerial positions. The findings revealed that (1) female respondents tend to have higher scores in PD, Masculinity and UA; (2) younger respondents tend to have higher scores in PD, Masculinity and UA, but lower scores in IU; (3) respondents with higher income tend to have higher scores in Collectivism, UA and SN; (4) respondents with managerial positions tend to have higher scores in PD, but lower scores in UA; (5) respondents with higher education tend to have higher scores in Collectivism and UA, but lower scores in IU and PEOU.

Table 5.3 The Instrument Used in the Final Version Questionnaire

IU	
IU1	Assuming I have access to email, I intend to use it.
IU2	Given that I have access to email, I predict that I would use it.
SN	
SN1	People who influence my behavior think that I should use email.
SN2	People who are important to me think that I should use email.
PU	
PU1	Using email improves my performance in my job.
PU2	Using email in my job increases my productivity.
PU3	Using email enhances my effectiveness in my job.
PU4	I find email to be useful in my job.
PEOU	
PEOU1	My interaction with email is clear and understandable.
PEOU2	Interacting with email does not require a lot of my mental effort.
PEOU3	I find email to be easy to use.
PEOU4	I find it easy to get email to do the work I want it to do.
C	
C1	Being accepted as a member of a group is more important than having autonomy and independence on the job.
C2	It is more important for a manager to encourage loyalty and a sense of duty in subordinates than it is to encourage individual initiative.
C3	Individual rewards are not as important as group welfare.
C4	Group success is more important than individual success.
PD	
PD3	Managers should be careful not to ask the opinions of subordinates too frequently, otherwise the manager might appear to be weak and incompetent.
PD4	Managers should make most decisions without consulting subordinates, because managers should look powerful and authoritative.
PD5	Employees should not question their manager's decisions.
PD6	Subordinates should pay high respect for their direct superior.
PD7	Employees should not show their disagreement to their managers.
M	
M1	It is more important for men to have a professional career than it is for women to have a professional career.
M2	Women do not value recognition and promotion in their work as much as men do.
M3	It is preferable to have a man in high level position than a woman.

M4	There are some jobs in which a man can always do better than a woman.
UA	
UA1	It is important to have job requirements and instructions spelled out in detail so that people know what they are expected to do.
UA2	It is better to have a bad situation that you know about, than to have an uncertain situation that might be better.
UA4	Rules and regulations are important because they inform workers what the organization expects of them.
UA5	People should avoid making changes because things could get worse.

5.3 Scale Validation

5.3.1 Exploratory Factor Analysis (EFA)

Exploratory factor analysis was first carried out to test if data collected in the main study possesses satisfactory construct reliability and validity, based on the measurement items determined in the pilot study. See Table 5.3 for the instrument used in the final version of the questionnaire.

As can be seen in Table 5.4 and Table 5.5, two PU items (i.e., PU1 and PU4) and one UA item (i.e., UA4) cross-loaded on other factors. However, since PU1 and PU4 are adapted from a well-established instrument which has been repeatedly validated in numerous prior studies (Venkatesh and Davis, 2000) and address users' perception of usefulness directly, these two items were therefore kept in the analysis because deleting them would reduce the content validity of the construct. For example, PU1 asks if email is useful in improving work efficiency and PU4 asks if email is seen as useful. By the same token, U4 is found to be concerned with the need for clarity of regulations, which captures the uncertainty avoidance concept, and hence remains in the final statistical analysis. Table 5.6 shows a summary of measurement scales to be used in the data analysis for the main study.

Table 5.4 Rotated Component Matrix for IU, PU, PEOU & SN

	Factor 1	Factor 2	Factor 3	Factor 4
IU1	0.882			
IU2	0.786			
PU1	0.712			
PU2		0.836		
PU3		0.720		
PU4	0.629			
PEOU1			0.820	
PEOU2			0.844	
PEOU3			0.757	
PEOU4			0.773	
SN1				0.901
SN2				0.864
% Variance	13.358%	5.759%	52.216%	79.818%
Cumulative % of variance explained				88.857%
Note that only loadings greater than 0.4 are presented				
Notation				
IU = Intention to Use				
PU = Perceived Usefulness				
PEOU = Perceived Ease of Use				
SN = Subjective Norms				

Table 5.5 Rotated Component Matrix for Cultural Values

	Factor 1	Factor 2	Factor 3	Factor 4
C1	0.684			
C2	0.686			
C3	0.821			
C4	0.780			
PD3		0.535		
PD4		0.799		
PD5		0.793		
PD6		0.496		
PD7		0.648		
M1			0.844	
M2			0.858	
M3			0.812	
M4			0.580	
UA1				0.749
UA2				0.768
UA4			0.469	
UA5		7		0.667
% Variance	9.517%	15.085%	28.998%	6.474%
Cumulative % of variance explained				60.074%
Notation				
C = Collectivism				
PD = Power Distance				
M = Femininity				
UA = Uncertainty Avoidance				

Table 5.6 Summary of Measurement Scales

Construct	Item	Source	Factor Loading	Mean	SD	Crobach's alpha	Construct Mean
IU	IU1	Venkatesh and Davis, 2000	0.92	1.82	1.01	0.8779	1.85
	IU2		0.98	1.88	1.03		
PU	PU1	Venkatesh and Davis, 2000	0.86	2.08	1.14	0.8296	2.45
	PU2		0.75	2.73	1.40		
	PU3		0.62	2.94	1.39		
	PU4		0.83	2.06	1.16		
PEOU	PEOU1	Venkatesh and Davis, 2000	0.90	2.07	1.20	0.8679	2.12
	PEOU2		0.93	2.08	1.18		
	PEOU3		0.92	2.12	1.19		
	PEOU4		0.89	2.19	1.18		
SN	SN1	Venkatesh and Davis, 2000	0.89	2.79	1.29	0.9279	2.07
	SN2		0.99	2.84	1.32		
C	C1	Hofstede, 1984	0.64	2.62	1.27	0.7279(0.7743 w/o C2)	2.51
	C2		0.71	2.72	1.38		
	C3		0.81	2.41	1.18		
	C4		0.82	2.28	1.24		
PD	PD3	Hofstede, 1984	0.61	4.31	1.64	0.7296 (0.7496 w/o PD3)	4.36
	PD4		0.87	4.07	1.75		
	PD5		0.69	4.62	1.61		
	PD6		0.47	3.11	1.35		
	PD7		0.71	4.45	1.57		
M	M1	Hofstede, 1984	0.69	2.91	1.45	0.8274(0.8688 w/o M4)	3.11
	M2		0.65	2.89	1.35		
	M3		0.68	2.94	1.39		
	M4		0.75	3.70	1.70		
UA	UA1	Hofstede, 1984	0.58	3.40	1.41	0.6307	3.51
	UA2		0.50	3.71	1.46		
	UA4		0.49	2.73	1.14		
	UA5		0.76	4.20	1.59		

5.3.2 Aggregation of Items

A LISREL test shows that the proposed a CFA model with the 28-item instrument does not converge. This could be due to the insufficient sample size needed to estimate all parameters. According to Kline (1998), to obtain satisfactory a CFA model, an appropriate sample size in terms of the ratio of *subjects* to *free model parameters* should be 10:1 or ideally 20:1. The number of free model parameters is counted according to the following rule:

The total number of (1) variances and covariances (i.e., unanalyzed

associations) of the exogenous latent factors, measurement errors, and disturbances; (2) direct effects on the indicators from the factors (i.e., factor loadings); and (3) direct effects on latent endogenous factors from other factors (i.e., path coefficients) equals the number of parameters.

The number of free model parameters prior to aggregation of items in this study is 65 (36 variances, 0 covariances for unanalyzed associations, 20 factor loadings, 9 path coefficients). According to the above rule, the sample size should be at least 650. However, the valid responses to this study only reach 302. Although a sample size greater than 200 is regarded as a large enough sample suitable for SEM modeling based on the rule of thumb (Kline, 1998), too many parameters resulting from too many items may be the cause of non-convergence of the model. A way to address this problem is to aggregate items to measure the constructs in the measurement model (Bagozzi and Heatherton, 1994). This method has been applied in some salient SEM-based research and proved to be valid (Rahim and Magner, 1995; Rahim, Antonioni, and Psenicka, 2001) in the field of psychology research. After aggregation, the number of free model parameters in this study dropped to 41 (24 variances, 0 covariances, 8 factor loadings, 9 path coefficients), which implies a suggested minimum sample size of 410. Although there is still a gap in the suggested sample size based on Kline's (1998) suggestion and the collected responses in this study, the aggregated model converges well due to the reduction in model complexity.

Additional support for using the aggregation method can be found in social psychology literature. It is not uncommon that a model with many items and parameters could result in sizable random errors and thus poor fit even when the sample size is large (Bagozzi and Heatherton, 1994; Rahim and Magner, 1995). Rahim, Antonioni, and Psenicka (2001) therefore suggested that when the number of measured items per factor is in the range of 4-7, it is appropriate to aggregate them to construct two aggregate variables per factor (Bagozzi and Heatherton, 1994). This study adopts this method, in which subsets of items within factors are summed to create aggregate variables. For constructs with more than 2 items, those counted as

even and those counted as odd were summed respectively as two new items. Then the summation of item scores was be averaged for each observation. After the aggregation, 16 aggregate items were created to represent 8 constructs, four of TAM and four of cultural values. See Table 5.7 for the results of a factor analysis of the aggregated items. The result shows that the aggregated items have clean and good loadings onto their respective factors.

Table 5.7 Rotated Component Matrix for Aggregated Items

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
IU1	0.873							
IU2	0.862							
PU1		0.790						
PU2		0.885						
PEOU1			0.832					
PEOU2			0.832					
SN1				0.889				
SN2				0.859				
C1					0.892			
C2					0.859			
PD1						0.848		
PD2						0.855		
M1							0.892	
M2							0.883	
UA1								0.917
UA2								0.925
Variance %	34.923	4.250%	5.197%	9.992%	8.008%	3.139%	6.652%	18.060
Cumulative % of variance explained				90.22%				

5.3.3 Testing the Measurement Model

Segars and Grover (1993) suggest that before causal paths in an SEM model are analyzed, a viable measurement model should be first tested and established in order to avoid possible interaction between the measurement and structural equation models. That is, the measurement model is first tested and modified to create a valid measurement model, then the structural equation model is analyzed to test the significance of the hypothesized relationships. It is also suggested that unidimensionality of the measurement model should be established before the structural analysis.

Unidimensionality is the degree to which items load only on their respective constructs without having “parallel correlational pattern(s) (Segars, 1997)”. With unidimensionality, all items reflecting a single factor have only that particular underlying factor shared among them, and there are no significant shared variances among these items beyond the construct (Gefen, Straub and Boudreau, 2000). The heuristic method of testing unidimensionality is to compare a series of models in order to identify the superior one. If the proposed measurement model has a significantly smaller chi-square compared to the alternative measurement models, unidimensionality of the proposed model is then indicated.

Three competing models are compared to test unidimensionality. First, the proposed eight-factor measurement model, which sets the correlations among all constructs free to correlate, is tested for fit statistics (see Figure 5.1). Then two candidate models are created, one constraining all inter-factor correlations to zero, the other constraining all inter-factor correlations to 1 (See Figure 5.2 and Figure 5.3). Finally, fit indices of the three alternative measurement models are compared to determine the best model (see Table 5.8 for the respective fit indices). The proposed eight-factor model (MM1) exhibits better model-data fit than the two candidates (MM2 and MM3), because all the fit indices of MM1 demonstrate superiority over those of MM2 and MM3. Hence, the unidimensionality of the proposed measurement model is supported.

Figure 5.1 Eight-Factor Model with Interfactor Correlations Set Free (MM1)

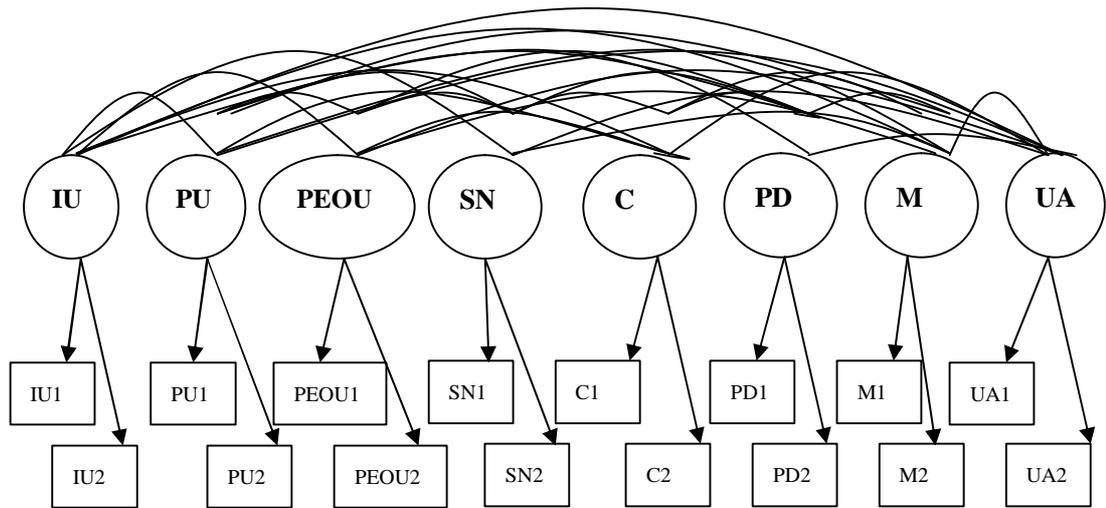


Figure 5.2 Eight-Factor Model with Interfactor Correlations Set to Zero (MM2)

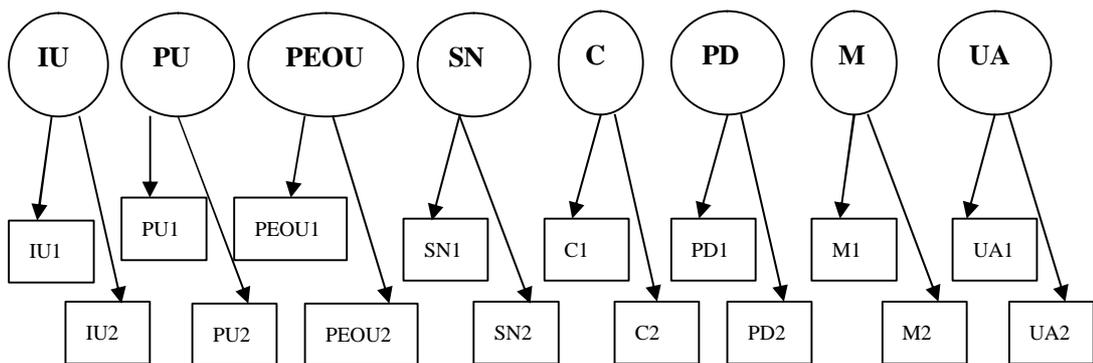


Figure 5.3 One-Factor Model with Interfactor Correlations Set to Unity (MM3)

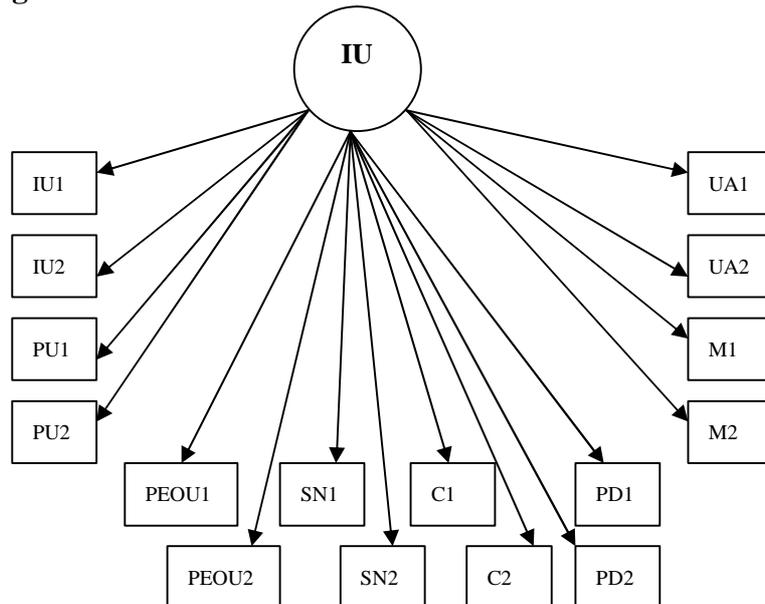


Table 5.8 Fit Indices for Alternative Measurement Models

Indices	MM1	MM2	MM3	Threshold
Chi-square	266.15	1388.75	2481.72	-
df	76	104	104	-
GFI	0.90	0.63	0.49	>=0.90
AGFI	0.82	0.52	0.34	>=0.80
RMSEA	0.091	0.20	0.28	<=0.10
NFI	0.93	0.71	0.40	>=0.90
NNFI	0.92	0.68	0.32	>=0.90
CFI	0.95	0.73	0.41	>=0.90
SRMR	0.04	0.30	0.19	<=0.10

However, unidimensionality alone is not enough to ensure usefulness of a scale since even a perfectly unidimensional scale may have a resultant composite score that is determined primarily by measurement error (Gerbing and Anderson, 1988). Therefore, scale assessment should also take construct validity and reliability test into consideration.

5.3.4 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (CFA) using the LISREL 8 software package (Joreskog and Sorbom, 1993) was then used to test both the measurement model and causal relationships in the path model simultaneously. As a member of the SEM family, LISREL tests relationships between latent constructs which are abstract concepts and therefore have to be indirectly inferred from multiple observed indicators, and simultaneously tests the validity of these indicators.

The validity of the measurement model can be validated by confirmatory factor analysis using LISREL. A typical procedure is to: (1) develop an *a priori* model based on previous studies and hypothesized relationships between observed indicators and unobserved constructs; (2) fit the model to sample data; (3) evaluate the model in terms of goodness of fit and parameter estimates; and (4) re-specify or modify the model to improve its fit to the data (Segars, 1994).

Table 5.9 shows the construct reliabilities and the loadings for the indicators on

the underlying constructs calculated based on LISREL output. All the item loadings are greater than the acceptable level of 0.70 and are significant at an alpha level of 0.01. Thereby, the convergent validity of the measurement of each construct is supported (Anderson and Gerbing, 1988).

Table 5.9 Factor Loadings for the CFA Model of the Research Model

Factor	Construct Reliability	Factor Loadings	T-statistics
Intention to Use	0.9193		
IU1		0.92	5.18
IU2		0.97	5.12
Perceived Usefulness	0.8390		
PU1		0.84	5.45
PU2		0.93	5.40
Perceived Ease of Use	0.9442		
PEOU1		0.96	9.67
PEOU2		0.95	9.59
Subjective Norms	0.9275		
SN1		0.91	8.21
SN2		0.98	8.30
Collectivism	0.8476		
C1		0.83	7.46
C2		0.88	7.73
Power Distance	0.7823		
PD1		0.90	6.32
PD2		0.78	6.70
Masculinity	0.8626		
M1		0.84	7.76
M2		0.91	8.11
Uncertainty Avoidance	0.8993		
UA1		0.52	5.15
UA2		0.62	5.93

5.3.5 Psychometric Properties of the Final Model

5.3.5.1 Convergent Validity

Psychometric properties can be evaluated using Cronbach's alpha, convergent validity, discriminant validity and etc. As discussed in Chapter 4, convergent validity can be evaluated by three measures: item reliability, construct reliability and average variance extracted (AVE) (Fornell and Larcker, 1981). The first measure, item reliability, measures the amount of variance in an item due to the underlying construct

rather than to measurement error. It is calculated by squaring the factor loading. Item reliability of 0.50 or above, or a significant *t* value for the factor loading, or both, can be considered as evidence of convergent value. In this study, only one out of the twelve items shows an item reliability (i.e., 0.44) lower than the 0.50 cutoff value, and all the factor loadings have significant *t*-values.

The second measure, construct composite reliability, can be calculated as follows:
$$\text{composite reliability} = \frac{(\text{square of summation of factor loadings})}{\{(\text{square of summation of factor loadings}) + (\text{summation of error variances})\}}$$
 (Chau and Hu, 2001). The values of factor loadings and error variances are obtained from LISREL output. Nunnally (1978) suggests a minimum of 0.80 for evidence of convergent validity. For all constructs in the model, construct reliabilities are greater than 0.80.

The third measure, average variance extracted (AVE) value, measures the amount of variance shared by in-group items captured by the underlying construct in relation to the amount of variance due to measurement error. It is calculated as follows:
$$\frac{(\text{summation of squared factor loadings})}{\{(\text{summation of squared factor loadings}) + (\text{summation of error variances})\}}$$
 (Fornell and Larcker, 1981). The value of AVE should be higher than 0.50 to conclude convergent validity. AVEs of all constructs in this study are higher than 0.50.

Table 5.10 Results of Three Tests of Convergent Validity

Test 1: Item Reliability	
Item	Reliability
IU1	0.85
IU2	0.96
PU1	0.74
PU2	0.90
PEOU1	0.92
PEOU2	0.90
SN1	0.79
SN2	0.92
C1	0.74
C2	0.76
PD1	0.86
PD2	0.64
M1	0.71
M2	0.83
UA1	0.44
UA2	0.83

Test 2: Construct Reliability	
Construct	Reliability
IU	0.9193
PU	0.8390
PEOU	0.9442
SN	0.9275
C	0.8476
PD	0.7823
M	0.8626
UA	0.8993

Test 3: Average Variation Extracted	
Construct	Average Variance Extracted
IU	0.81
PU	0.85
PEOU	0.89
SN	0.89
C	0.86
PD	0.85
M	0.88
UA	0.83

From Table 5.10, it is concluded that the instrument demonstrates adequate convergent validity. The item reliabilities appear to be satisfactory with all items above the 0.5 threshold except for UA1 (i.e., 0.44), and construct reliabilities of all scales exceeded 0.80, above the recommended value for this index. The AVE values of the constructs are all above 0.50, indicating variance due to the construct is greater than the variance due to measurement error for all constructs.

5.3.5.2 Discriminant Validity

As stated in chapter 4, there are two ways to assess discriminant validity. One method to evaluate discriminant validity is to compare the variance shared between measures of two different constructs (i.e., R-square) and the average variance extracted values (AVEs). If R-square is lower than AVE, then discriminant validity is indicated. R-square can be obtained by squaring the correlation between the two constructs (Igbaria et al., 1995). Both R-square and AVE can be obtained from the output of LISREL analysis.

Table 5.11 shows the values of AVEs, correlations and shared variances (indicated by squared correlation). The values in the second row are AVEs. The remaining rows contain the correlations and the squared correlations (values in the brackets). Correlations between constructs ranged from 0.03 to 0.61. All AVE values are found to be higher than the values of the squared correlations, exhibiting high discriminant validity of each construct from other constructs.

The second method to test discriminant validity is to compare the constrained measurement model with an unconstrained one. First, the correlation parameter between two constructs is constrained to 1.0, one pair of constructs at a time. Second, the difference between the resulting chi-squares of the two models was calculated. As it turns out, the difference of chi-squares is also distributed as a chi-square statistic with degrees of freedom equal to the difference of parameters between the models (Jaccard and Wan, 1996), which is 1 in this test. With the degrees of freedom equal to 1, the critical value of the chi-square difference test is 3.84 at significant level of 0.01.

Table 5.41 Discriminant Validity–Comparing AVEs and Squared Correlations

	IU	PU	PEOU	SN	C	PD	M	UA
AVE	0.81	0.85	0.89	0.89	0.86	0.85	0.88	0.83
IU	1.00							
PU	0.75 (0.56)	1.00						
PEOU	0.78 (0.61)	0.68 (0.46)	1.00					
SN	0.49 (0.24)	0.73 (0.53)	0.61 (0.37)	1.00				
C	0.26 (0.07)	0.39 (0.15)	0.29 (0.08)	0.48 (0.23)	1.00			
PD	0.20 (0.04)	0.30 (0.09)	0.20 (0.04)	0.33 (0.11)	0.24 (0.06)	1.00		
M	0.21 (0.04)	0.34 (0.12)	0.18 (0.03)	0.29 (0.08)	0.40 (0.08)	0.55 (0.30)	1.00	
UA	0.21 (0.04)	0.33 (0.12)	0.22 (0.05)	0.35 (0.12)	0.44 (0.19)	0.75 (0.56)	0.57 (0.32)	1.00

Note: The numbers in the brackets represent the squared correlation values between constructs of the respective column and row.

Table 5.15 Chi-square Differences

	IU	PU	PEOU	SN	C	PD	M	UA
IU	--							
PU	2.11	--						
PEOU	0.07	0	--					
SN	19.51**	17.77**	1.94	--				
C	31.82**	34.14**	2.89	29.1**	--			
PD	24.4**	21.61**	1.34	46.77**	26.98**	--		
M	10.7**	51.49**	1.47	17.67**	35.44**	15.76**	--	
UA	21.7**	16.93**	65.31**	2.68**	13.46**	3.74**	10.38**	--

Note: ** Chi-square differences are significant at 0.01

Table 5.12 shows the chi-square differences between the constrained and unconstrained model for discriminant validity test of the research model constructs. It shows that the majority of chi-square differences are significant, suggesting that the construct captured by the measurement scale is generally significantly unique from other constructs (Segars and Grover, 1993). Although the construct of PEOU is problematic, its discriminant validity has been validated in numerous prior studies (Venkatesh, 2000). It therefore can be concluded that the majority of measurement items are generally unique although some constructs have less than ideal discriminant validity test. As a result, it can be concluded that the discriminant validity of the

instrument is reasonably strong.

In conclusion, the final measurement model is of an eight-factor structure with good psychometric properties. Most of the indices evaluating convergent validity and discriminant validity are above the acceptable levels. The loadings from the measurement items to the constructs can be interpreted in a similar manner to factor analysis. As pointed out by Chau (1997a), good model fit does not guarantee high construct validity. It is therefore important to have a strong theoretical base in developing a research instrument and a research model. The content validity of the instrument has been discussed in Chapter 4, and is strongly supported by prior relevant literature. Hence only nomological validity remains to be tested in the structural model to conclude the overall construct validity of the research instrument.

5.4 LISREL Path Analysis

5.4.1 Assessment of the Structural Model

Once confidence is gained with respect to the measurement model assessment, the structural model can be evaluated using the Maximum Likelihood method of LISREL. By Moderated Structural Equation Modeling (MSEM) approach using Ping's (1995) procedure, the test on the proposed interaction effects is operationalized as testing the statistical significance of the path coefficients between the interaction variables and the dependent variables. It is suggested that the presence of product terms may lead to violations of the multivariate normality assumption when applying ML estimation (Jaccard and Wan, 1996). Although it is recognized that the multivariate normality restriction may be relaxed due to the large body of the literature supportive of the robustness of ML estimation (Cortina, Chen and Dunlap, 2001), univariate normality tests on the skewness and kurtosis indexes of the introduced product variables, i.e. SNPD and UPEOU, are conducted to gauge their non-normality. The PRELIS output shows that the skewness values of SNPD and UPEOU are 0.591 and 0.264 respectively, both within the recommended threshold of less than 3.0; the kurtosis values of these two variables are 2.530 and 1.299 respectively, both within the

recommended threshold of less than 10.0 (Kline, 1998). In conclusion, the product interaction variables do not show “extreme” non-normality, and thereby the use of MSEM approach is appropriate to analyse the data set in the main study.

The results of the analysis of the structural model are presented in Table 5.13. The fit statistics suggest an overall good fit of the model to the data (chi-square = 102.42, p = 0.58; df = 106, GFI = 0.9, AGFI = 0.94). Seven of the nine hypotheses in the structural model are significant. Figure 5.4 depicts the path coefficients corresponding to the hypotheses in the model.

The explanatory power of the research model is assessed by examining the portion of variance explained. The squared multiple correlations (SMCs), which captures the extent to which the model explains variance in the data set, show that the extended model accounts for 63% of the variance in PU, 77% of the variance in IU, and 43% of the variation in SN. The strength of hypothesized paths is evaluated by standardized path coefficient, ranging from -1 to +1.

Table 5.63 Significance of the Individual Paths

Path	Path Coefficient	t-value	Hypothesis
PU – IU	0.49*	1.94	H1a
PEOU – IU	0.57 **	2.84	H1b
SN – IU	-0.24	-1.29	H1d
PDSN – IU	-0.68**	-2.40	H3
PEOU – PU	0.42 **	3.35	H1c
SN – PU	0.47 **	3.40	H1e
M – PU	0.12	1.19	H4
UPEOU -- PU	0.30 *	1.61	H5
C – SN	0.63 **	4.70	H2

Note: * p-value < 0.05; ** p-value < 0.01; ***p-value < 0.001.

Table 5.14, Table 5.15 and Table 5.16 present the direct, indirect and total effects of the exogenous variables (i.e., independent variables) on the target endogenous construct (i.e., independent variables), which are calculated by the LISREL software. The path coefficient of an independent variable represents the *direct effect* of that variable on the dependent variable. An *indirect effect* represents those effects

interpreted by the intervening variable. The indirect effect is the product of the path coefficients along an indirect route from cause to effect via tracing arrows in the headed direction only. For more than one indirect path, the total indirect effect is their sum. According to Kline (1998), “Indirect effects involve one or more intervening variables that ‘transmit’ some of the causal effects of prior variables onto subsequent variables. (Intervening variables in indirect effects are also called mediator variables).” The *total effect* of a variable on a dependent variable is the sum of the direct and indirect effects (Alwin and Hauser, 1975; Ross, 1975).

Table 5.14 Direct, Indirect, and Total Effects in Predicting Intention to Use

Variables	DIRECT	INDIRECT	TOTAL
Perceived Usefulness	0.49*	-	0.49*
Perceived Ease of Use	0.57 **	0.20 *	0.78 **
Subjective Norms	-0.24	0.23 *	-0.01
Collectivism	-	-0.01	-0.01
Power Distance	-	-	-
Masculinity	-	0.06	0.06
Uncertainty Avoidance	-	-	-
PDSN	-0.68**	0.00	-0.68**
UPEOU		0.15	0.15

Note: * p < 0.05; ** p < 0.01.

Table 5.15 Direct, Indirect, and Total Effects in Predicting Perceived Usefulness

Variables	Direct	Indirect	Total
Perceived Ease of Use	0.42 **	-	0.42**
Subjective Norms	0.47 **	-	0.47**
Collectivism	-	0.30**	0.30**
Power Distance	-	-	-
Masculinity	0.12	-	0.12
Uncertainty Avoidance	-	-	-
PDSN	-	-0.12	-0.12
UPEOU	0.30*	0.15	0.30*

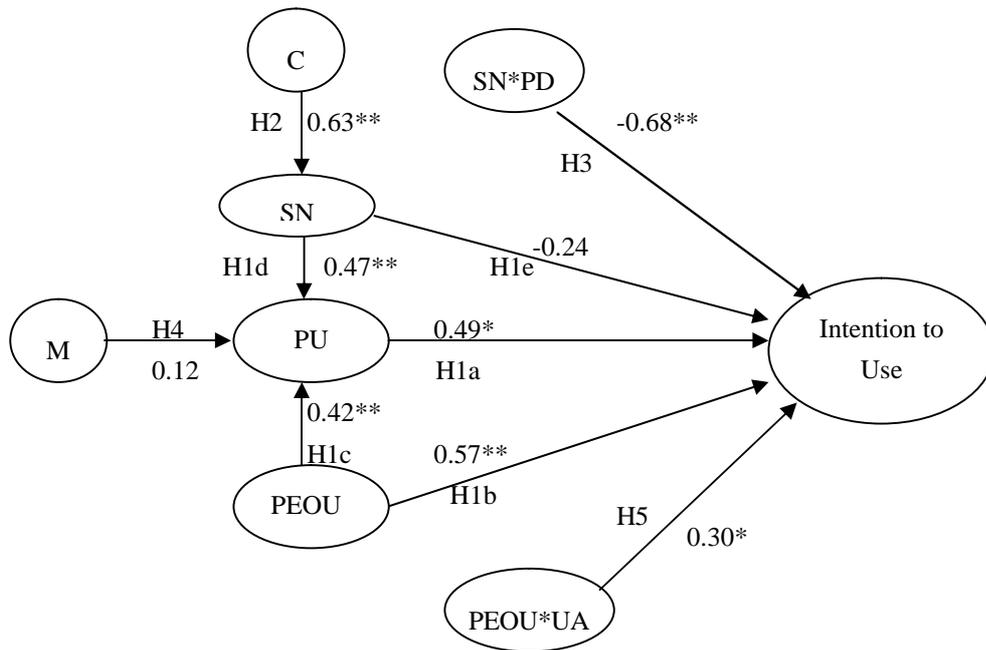
Note: * p < 0.05; ** p < 0.01.

Table 5.16 Direct, Indirect, and Total Effects in Predicting Subjective Norms

Variables	Direct	Indirect	Total
Collectivism	0.63 **	-	0.63**
Power Distance	-	-	-
Masculinity	-	-	-
Uncertainty Avoidance	-	-	-
UPEOU		-	-

Note: * p < 0.05; ** p < 0.01.

Figure 5.4 Results of the Structural Path Model



Notes: n = 302; * p-value < 0.10; ** p-value < 0.05; ***p-value < 0.01.

5.4.2 Explaining Intention to Use (IU)

Table 5.14 shows that both PU and PEOU have a strong direct significant effect on IU ($\beta = 0.49, p < 0.05$; and $\beta = 0.57, p < 0.01$ respectively). However, relative strengths of PU and PEOU in affecting IU are also different from typical TAM studies that find PU outweighs PEOU in influencing IU. In addition, compared to PU, the total effect of PEOU on IU exceeds that of PU. This substantiates the importance of ease of use in order to diffuse email effectively in organizations. In addition, PD is found to interact with the SN – IU relationship ($\beta = -0.68, p < 0.01$) negatively. However, SN did not have significant direct impact on IU, not supporting H1e. The variance of IU explained by the predictors is 77%, higher than the typical amount of variance explained by TAM in prior IS research (i.e., around 50%) (Venkatesh, 1996).

5.4.3 Explaining Perceived Usefulness (PU)

Table 5.15 shows that PEOU and SN have significant direct effects on PU ($\beta =$

0.42 and $\beta = 0.47$ respectively, $p < 0.01$), and the impact of PEOU on PU is interacted positively by UA, suggesting that for individuals with high UA value, PEOU would contribute more to PU than for those with low UA value. In total, 63% of the variance in PU is explained.

5.4.4 Explaining Subjective Norms (SN)

Table 5.16 shows that Collectivist value has a strong positive effect on SN ($\beta = 0.63$, $p < 0.01$). 43% of the variation of SN is explained by collectivist value.

5.4.5 Explaining Cultural Values

Collectivist values are found to have a positive direct significant effect on SN ($\beta = 0.63$, $p < 0.01$), and a significant indirect effect on PU ($\beta = 0.30$, $p < 0.01$) via SN, implying individuals with higher collectivist value perceive a higher social pressure to engage in email use than those with lower collectivist value. PD is found to interact the relationship between SN – IU in a negative direction ($\beta = -0.68$, $p < 0.01$), implying for those with higher PD, SN has less impact on IU than those with lower PD value. Masculine value does not have significant impact on PU. UA is found to have a significant interaction effect on the relationship between PEOU and PU ($\beta = 0.30$, $p < 0.05$). This indicates that individuals who prefer predictability and structured situations would perceive email as more useful due to its ease of use.

Table 5.77 Hypotheses Testing

Hypotheses	Results
H1a: Perceived Usefulness (PU) will positively affect Intention to Use email (IU) in the context of Chinese mainland.	Significant at 0.05
H1b: Perceived Ease of Use (PEOU) will positively affect IU in the context of Chinese mainland.	Significant at 0.01
H1c: PEOU will positively affect PU in the context of Chinese mainland.	Significant at 0.01
H1d: Subjective Norm (SN) will positively affect PU in the context of Chinese mainland.	Significant at 0.01
H1e: SN will positively affect on IU in the context of Chinese mainland.	Not significant
H 2: Collectivism will positively affect SN.	Significant at 0.01
H 3: Power distance will negatively interact the relationship between PU and IU.	Significant at 0.01
H4: Masculinity will positively affect PU.	Not Significant
H5: Uncertainty Avoidance (UA) will positively interact the relationship between PEOU and PU.	Significant at 0.05

Note that the SEM significance test is similar to that of multiple regression. A significant result means that there is a unique contribution from the independent variable. The sign of the regression coefficient tells whether the effect is positive or negative. See Table 5.17 for a summary of hypotheses testing results.

5.4.6 Assessment of Model Fit

There are many different indices to characterize the overall fit between the predicted and observed covariance matrices in a structural equation analysis. There has been little agreement as to which index is best, and rules of thumb have been regarded as pragmatic and have been widely accepted in academic research (Jaccard and Wan, 1996). Typically reported indices used in IS research (Gefen, Straub and Boudreau, 2000; Chau and Hu, 2001) will be selected to measure the model fit for this study. These indices can be conveniently divided into three classes (Jaccard and Wan, 1996). The first class measures absolute model fit by comparing predicted versus observed variances and covariances. The second class adds a penalty function for lack of parsimony to the first class. The third class compares the absolute fit of the model to a competing or alternative model that is either *a priori* specified or imposed

arbitrarily on the data.

The first class includes the chi-square test, the goodness-of-fit index (GFI), and the standardized root mean square residual (Standardized RMR). The research model yields a statistically significant chi-square of 102.42 ($df = 106$, $p=0.58$), with p-value greater than the suggested level of 0.05, indicating very good model fit to data. The chi-square/degrees-of-freedom ratio was 0.97, within the suggested level of 3 (Gefen, Straub and Boudreau, 2000).

The fit of the model to the data can also be judged by GFI and the adjusted goodness-of-fit index (AGFI) obtained through LISREL analysis (Marsh, Balla and McDonald, 1988). GFI is computed based on a ratio of the sum of the squared discrepancies to the observed variances to measure the absolute fit of the combined measurement and structural model to the data. According to the rule of thumb, if GFI exceeds 0.9 then a good fit to the data can be concluded. AGFI adjusts the GFI for degrees of freedom in the model. In this study, GFI is 0.96 and AGFI is 0.94, both above the thresholds for these two indices.

The Standardized RMR (SRMR) index is the average discrepancy between the predicted and observed correlations. The smaller the value of this index, the smaller the deviation between the predicted and observed correlations in terms of correlation units. Generally, a value of less than 0.10 can be judged acceptable. The SRMR for the tested model was 0.038, within the 0.08 threshold of good fit.

The index of the second class of tests to gauge model fit includes the index of RMSEA. RMSEA (Steiger, 1990; Browne and Cudek, 1993). The smaller the value of RMSEA, the better the model fit. RMSEA values less than 0.08 indicates adequate model fit and less than 0.05 implies good model fit (Jaccard and Wan, 1996, p88). The RMSEA in this study is 0, indicating a perfect fit in the population.

The third class includes comparative fit index (CFI), incremental fit index (IFI), normed fit index (NFI) or non-normed fit index (NNFI), all with values above 0.90 indicating good model fit. The NNFI for this research model is 1.00; the CFI is 1.00; IFI is 1.00. The fit statistics suggest a satisfactory fit of the model to data. See Table 5.18 for the LISREL summary statistics of model testing.

Table 5.88 LISREL Summary Statistics

Fit Indices	Value	Threshold
P value	0.58	>=0.05
Chi-square	71.42	-
df	32	-
Chi-square/ df	0.97	<=3.0
Root Mean Square Error of Approximation (RMSEA)	0.0	<=0.10
Goodness-of-fit Index (GFI)	0.96	>=0.90
Adjusted Goodness-of-fit Index (AGFI)	0.94	>=0.80
Standardized RMR	0.038	<=0.08
Non-Normed Fit Index (NNFI)	1.00	>=0.90
Comparative Fit Index (CFI)	1.00	>=0.90
Incremental Fit Index (IFI)	1.00	>=0.90

5.5 Analyses for Alternative Path Models

An alternative model is run to examine the direct effects of the four cultural values on IU for email. Straub, Keil and Brenner (1997) have provided a conceptual framework of cultural effects on email acceptance. Since Straub's framework is an explanatory theory at country level, it is not applied in the model building nor in the empirical test at the individual level. It is therefore not used in the proposed research model. Nevertheless, this cultural framework of email acceptance is tested as an alternative competing model for the purpose of model comparison.

Straub, Keil and Brenner (1997) states that the high cultural value on power distances between managers and workers (high PD), assertiveness in social interactions (high Masculinity), and collectivist and group goals (high Collectivism) will result in a less extensive use of "lean" communication channels such as email that require high social presence in communication. The alternative model thereby hypothesizes that Collectivism, PD, Masculinity and UA have direct negative effect on IU. As an example, in a high PD culture, individuals may show deference to authority

by refraining from using media such as email that do not allow access to a richer set of cues. Similarly, culture with high collectivism would favor media such as face-to-face meeting across all communications tasks, because email may mute the group effect. Additionally, the collectivist emphasis on tradition is also found to limit the extent of new technology transfer (Hofstede, 1980), for example implementing and using new CMC technology (Rice et al., 1998). This is consistent with the belief that people from collectivist cultures prefer richer media for assessment of the social contexts underlying communication (Rice et al., 1998). According to Straub, Keil and Brenner (1997), high masculinity is highly related to interpersonal presence, and thus less socially present media should be less acceptable for individuals with high masculinity, for media with rich interactional cues are necessary for communicating the overall message of the communicator. Straub (1994) argued that cultures with a higher UA index are expected to perceive email as less useful and show less intention to use, since these media are less well suited to uncertainty reduction compared to face-to-face and other rich channels.

The candidate model then hypothesizes that cultural values directly affect an individual's intention to use email. However, results of data analysis reveal that none of the four cultural values has a significant effect on IU. See the Table 5.19 and Table 5.20 for fit indices of the alternative models.

Table 5.99 LISREL Summary Statistics for the Alternative Model 1

Fit Indices	Value	Threshold
P value	0.99	≥ 0.05
Chi-square	51.18	-
df	80	-
Chi-square/ df	0.64	≤ 3.0
Root Mean Square Error of Approximation (RMSEA)	0.0	≤ 0.10
Goodness-of-fit Index (GFI)	0.98	≥ 0.90
Adjusted Goodness-of-fit Index (AGFI)	0.96	≥ 0.80
Standardized RMR	0.027	≤ 0.05
Non-Normed Fit Index (NNFI)	1.05	≥ 0.90
Comparative Fit Index (CFI)	1.00	≥ 0.90
Incremental Fit Index (IFI)	1.05	≥ 0.90

To conclude, findings in the proposed research model contradict the alternative model which was established based on Straub's proposition that culture influences the intention to use email directly. Rather, the proposed research model reveals more complexity in cultural effects on email acceptance. This study finds that cultural values' impact on email adoption is largely mediated through SN, or by interacting salient relationships in the TAM model. Therefore, this study would regard Straub, Keil and Brenner's (1997) framework as a useful discussion on cultural influence rather than as an established model.

In addition, another analysis for paths was carried out to explore potentially overlooked theoretical relationships by examining the modification index (MI) in LISREL output. The distinct significantly large MI in the path model is 11.4 for the path between SN and PEOU. The model modification stopped there, as the LISREL output showed no additional large MI. Adding this path would significantly improve model-data fit. Surprisingly, the LISREL output shows that with this additional path added, the relationship between Masculinity and PU turns out to be positively significant. The impact of Masculinity on PU has been found to be non-significant in the main study. However, the same relationship was found to be significant after data analysis of the pilot study as well as in the comparative analyses of theoretical paths, indicating that the non-significance of the M-PU relationship may be related to problems in the measurement of the masculinity construct.

The significant relationship between SN and PEOU detected through MI was initially believed to be an artifact of data analysis with a lack of theoretical support and therefore should be dropped from the nomological net of the TAM model. However, since the MI in the pilot study also suggests a direct link between SN and PEOU, and adding this path in both pilot and main studies greatly improves the model fit of the proposed research model (see Table 5.20), this study proposes future investigation of this potential theoretical relationship. It is possible that in the case of email acceptance, the users' perceptions about ease of using email would increase in response to the

persuasive social information of SN. According to Markus (1994), the use of email is dependent on “critical mass”. When social actors who are important to the individual are believed to favor and advocate email use, it may implicitly indicate the use experience of these social referents as co-communicators and the existence of “critical mass” of email use in the social setting. This situation can be regarded as a positive external facilitating conditions (Venkatesh, 2000) and is conducive in forming the perception of ease of email use.

Table 5.100 LISREL Summary Statistics for the Alternative Model 2

Fit Indices	Value	Threshold
P value	0.52	≥ 0.05
Chi-square	104.23	-
df	110	-
Chi-square/ df	0.95	≤ 3.0
Root Mean Square Error of Approximation (RMSEA)	0.0	≤ 0.10
Goodness-of-fit Index (GFI)	0.96	≥ 0.90
Adjusted Goodness-of-fit Index (AGFI)	0.94	≥ 0.80
Standardized RMR	0.041	≤ 0.05
Non-Normed Fit Index (NNFI)	1.00	≥ 0.90
Comparative Fit Index (CFI)	1.00	≥ 0.90
Incremental Fit Index (IFI)	1.00	≥ 0.90

5.6 Conclusion

This chapter presents the results of data analysis. Respondent profiles and descriptive data are first summarized. Both factor analysis and CFA are used to analyze the validity and reliability of the measurement scales model, showing acceptable psychological properties for research constructs. Next, the path model is analyzed with the research model providing support to nine of the ten hypotheses. SEM and MSEM approaches applying LISREL techniques are used to examine the structural path model. In addition to the applicability of the TAM framework in the context of Chinese mainland, this study found that cultural values generally have both significant direct and interacting effect on email acceptance. With the exception of the M – PU and the SN – IU links, the results indicate strong support for the proposed relationships among the model constructs, indicating acceptable nomological validity of cultural constructs.

The model exhibits a strong explanatory power with 77% of the variation in IU explained by the model, and up to 63% of the variation in PU explained by PEOU, SN and UPEOU. Collectivism and PD are found to have significant impact on the perceived instrumentality of email, while UA is relevant to the relative weight of PEOU in forming usefulness perception. Unexpectedly, user perceptions of email are not sensitive to masculinity, implying that email may be able to meet the task requirement regardless the typical values of one sex. These findings provide in-depth insights into the role of cultural values in user acceptance, demonstrating that cultural values do contribute to the perceptions leading to email acceptance.

CHAPTER 6 CONCLUSIONS

6.1 Introduction

In this chapter, a discussion of the data analysis results is presented. Contributions and limitations of the study are then examined. Directions for future research are then explored. Finally this chapter presents an overall conclusion of the study.

6.2 Discussion based on Data Analysis Results

The data analysis results show that culture has a significant impact on user acceptance of email as this study proposes. Specifically, Technology Acceptance Model (TAM) generally holds in the research setting of Chinese culture; three out of the four work-related cultural values are found to have either significant direct or interaction effect on user acceptance of email. Details of the relationships among TAM constructs and the relationships between TAM constructs and cultural values are discussed as follows.

6.2.1 Relationships among Technology Acceptance Constructs

When explaining TAM's popularity, Mathieson, Peacock and Chin (2001) pointed out that "the availability of sound instruments is an important property of TAM, since it simplifies the comparison of results across studies and supports cumulative theoretical development". Because it is specially tailored to the setting of technology use and is developed based on review of relevant theories and models, the TAM model has exhibited dominance over other models to explain technology acceptance in the IS literature. For example, in addition to being less parsimonious than TAM and not specific to IS usage, in contrast to TAM's easier application to predict IS usage, TPB requires unique operationalizations in every situation in which it is used (Mathieson, Peacock and Chin, 2001). The simplified TAM2 model is therefore selected as the core theory of this research, so that the investigated

relationships between culture and technology acceptance may possess more universalism.

Recently, Venkatesh et al (2003) pointed out that technology acceptance researchers tend to select a “favored model” to explain technology acceptance behavior, while largely ignore the contributions from alternative models of user acceptance. The authors further proposed a new model as a synthesis of the major user acceptance models. As the key variables and theoretical relationships in the unified model are similar to those of the simplified TAM2 (i.e., TAM and the inclusion of subjective norms), it is reasonable to conclude that the dominance of the TAM based theory is further enhanced by the new model rather than challenged.

Research findings show that relationships among technology acceptance constructs are generally consistent with those found in the TAM and TAM2 models (Venkatesh and Davis, 2000). It therefore can be regarded as supportive evidence of TAM’s applicability across cultures.

6.2.1.1 Antecedents to Intention to Use (IU)

Results shows that the more useful and easy email is perceived to be, the more likely it is that people will use it. The finding that PU has a strong positive direct effect on email acceptance indicates that an email system perceived to be high in instrumentality will lead to a higher acceptance rate. PEOU also has a strong positive direct effect on email acceptance over and above its indirect effect via PU. The link between PU and PEOU is in agreement with prior studies (Davis, 1989; Davis, Bagozzi, and Warshaw, 1989; Venkatesh and Davis, 2000). However, in contrast to prior research (Davis, Bagozzi, and Warshaw, 1989; Davis, 1993) which have found that the total effect of PU is greater than PEOU on IU, this study revealed that PEOU is more important than PU in user acceptance of email, consistent with the findings of Igbaria et al. (1997). This suggests that users in Chinese mainland were driven to accept email primarily on the basis of ease of use, and secondly on instrumentality.

Venkatesh and Davis (2000) hypothesized that the SN – IU link is significant only in a mandatory use setting and SN has no significant impact on IU if the use of the technology are voluntary. However, since the cultural characteristics of Chinese mainland is of strong social influence due to high collectivism and power distance, this study has hypothesized that SN will directly affect IU based on the rationale that “people may choose to perform a behavior, even if they are not themselves favorable toward the behavior or its consequences, if they believe one or more important referents think they should, and they are sufficiently motivated to comply with the referents” (Venkatesh and Davis, 2000). However, the analysis result shows that SN has no significant direct impact on IU. Since the email use in this study is of a voluntary nature, this finding is consistent with Venkatesh and Davis’ (2000) conclusion that in the setting of voluntary IT use, SN has no direct impact on intention to use. This non-significant relationship provides additional evidence to support the proposition that the direct compliance effect of SN on IU does not operate in a voluntary setting (Venkatesh and Davis, 2000) even in a context like the Chinese mainland where social influence is supposed to be strong.

6.2.1.2 Antecedents to Perceived Usefulness (PU)

Consistent with prior research (Davis, Bagozzi, and Warshaw, 1989; Davis, 1993; Igbaria et al., 1997; Venkatesh and Davis, 2000), PEOU and SN have strong positive effects on PU. This suggests how important it is for email to be easy to use and its use to be promoted by important social referents, in order to be perceived useful by users.

This study hypothesized the Masculinity – PU link to be significant because perception of IT usefulness lies essentially in its instrumentality in fulfilling work goals, which is more a concern for individuals with masculine value (Srite, 2000). A technology is seen as useful if it is believed to be able to increase an individual’s job performance and help the individual achieve his or her work goals (Davis, 1989). As work goals are more associated with masculine cultures (Hofstede, 1984), this study

posits masculinity would have a positive direct effect on PU. However, data analysis results show the Masculinity – PU relationship is not supported, indicating that the usefulness of email is not specifically sensitive to the assertiveness of an individual in the context of this study. This implies that usefulness of email is not necessarily greater for those who emphasize work achievement (high masculinity) over those who stress quality of life and environment or personal relationships (low masculinity). This may be due to the fact that email usage includes both task orientation and relationship building orientation (Kettinger, 1997).

Another explanation for this unexpected finding may be that in the main study setting of Shanghai, the assumed correspondence between masculine value and acceptance of distinct sex roles as presumed by Hofstede (1980) does not hold. A close examination of items for the masculinity construct finds that the Masculinity measure proposed by Hofstede actually measures gender differences. Hofstede leaps to a layer of higher abstraction of masculinity based on the fact that the males surveyed have near consistency in emphasizing advancement and earnings over friendly atmosphere and physical conditions. Therefore, agreement to the difference in sex roles captures the masculine values of purchasing advancement and material success. However, in the setting of Shanghai, a city historically famous for its egalitarian view of sex roles, Hofstede's measure for masculine value based on sex role distinction may be problematic, rendering the Masculinity-PU relationship less reliable.

6.2.1.3 Antecedents to Subjective Norms (SN)

This study proposed Collectivism as the antecedents to the SN construct. The findings show that collectivism had a significant effect on subjective norms, indicating that people with higher collectivist values perceived a higher social pressure to engage in email use if their important social referents expect it, than did people with lower collectivist value. It is argued that people with high collectivism may tend to be more conformist and in turn place greater emphasis on the opinions of others. This finding may suggest that an effective way of encouraging email adoption in organizations

where people tend to be collectivists may be through social influence of superiors or peers in the workplace.

This finding is consistent with Earley's (1994) work that states that, in contrast to individualists who sample their social environment through privately referenced information, collectivists base "their self-understanding on the reactions of important others around them" and place great value in interpersonal responsiveness. The opinions of these "important others" forms one's subjective norms for using email. Therefore, when individuals perceive their environment as being favorable to using email, which is reflected through the reactions of other social referents, email will be perceived to be useful because their own use of email as a response sends the message of compliance with the collective or the group.

6.2.1.4 Interacting Relationships

This study proposes two interacting relationships between cultural values on intention to use email. The first posits that PD interacts the relationship between SN and IU, and the second posits that Masculinity interacts with the PEOU-IU relationship. Both interaction effects are found to be significant.

6.2.1.4.1 Power Distance on SN - IU Relationship

Hypothesis 3 posits an interacting effect of PD on the relationship between PU and IU for email based on the reasoning that email use co-varies with relational social influences (Schmitz and Fulk, 1991), and intention to use email could diminish if email use levels off power status for those holding high PD value. The findings support the proposition that the interaction effect of PD on the SN-IU relationship is in a negative direction indicating the higher the level of PD, the less its influence on the SN-IU relationship.

The negative interaction effect found in this study might be explained by the fact that individuals tend to shun activities that are deemed inappropriate in regard to their

power and status in a group (Robinchaux and Cooper, 1998), even if they are persuaded to believe that the activities are useful to them. For individuals with high PD value, email use considered as improper given that communications using email would equalize social status differentials in organizations. Straub, Keil and Brenner (1997) propose that power distance should have a distinct impact on communication patterns. They pointed out that the leveling effect of CMC technology is not seen as a desirable feature in high PD societies, in which individuals would show respect to authority by refraining from using email in the form of simple textual message. Hence, email should be limited by such social norms (Straub, Keil and Brenner, 1997). Therefore, it is reasonable to believe that an individual's perception of PD in workplaces may lead him or her to think that email use is not desirable on the consideration that it may reduce deference to superiors or make superiors feel less authoritative due to its leveling effect on power and hierarchy manifestation (Sarbaugh-Thompson and Feldman, 1998).

The implication of the finding is that despite its widely recognized instrumentality in cost saving and efficiency improvement, email may be perceived as less able to fulfill the desired goal of social interaction for individuals with high PD values. By the same token, one may predict that technologies with equalizing effects would not be as useful to maintain social hierarchical order for individuals with high PD values. In other words, in spite of the effort made by the PRC government to promote the use of CMC technologies in state-owned organizations, which may be regarded as a major source of SN, individual employees may be less willing to use the technologies because of the equalizing effect. This is consistent with some research conclusions that email may have undesirable effects when "rich" communication is needed (Walther, 1995). It can be therefore argued that to better diffuse email use, actual usage by superiors would be more effective in alleviating concerns on the subordinates' part over equalizing or leveling effects.

6.2.1.4.2 UA on PEOU - PU Relationship

Hypothesis 5 posits that UA has positive interacting effect on the relationship between PEOU and PU. The finding shows the hypothesized interaction effect is supported. It has been suggested that PEOU can be equated with freedom from efforts and anxiety, which is more of a concern for those with high uncertainty avoidance value. According to Davis (1989), if a technology is easy to use, it would be pleasant and comfortable to work with and in turn be more useful in improving job performance. Venkatesh (2000) found PEOU to be more associated with anxiety reduction, which is part of the psychological property of uncertainty avoidance. The positive interacting effect of UA on the PEOU-PU relationship suggests that, in the process of email adoption, the greater the reduction in uncertainties and resultant anxieties, the more email will be perceived to be useful because of its ease of use.

6.2.2 Discussion of Relationships by Cultural Values

This section will draw some general conclusions about the significant relationships regarding each of the four cultural values – Collectivism, Power Distance (PD), Masculinity and Uncertainty Avoidance (UA).

6.2.2.1 Collectivism

A direct relationship was hypothesized between collectivism and subjective norms, such that collectivists would be affected more by subjective norms to use email than the individualists. This hypothesis was developed based on the relationship orientation nature of collectivism and the resultant conformity tendency. Individuals high in Collectivist value were found to be more subject to social influence over email use.

Collectivism is found to significantly relate to SN, which mediates the influence of collectivist value on PU. That is to say, the higher an individual's collectivist value, the greater his or her concerns about SN of using email, and in turn the more useful is email perceived to be.

This reasoning is echoed by Bochner's (1994) proposition that collectivists will more likely be "sensitive to the demands of their social context and more responsive to the assumed needs of others", and that behaviors that disrupt harmony are not desirable. In regard to email use for coalition-building (Romm and Pliskin, 1998), it is also reasonable to believe that through SN of using email, the collectivist individual may perceive email as useful. In contrast to some general belief that email has negative social effects (Markus, 1994b) due to its filtering of social cues and therefore dehumanizing communication, Walther (1995) demonstrates that CMC can support positive relational communication between people.

However, with regard to the significant impact of Collectivism on PU via the mediation of SN, the counter argument may be that the usefulness perception of email may be over-ridden by other characteristics such as social influence. In order to keep harmony and avoid conflicts caused by the IT-induced power redistribution in organizations, the introduction of new information technology will tend to be resisted (Ping and Grimshaw, 1992). Straub (1997) posited that culture with high collectivism would tend to use media such as face-to-face meeting across all communication tasks, as opposed to email, since the lack of social presence in email may mute the group effect.

It is also argued that the lack of social cues in email may reduce its perceived usefulness to individuals with higher collectivist value. For example, the lack of cues in email may lead to an increase in inaccurate communications for individuals who are significantly different in collectivist value (Ross, 2001), and thus reduce the usefulness of email as a communication medium in the work place. Rice et al. (1998) also found that people with high collectivist values prefer richer and synchronous media, because of their greater emphasis on traditional uses of time, and the need for evaluating the contexts underlying communication. Email, regarded as a partial communication channel, is therefore viewed as less capable of improving communication performance

and in turn seen to be lower in its instrumentality. Hence for those with higher Collectivist value, Collectivism's significant effect on PU mediated by SN indicates that the inadequacy of email's social presence and information richness may be offset by the tendency to keep harmony with social norms.

This finding provides evidence to clarify the myth that the perception of email usefulness is necessarily unfavorable in collectivist culture due to its limitation in social role (Straub, Keil and Brenner, 1997). For example, Hofstede (1980) believes that collectivism's emphasis on tradition may limit the extent of new technology transfer. Rice et al. (1998) also propose that the diffusion of new computer-based communication media might be subject to this cultural constraint.

This study finds that email use is not necessarily undesirable in collectivist culture. Rather, if important social actors favor email use, through compliance to SN, email will be perceived to be useful in maintaining harmony. For example, if the important social actors in an organization are enthusiastic about promoting organizational email diffusion, to comply with superiors' expectation or the subjective norms to use email, individuals high in collectivist value would see email as useful for social relationship building.

The study also implies that email can be better accepted if the impact of potential barriers can be alleviated via the support of important social actors in organizations. In an environment where collectivism is the central tendency, the intention of superiors, as a source of subjective norms, to diffuse email use will be effective. It is therefore possible that for organizations in a collectivist culture, if the superiors use email at work, then it is very likely employees would perceive email as more useful and result in a better organizational acceptance of email. In such a situation, social environment plays a more prominent role, and email is viewed as beneficial for relationship building and maintaining harmony through compliance with superiors.

6.2.2.2 Power Distance

Power distance is found to have a negative interacting effect on the SN-IU relationship. The finding reveals that the interaction effect of PD on SN-IU is of lower magnitude among individuals with higher PD value than those lower in this value. There is strong evidence that concern over equalizing effect more than offset the positive influence of SN on IU for those individuals with high PD values. However, more research in the area is needed to further assess the interaction effects of PD and to better understand the complex interplay of the two opposing effects.

Although the proposition that PD interacts with the SN-IU relationship is backed by both theoretical and empirical support, there is disagreement over the direction of the interacting effect. As some of the prior studies indicate, individuals with higher PD perception tend to perceive the views of higher status individuals to be superior to their own (Tung and Quaddus, 2002). In other words, the acceptance of unequal power distribution implies an acceptance of substituting the decisions of an authority over the decisions of the individual (Wong and Birnbaum-More, 1994). Therefore, the higher the PD value one holds, the stronger will be the referents' influence on the individual, which indicates a greater role of SN in one's perception of email usefulness. In other words, an individual's PD value could interact positively with the effect of SN on IU of email use in an organizational setting.

6.2.2.3 Masculinity

A non-significant relationship is found between masculinity and perceived usefulness of email. This non-significant relationship suggests that the usefulness perceptions of email are probably not sensitive to the masculine values of individuals. In other words, individuals with high levels of masculine value and those with low levels of masculine value are equally likely to perceive email as useful.

In this study, we have assumed that the more one holds masculine value, the higher the level of usefulness one would perceive for email. However, this proposition

is not supported in this study. In the setting of this study, an individual holding higher masculine value does not necessarily have a more favorable perception of email as effective in improving their work performance in their work place. It can also be argued that in the context of Chinese mainland, the instrumentality of email is seen as low and it is thus less preferred by those who seek to achieve their material goals in organizations. This finding is supportive of Information Richness Theory (IRT) and Social Presence Theory (SPT).

For convenience of reference, the attribute on the opposite pole to masculinity is referred to as femininity (Hofstede, 1980), which is more concerned with maintaining personal relationships. The research finding that email has both task usage and social usage (Kettinger, 1997) may provide some explanation for the non-significant relationship. While masculine individuals may use email for improving task performance, the feminine individuals may use it and support relationship building and improve the quality of the work environment. Email could be perceived as useful to both groups.

This unexpected finding may be due to poor correspondence between the measurement items and the underlying concepts of masculine value. According to Srite (2000), the items in Hofstede's Value Survey Module (VSM) measures actually gender differences rather than directly measuring masculine value. He points out that Hofstede has made an inferential leap when he proposes that these items measure work-related values, but it is not clear how closely gender roles correspond to work values. According to Hofstede (1980), masculine value is exhibited if people have a clear impression of the different roles of sexes, and this masculine value presents an achievement orientation. However, in the metropolis of Shanghai known as the economic center of Chinese mainland, the female role has not been as distinct from male role as expected by the traditional social norms. As females have played an important role in the development of light industry in Shanghai and their income has been an important source of support to their families, it is likely that both sexes in

Shanghai emphasize work fulfillment. Since the instrument is designed to assess people's views on sex role expectation in society, the masculine attributes such as material success may fail to be derived from the measuring items.

6.2.2.4 Uncertainty Avoidance

The proposition that uncertainty avoidance (UA) interacts with the relationship between PEOU and PU is supported in this study. Individuals high in UA would be more likely to perceive email as useful due to ease of use as compared to those low in UA. Davis et al (1989) described the relationship between PEOU and PU as the relationship between the two basic mechanisms influencing IT usage behavior: self-efficacy and instrumentality. Specifically, improvements in PEOU can be instrumental and contribute to increasing users' performance, because effort saved due to improved PEOU may be reallocated to enable a person to accomplish more work for the same effort. Hence, TAM posits that to the extent that increased PEOU contributes to improved performance, PEOU would have a direct effect on PU. This study hypothesizes that the direct relationship between PEOU and PU or the contribution of PEOU to PU, will be dependent of one's tendency to reduce uncertainty, or in other words, be interacted by one's cultural value in UA.

The findings suggest that uncertainty avoidance is relevant to the PEOU-PU relationship. The theoretical underpinnings for such a link can be drawn from anxiety theory which illustrates the relationship between stress and effort allocation. PEOU refers to the degree to which a person believes that using a particular system would be free of effort, defined as a finite resource that a person may allocate to the various activities for which her or she is responsible. Anxiety, typically, has an adverse effect on the attention devoted to the task at hand since attentional resources will be directed to the off-task activity of anxiety reduction, thus increasing the effort required to accomplish tasks (Venkatesh, 2000). Hence, given that PEOU is an individual judgment about the ease of behavioral performance based on effort, the instrumentality of perceived usefulness deriving from the perceived ease of use will be

more important for individuals who have higher levels of anxiety. Less effort or higher perceived ease of use could reduce stress or anxiety. Individuals with high level of uncertainty avoidance are usually subject to a higher level of anxiety than those with lower levels of uncertainty avoidance (Hofstede, 1984). The contribution of PEOU to PU would be more significant for high UA individuals than low UA individuals.

6.3 Limitations

As with any research, this study has several limitations. A major limitation lies in the sampling frame which may not be representative of the population since copies of the questionnaire were distributed to bank employees based on their agreement to participate in this study. Since a systematic random sampling approach was not applied, the research finding should be interpreted with caution to avoid generalizing to other populations without justification or further empirical test.

In addition, this study has employed a single method to investigate the relationship between cultural values and technology acceptance. Future research could use a variety of methodologies (interviews, qualitative methods, longitudinal study, etc.) to understand culture-technology relationship. In addition, beliefs and values are not necessarily static, and this cross-sectional study might have left out some features of technology adoption within organizations, such as the influence of experience, changes in pre-adoption and post-adoption, and distinguishing near-term versus long-term perceptions. For example, longitudinal studies that examine how the relationship between cultural values and email acceptance beliefs alters over time would provide more rigorous evidences to validate proposed relationships.

Another limitation is that the breadth of exploration of cultural impact is limited to Hofstede's four cultural values. Other cultural factors may also influence email acceptance. For example, cultural attributes of the Chinese language may place email at a disadvantage because it is difficult to use computer keyboards to represent a large number of characters.

6.4 Contributions to Research

Since cultural differences have been observed in IS user acceptance research, the lack of cultural orientation in TAM risk neglecting an important aspect of technology user acceptance. The present study extends researchers' call for more rigorous and empirical cultural IS studies to examine culture's influence on user technology acceptance explicitly at the micro level. This study makes a number of contributions to the body of knowledge in the IS area. See Table 6.1 for a comparison of the major cultural TAM studies.

First, this research advances TAM by integrating two theoretical streams of research – technology acceptance theories and cultural theories. Cultural values are found to have either direct effects or interacting effects on user acceptance of email. This allows researchers to make *a priori* predictions of CMC technology acceptance in different cultures based on the revealed links between culture and CMC adoption. There have been very few studies examining the role of cultural values in CMC technology acceptance using a multi-discipline approach. This integration is particularly relevant in the face of growing globalization and multiculturalism.

Considering the enormous global IT transfer, the omission of cultural variables in TAM has been one of its major deficiencies. Without considering cultural influence in the model, the generalizability of TAM to cultures other than those in North America is problematic. In addition to the contribution to the theoretical base of TAM's applicability in different cultural contexts, this study also contributes to communication research in identifying the cultural elements involved. The findings reveal how individuals with varying cultural values accept a CMC technology, therefore allowing researchers to make *a priori* predictions of technology acceptance behaviors in different cultures provided the cultures are classified according to Hofstede's dimensions.

For example, for users with high collectivism, subjective norms is an effective mediator of email acceptance. Therefore, stressing email as a practice of the majority in the organization could be effective to improve its usefulness perception. Particularly, if the organizational culture reflects Collectivism as a central tendency, diffuse email use as a collective norm of that organization will increase employees' perception of email usefulness. However, for individualists, the measure may not hold effective. While for individuals with high PD, an organization culture believing that email use does not level off status differences would be effective to improve email acceptance, because the interaction effect of PD on SN-IU relationship is of lower magnitude among individuals with higher PD value.

A positive relationship between Masculinity and PU is not supported in this study. Since the perceived instrumentality of email is not particularly sensitive to masculine value, it may be inferred that email is equally likely be accepted regardless of whether the individuals emphasize on work performance (high masculinity) or relationship building (low masculinity). For individuals with high uncertainty avoidance, emphasis on the ease of email use would be effective in increasing perceived usefulness of email.

Furthermore, this study contributes to the development of instruments for measuring cultural values at the individual level. These validated measurement scales could be replicated in future cultural research. The comprehensive validation of scales measuring cultural values contributes to the systematic study on the interaction of culture and IT acceptance at the micro-level. The process undertaken in both the pilot study and the main study indicates that the modified instrument possesses relatively satisfactory psychometric properties. In addition, the use of Moderated Structural Equation Modelling (MSEM) approach using Ping's (1995) technique is among the first of such work in the area to detect and analyse interaction effects. This could be a significant step for future cultural IS study, which has long been considered as piecemeal and confusing due to the unavailability or inefficiency of good

measurements of culture and a lack of vigorous methods to examine culture's moderating effect on IT acceptance.

Table 6.1 A Comparison of Published Cultural TAM Studies and this Study

	Straub (1994)	Straub et al (1997)	Robichaux & Cooper (1998)	This Study
Research type	Survey	Survey	Conceptual	Survey
Research context	Email use in the US & Japan	Email use in the US, Switzerland & Japan	GSS participation	Email use
Theories based	TAM and Hofstede's framework	TAM and Hofstede's framework	TAM and Hofstede's framework	TAM and Hofstede's framework
Use of culture	Providing explanations for the differences in email use	Providing predictions on TAM's cross-cultural applicability	Cultural dimensions explaining differences in the ability of GSS to increase participation	Cultural values are posited to be either antecedents or moderators of email acceptance constructs
Instrument measuring culture	Country as the proxy of culture	Country as the proxy of culture	N/A	Cultural values measured at individual level, adapting from Hofstede's work
Data analysis Method	Regression	Regression	N/A	Moderated Structural Equation Modeling
Research findings	Cultural differences seem to explain differences in email acceptance in the two cultures.	TAM holds for both the US and Switzerland but not for Japan.	The level at which a group lies on the cultural dimensions can significantly impact the ability of GSS to increase participation.	Cultural values are found to be either antecedents or moderators of email acceptance constructs

6.5 Contributions to Practice

Findings of this study have some important managerial implications. In general, this study shows that cultural values have significant impact on user technology acceptance through direct effects or interacting effects. Organizations can take corresponding management action to facilitate technology diffusion based on the role of cultural values in technology acceptance. Pre-adoption assessment of IT implementation can be made in the process of cross-cultural global technology transfer. For example, when individuals with high uncertainty avoidance consider email to have little utility, design and training practice stressing the friendly user interface and ease

of use may avert that unfavorable impression of the technology. Although managers may know the existence of cultural influence implicitly, they should gain more insight into the delineated cultural aspects of email acceptance.

Cultural awareness should be part of the training process for IT managers and planners. For example, in an organization where collectivism is the central tendency, group-based training and round-table discussions might be beneficial for the diffusion of the CMC technology. If an individualist tendency dominates the organization, then mandates from top management to use email may not be effective. Moreover, the implication of the finding that reactions to CMC technology implementation can have cultural variations is that resistance to email use may signal some cultural dimension that needs to be addressed.

The studied cultural perspective of user acceptance also provides practical implications for businesses to enhance technology acceptance in Chinese culture. This contribution is especially important for IT implementation in non-western economies which have substantial cultural differences from Western developed countries. In the context of Chinese mainland, which is characterized as a culture of high power distance and high collectivism, support from top management may be an effective way to encourage IT adoption and use, because the norms of email use will prevail if they represent the norms of the power elite or of the collective.

Accordingly, to facilitate organizational email diffusion, the following guideline may be conducive. First, the implementation of an organizational email system should consider cultural factors affecting acceptance. If collectivism or PD is the central tendency of the organization, then email use by superiors or peers would enhance the usefulness perception and intention to use the system. Training on the etiquette of social email writing, which could increase the information richness of email in a high context culture, could be an effective way to replicate a flavor of social cues as relational trust grows. Second, create a comfort level for email use. For example,

when pursuance of clear rules and uncertainty avoidance dominates organizational work practice and style, a clear organizational norm on email use is desirable. This could be in the form of a brochure depicting the legal effectiveness of email files, the maintenance of such files and accessibility of external support, etc. Finally, an organization may encourage email use as a supplement for social relationship building. The cost-effectiveness and efficiency instrumentality of email renders it a useful tool to enable continuous contact, so email should be viewed as a support to, but not a substitute for, other communication channels.

6.6 Directions for Future Research

The study could be replicated in different countries to assess the validity of the identified relationships between cultural values and user technology acceptance. In addition to reevaluation for their cross-cultural applicability, current technology acceptance theories should extend their research model to include cultural factors as possible explanatory variables, or take the influence of the cultural setting of the research into consideration. Other aspects of culture could also be examined for their possible impact on technology acceptance, such as gender, language, organizational culture, and etc. Moreover, different CMC technologies other than email could be investigated based on replications of this research to test the validity of the identified theoretical relationships.

The second area lies in the development of a scale to measure cultural values, particularly the masculine value. The present study used items developed by Hofstede (1980). However, the measure exhibits less than ideal nomological validity. The main reason may be the inferential leap in Hofstede's (1980) instrument between gender role and masculine values. However, this inference may not hold true after two decades' evolution in cultural values, since whether attitudes towards gender role actually capture masculinity and femininity remains to be an empirical research question to be answered in the changed environment.

In addition, personal traits other than the cultural values identified by Hofstede may need to be included in the TAM model. The relationships among cultural, societal or personal values and technology adoption could be further explored with more depth and breadth based on the extended TAM model, so that more specific findings could be derived as basis for management intervention to tackle culture-based resistance to CMC technology.

Furthermore, future research may examine the interplay between different levels of culture based on Straub's Theory-based View of Culture. For example, this study focuses on cultural values at the individual level, while the influence of organizational cultural and regional cultural norms on technology acceptance could be a good qualitative study topic. Finally, multi-method research would be applied to investigate the cultural impact on technology adoption. As mentioned, qualitative studies or longitudinal studies could provide more insights into the complexity of the culture-technology interaction.

6.7 Conclusion

This study examines the influence of cultural values on email acceptance in the Chinese mainland based on the TAM model. By incorporating elements from the TAM2 model together with Hofstede's cultural theory, this study investigates the direct and interaction effects of cultural values of user perceptions on email acceptance. The findings support seven of the nine hypothesized relationships.

A structural equation model examining the role of cultural values on user intention to use email was proposed and tested. TAM was expanded by incorporating direct and interaction effects of cultural values in the research model. The findings reveal that cultural values have significant indirect and interaction effect on intention to use email, and the salient TAM beliefs mediated the effect of cultural factors on user acceptance to email. The findings indicate that perceived usefulness (PU), perceived ease of use (PEOU) and subjective norms (SN) are key intervening variables linking cultural

influence with user Intention to Use email (IU).

The findings generally suggest that some aspects of user acceptance and usage behavior may be universal across cultures while others may be subject to significant cultural influence. This study contributes to the IS literature in that it overcomes the limitations of prior exploratory studies and explicitly establishes a theoretical link between cultural factors and technology adoption with empirical support. This goal is achieved by directly measuring the cultural values at an individual level. In addition, this study is the first to utilize the MSEM approach to explore the interaction effects of cultural influence on technology adoption. As one of the first attempts to study the TAM model's applicability in the context of Chinese mainland, the knowledge obtained from this study should help IS researchers and practitioners better understand cultural influence in CMC technology diffusion in an eastern transitional economy. This understanding should provide in-depth insight for effective CMC technology adoption in different cultural contexts.

Appendix A Items Organized by Construct (Pilot Test Items)

Behavioral Intention to Use

1. Assuming I have access to email, I intend to use it.
2. Given that I have access to email, I predict that I would use it.

Perceived Usefulness

1. Using email improves my performance in my job.
2. Using email in my job increases my productivity.
3. Using email enhances my effectiveness in my job.
4. I find email to be useful in my job.

Perceived Ease of Use

1. My interaction with email is clear and understandable.
2. Interacting with email does not require a lot of my mental effort.
3. I find email to be easy to use.
4. I find it easy to get email to do the work I want it to do.

Subjective Norm

1. People who influence my behavior think that I should use email.
2. People who are important to me think that I should use email.

Collectivism

1. Being accepted as a member of a group is more important than having autonomy and independence on the job.
2. It is more important for a manager to encourage loyalty and a sense of duty in subordinates than it is to encourage individual initiative.
3. Individual rewards are not as important as group welfare.
4. Group success is more important than individual success.
5. I prefer to have a job which leaves me sufficient time for my personal or family life.
6. I prefer to have considerable freedom to adopt my own approach to the job.
7. I prefer to have challenging work to do—work from which you can achieve personal sense of accomplishment.
8. I prefer to have training opportunities to improve my skills or learn new skills.
9. I prefer to have good physical working conditions.
10. I hope I can fully use my skills or abilities on the job.

Power Distance

1. A manager should perform work which is difficult and important and delegate tasks which are repetitive and mundane to subordinates.
2. Higher level managers should receive more benefits and privileges than lower

level managers and professional staff.

3. Managers should be careful not to ask the opinions of subordinates too frequently, otherwise the manager might appear to be weak and incompetent.
4. Managers should make most decisions without consulting subordinates.
5. Employees should not question their manager's decisions.

Masculinity

1. It is more important for men to have a professional career than it is for women to have a professional career.
2. Women do not value recognition and promotion in their work as much as men do.
3. It is preferable to have a man in high level position than a woman.
4. There are some jobs in which a man can always do better than a woman.
5. It is preferable to have a man in a high level position than a woman.
6. As for an ideal job, it is important to have an opportunity for high earnings.
7. As for an ideal job, it is important to get the recognition I deserve when I do a good job.
8. As for an ideal job, it is important to have an opportunity for higher jobs.
9. As for an ideal job, it is important to have a good relationship with direct superior.
10. As for an ideal job, it is important to work with people who cooperate well with one another.
11. As for an ideal job, it is important to have the security that I will be able to work for my company as long as I want to.

Uncertainty Avoidance

1. It is important to have job requirements and instructions spelled out in detail so people know what they are expected to do.
2. It is better to have a bad situation that I know about, than to have an uncertain situation that might be better.
3. Providing opportunities to be innovative is more important than requiring standardized work procedures.
4. Rules and regulations are important because they inform workers what the organization expects of them.
5. People should avoid making changes because things could get worse.
6. I often feel nervous or tense at work.
7. Company rules should not be broken, even when the employees think it is in the company's best interest.

Appendix B Revised Items Organized by Construct

Behavioral Intention to Use

1. Assuming I have access to email, I intend to use it.
2. Given that I have access to email, I predict that I would use it.

Perceived Usefulness

1. Using email improves my performance in my job.
2. Using email in my job increases my productivity.
3. Using email enhances my effectiveness in my job.
4. I find email to be useful in my job.

Perceived Ease of Use

1. My interaction with email is clear and understandable.
2. Interacting with email does not require a lot of my mental effort.
3. I find email to be easy to use.
4. I find it easy to get email to do the work I want it to do.

Subjective Norm

1. People who influence my behavior think that I should use email.
2. People who are important to me think that I should use email.

Collectivism

1. Being accepted as a member of a group is more important than having autonomy and independence on the job.
2. It is more important for a manager to encourage loyalty and a sense of duty in subordinates than it is to encourage individual initiative.
3. Individual rewards are not as important as group welfare.
4. Group success is more important than individual success.

Power Distance

1. A manager should perform work which is difficult and important and delegate tasks which are repetitive and mundane to subordinates.
2. Higher level managers should receive more benefits and privileges than lower level managers and professional staff, since superiors are of a different kind.
3. Managers should be careful not to ask the opinions of subordinates too frequently, otherwise the manager might appear to be weak and incompetent.
4. Managers should make most decisions without consulting subordinates, because managers should look powerful and authoritative.
5. Employees should not question their manager's decisions.

Masculinity

1. It is more important for men to have a professional career than it is for women to have a professional career.
2. Women do not value recognition and promotion in their work as much as men do.
3. It is preferable to have a man in high level position than a woman.
4. There are some jobs in which a man can always do better than a woman.
5. It is preferable to have a man in a high level position than a woman.

Uncertainty Avoidance

1. It is important to have job requirements and instructions spelled out in detail so people know what they are expected to do.
2. It is better to have a bad situation that I know about, than to have an uncertain situation that might be better.
3. Providing opportunities to be innovative is more important than requiring standardized work procedures.
4. Rules and regulations are important because they inform workers what the organization expects of them.
5. People should avoid making changes because things could get worse.

Appendix C Instrument Used in Pilot Study

Measurement Model				
No.	Construct	Operational Definition	Measurement Items	Validated by
1	Intention to Use (IIU)	A measure of the strength of one's willingness to perform a specified behavior (Fishbein and Ajzen, 1975).	<ol style="list-style-type: none"> 1. Assuming I have access to email, I intend to use it. 2. Given that I have access to email, I predict that I would use it. 	Venkatesh, 2000
2	Perceived Usefulness (PU)	The degree to which a person believes that using a particular technology will enhance his or her job performance (Davis, 1989).	<ol style="list-style-type: none"> 1. Using email improves my performance in my job. 2. Using email in my job increases my productivity. 3. Using email enhances my effectiveness in my job. 4. I find email to be useful in my job. 	Davis, 1989
3	Perceived Ease of Use (PEOU)	The degree to which a person believes that using a technology will be free of effort (Davis, 1989).	<ol style="list-style-type: none"> 1. My interaction with email is clear and understandable. 2. Interacting with email does not require a lot of my mental effort. 3. I find email to be easy to use. 4. I find it easy to get email to do the work I want it to do. 	Davis, 1989
4	Subjective Norms (SN)	A person's perception that most people who are important to him think he should or should not perform the behavior in question (Fishbein and Ajzen, 1975).	<ol style="list-style-type: none"> 1. People who influence my behavior think that I should use email. 2. People who are important to me think that I should use email. 	Venkatesh, 2000

Measurement Model				
No.	Construct	Operational Definition	Measurement Items	Validated by
5	Collectivism (C)	Collectivism is the degree to which people focus more on working together in groups rather than working as individuals (Hofstede, 1994).	<ol style="list-style-type: none"> 1. Being accepted as a member of a group is more important than having autonomy and independence on the job. 2. It is more important for a manager to encourage loyalty and a sense of duty in subordinates than it is to encourage individual initiative. 3. Individual rewards are not as important as group welfare. 4. Group success is more important than individual success. 5. I prefer to have a job which leaves me sufficient time for my personal or family life. 6. I prefer to have considerable freedom to adopt my own approach to the job. 7. I prefer to have challenging work to do—work from which I can achieve personal sense of accomplishment. 8. I prefer to have training opportunities to improve my skills or learn new skills. 9. I prefer to have good physical working conditions. 10. I hope I can fully use my skills or abilities on the job. 	To be validated
6	Power Distance (PD)	The extent to which inequality of power distribution is seen as irreducible fact of life (Hofstede, 1984).	<ol style="list-style-type: none"> 1. A manager should perform work which is difficult and important and delegate tasks which are repetitive and mundane to subordinates. 2. Higher level managers should receive more benefits and privileges than lower level managers and professional staff. 3. Managers should be careful not to ask the opinions of subordinates too frequently, otherwise the manager might appear to be weak and incompetent. 4. Managers should make most decisions without consulting subordinates. 5. Employees should not question their manager's decisions. 	To be validated

Measurement Model				
No.	Construct	Operational Definition	Measurement Items	Validated by
7	Masculinity (M)	The extent of emphasis on work goals (earnings, advancement) and assertiveness, as opposed to personal goals and nurturance (Hofstede, 1984).	<ol style="list-style-type: none"> 1. It is more important for men to have a professional career than it is for women to have a professional career. 2. Women do not value recognition and promotion in their work as much as men do. 3. It is preferable to have a man in high level position than a woman. 4. There are some jobs in which a man can always do better than a woman. 5. It is preferable to have a man in a high level position than a woman. 6. As for an ideal job, it is important to have an opportunity for high earnings. 7. As for an ideal job, it is important to get the recognition I deserve when I do a good job. 8. As for an ideal job, it is important to have an opportunity for higher jobs. 9. As for an ideal job, it is important to have a good relationship with direct superior. 10. As for an ideal job, it is important to work with people who cooperate well with one another. 11. As for an ideal job, it is important to have the security that I will be able to work for my company as long as I want to. 	To be validated

Measurement Model				
No.	Construct	Operational Definition	Measurement Items	Validated by
8	Uncertainty Avoidance (UA)	The degree to which members of a society feel uncomfortable with uncertainty and ambiguity (Hofstede, 1980).	<ol style="list-style-type: none"> 1. It is important to have job requirements and instructions spelled out in detail so people know what they are expected to do. 2. It is better to have a bad situation that I know about, than to have an uncertain situation that might be better. 3. Providing opportunities to be innovative is more important than requiring standardized work procedures. 4. Rules and regulations are important because they inform workers what the organization expects of them. 5. People should avoid making changes because things could get worse. 6. I often feel nervous or tense at work. 7. Company rules should not be broken, even when the employees think it is in the company's best interest. 	To be validated

No.	Notation	Construct	Source
1	BI	Behavioral Intention to Use (BI)	TAM
2	I	Individualism (I)	Cultural values
3	M	Masculinity (M)	Cultural values
4	PD	Power Distance (PD)	Cultural values
5	PEOU	Perceived Ease of Use (PEOU)	TAM
6	PU	Perceived Usefulness (PU)	TAM
7	SN	Subjective Norms (SN)	TAM
8	UA	Uncertainty Avoidance (UA)	Cultural values

Appendix D Questionnaire for Pilot Study

Instructions:

The purpose of this study is to examine *intraorganizational usage of E-mail*. Please answer all questions to the best of your ability. There are no right or wrong answers. What matters is your personal opinion.

The survey should take approximately 15 minutes.

Intraorganizational usage of E-mail include coordinating project activities, negotiations/bargaining, information exchange, brainstorm, conflicts/disagreements resolution, progress on projects, feedback on reports and ideas.

Thank you for taking the time to complete this survey.

Part One								
No.	Questions	Strongly Disagree		Neutral		Strongly Agree		
UA Uncertainty Avoidance								
1	It is important to have job requirements and instructions spelled out in detail so people know what they are expected to do.	1	2	3	4	5	6	7
2	It is better to have a bad situation that I know about, than to have an uncertain situation that might be better.	1	2	3	4	5	6	7
3	Providing opportunities to be innovative is more important than requiring standardized work procedures.	1	2	3	4	5	6	7
4	Rules and regulations are important because they inform workers what the organization expects of them.	1	2	3	4	5	6	7
5	People should avoid making changes because things could get worse.	1	2	3	4	5	6	7
6	I often feel nervous or tense at work.	1	2	3	4	5	6	7
7	Company rules should not be broken, even when the employees think it is in the company's best interest.	1	2	3	4	5	6	7
B Power Distance								
1	A manager should perform work which is difficult and important and delegate tasks which are repetitive and mundane to subordinates.	1	2	3	4	5	6	7
2	Higher level managers should receive more benefits and privileges than lower level managers and professional staff.	1	2	3	4	5	6	7

Part One								
No.	Questions	Strongly Disagree		Neutral		Strongly Agree		
3	Managers should be careful not to ask the opinions of subordinates too frequently, otherwise the manager might appear to be weak and incompetent.	1	2	3	4	5	6 7	
4	Managers should make most decisions without consulting subordinates.	1	2	3	4	5	6 7	
5	Employees should not question their manager's decisions.	1	2	3	4	5	6 7	
C Collectivism								
1	Being accepted as a member of a group is more important than having autonomy and independence on the job.	1	2	3	4	5	6 7	
2	It is more important for a manager to encourage loyalty and a sense of duty in subordinates than it is to encourage individual initiative.	1	2	3	4	5	6 7	
3	Individual rewards are not as important as group welfare.	1	2	3	4	5	6 7	
4	Group success is more important than individual success.	1	2	3	4	5	6 7	
5	I prefer to have a job which leaves me sufficient time for my personal or family life.	1	2	3	4	5	6 7	
6	I prefer to have considerable freedom to adopt my own approach to the job.	1	2	3	4	5	6 7	
7	I prefer to have challenging work to do- work from which I can achieve personal sense of accomplishment.	1	2	3	4	5	6 7	
8	I prefer to have training opportunities to improve my skills or learn new skills.	1	2	3	4	5	6 7	
9	I prefer to have good physical working conditions.	1	2	3	4	5	6 7	
10	I hope I can fully use my skills or abilities on the job.	1	2	3	4	5	6 7	
M Masculinity/Femininity								
1	It is more important for men to have a professional career than it is for women to have a professional career.	1	2	3	4	5	6 7	
2	Women do not value recognition and promotion in their work as much as men do.	1	2	3	4	5	6 7	
3	It is preferable to have a man in high level position than a woman.	1	2	3	4	5	6 7	
4	There are some jobs in which a man can always do better than a woman	1	2	3	4	5	6 7	
5	It is preferable to have a man in a high level position than a woman	1	2	3	4	5	6 7	
6	As for an ideal job, it is important to have an opportunity for high earnings.	1	2	3	4	5	6 7	
7	As for an ideal job, it is important to get the recognition I deserve when I do a good job.	1	2	3	4	5	6 7	
8	As for an ideal job, it is important to have an opportunity for higher jobs.	1	2	3	4	5	6 7	

Part One										
No.	Questions	Strongly Disagree	1	2	3	4	5	6	7	Strongly Agree
9	As for an ideal job, it is important to have a good relationship with direct superior.	1	2	3	4	5	6	7		
10	As for an ideal job, it is important to work with people who cooperate well with one another.	1	2	3	4	5	6	7		
11	As for an ideal job, it is important to have the security that I will be able to work for my company as long as I want to.	1	2	3	4	5	6	7		
IU Intention to use										
1	Assuming I have access to email, I intend to use it.	1	2	3	4	5	6	7		
2	Given that I have access to email, predict that I would use it.	1	2	3	4	5	6	7		
F Perceived usefulness										
1	Using email improves my performance in my job.	1	2	3	4	5	6	7		
2	Using email in my job increases my productivity.	1	2	3	4	5	6	7		
3	Using email enhances my effectiveness in my job.	1	2	3	4	5	6	7		
4	I find email to be useful in my job.	1	2	3	4	5	6	7		
G Perceived Ease of Use										
1	My interaction with email is clear and understandable.	1	2	3	4	5	6	7		
2	Interacting with email does not require a lot of my mental effort.	1	2	3	4	5	6	7		
3	I find email to be easy to use.	1	2	3	4	5	6	7		
4	I find it easy to get email to do the work I want it to do.	1	2	3	4	5	6	7		
H Subjective Norm										
1	People who influence my behavior think that I should use email.	1	2	3	4	5	6	7		
2	People who are important to me think that I should use email.	1	2	3	4	5	6	7		

Part Two	
Background Information	
1	Gender: ? Male ? Female
2	Age: ? 18-24 ? 25-29 ? 30-34 ? 35-39 ? 40-44 ? 45-49 ? 50-54 ? 55-59 ? 60- 65 ? 65 or above
3	Education ? Some high school or less ? Graduated high school ? Vocational/technical school ? Some college ? Graduated college ? Post-graduate study
4	Monthly Individual Income: ? Less than RMB 1,000 ? RMB 1,000- RMB 2,499 ? RMB 2,500- RMB 3,999 ? RMB 4,000- RMB 5,499 ? RMB 5,500- RMB 6,999 ? RMB 7,000- RMB 8,499 ? RMB 8,500- RMB 9,999 RMB 10,000- RMB 19,999 RMB 20,000 –RMB 29,000 ? RMB 30,000 or more
5	Position:
6	Name of Your Bank:
7	The Nature of Bank: ? State-owned commercial banks ? Shareholding commercial banks ? Civil commercial bank ? Foreign banks

Appendix E Final Questionnaire

Instructions:

The purpose of this study is to examine *intraorganizational usage of E-mail*. Please answer all questions to the best of your ability. There are no right or wrong answers. What matters is your personal opinion.

The survey should take approximately 15 minutes.

Intraorganizational usage of E-mail include coordinating project activities, negotiations/bargaining, information exchange, brainstorm, conflicts/disagreements resolution, progress on projects, feedback on reports and ideas.

Thank you for taking the time to complete this survey.

Part One								
No.	Questions	Strongly Disagree	Neutral				Strongly Agree	
UA								
Uncertainty Avoidance								
1	It is important to have job requirements and instructions spelled out in detail so people know what they are expected to do.	1	2	3	4	5	6	7
2	It is better to have a bad situation that I know about, than to have an uncertain situation that might be better.	1	2	3	4	5	6	7
4	Rules and regulations are important because they inform workers what the organization expects of them.	1	2	3	4	5	6	7
5	People should avoid making changes because things could get worse.	1	2	3	4	5	6	7
PD								
Power Distance								
3	Managers should be careful not to ask the opinions of subordinates too frequently, otherwise the manager might appear to be weak and incompetent.	1	2	3	4	5	6	7
4	Managers should make most decisions without consulting subordinates.	1	2	3	4	5	6	7
5	Employees should not question their manager's decisions.	1	2	3	4	5	6	7
6	Subordinates should pay high respect for their direct superior.							
7	Employees should not show their disagreement to their managers.							
C								
Collectivism								
1	Being accepted as a member of a group is more important than having autonomy and independence on the job.	1	2	3	4	5	6	7

Part One										
No.	Questions	Strongly Disagree	1	2	3	4	5	6	7	Strongly Agree
2	It is more important for a manager to encourage loyalty and a sense of duty in subordinates than it is to encourage individual initiative.	1	2	3	4	5	6	7		
3	Individual rewards are not as important as group welfare.	1	2	3	4	5	6	7		
4	Group success is more important than individual success.	1	2	3	4	5	6	7		
M Masculinity										
1	It is more important for men to have a professional career than it is for women to have a professional career.	1	2	3	4	5	6	7		
2	Women do not value recognition and promotion in their work as much as men do.	1	2	3	4	5	6	7		
3	It is preferable to have a man in high level position than a woman.	1	2	3	4	5	6	7		
4	There are some jobs in which a man can always do better than a woman.	1	2	3	4	5	6	7		
IU Intention to Use										
1	Assuming I have access to email, I intend to use it.	1	2	3	4	5	6	7		
2	Given that I have access to email, I predict that I would use it.	1	2	3	4	5	6	7		
PU Perceived Usefulness										
1	Using email improves my performance in my job.	1	2	3	4	5	6	7		
2	Using email in my job increases my productivity.	1	2	3	4	5	6	7		
3	Using email enhances my effectiveness in my job.	1	2	3	4	5	6	7		
4	I find email to be useful in my job.	1	2	3	4	5	6	7		
PEOU Perceived Ease of Use										
1	My interaction with email is clear and understandable.	1	2	3	4	5	6	7		
2	Interacting with email does not require a lot of my mental effort.	1	2	3	4	5	6	7		
3	I find email to be easy to use.	1	2	3	4	5	6	7		
4	I find it easy to get email to do the work I want it to do.	1	2	3	4	5	6	7		
SN Subjective Norm										
1	People who influence my behavior think that I should use email.	1	2	3	4	5	6	7		
2	People who are important to me think that I should use email.	1	2	3	4	5	6	7		

Part Two	
Background Information	
1	Gender: ? Male ? Female
2	Age: ? 18-24 ? 25-29 ? 30-34 ? 35-39 ? 40-44 ? 45-49 ? 50-54 ? 55-59 ? 60- 65 ? 65 or above
3	Education ? Some high school or less ? Graduated high school ? Vocational/technical school ? Some college ? Graduated college ? Post-graduate study
4	Monthly Individual Income: ? Less than RMB 1,000 ? RMB 1,000- RMB 2,499 ? RMB 2,500- RMB 3,999 ? RMB 4,000- RMB 5,499 ? RMB 5,500- RMB 6,999 ? RMB 7,000- RMB 8,499 ? RMB 8,500- RMB 9,999 RMB 10,000- RMB 19,999 RMB 20,000 –RMB 29,000 ? RMB 30,000 or more
5	Position:
6	Name of Your Bank:
7	The Nature of Bank: ? State-owned commercial banks ? Shareholding commercial banks ? Civil commercial bank ? Foreign banks

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