



Testing of the Cross-Cultural Applicability of Technology Acceptance Model: Evidence from the PRC

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ABSTRACT

Communication is an important part of organizational activities since employees in an organization need to communicate with each other and with external parties. In developed economies, computer-based communication technology (CMC), such as email, has successfully replaced traditional media as the cornerstone of office communication. However, CMC has not been used to the same extent in developing economies. Traditional communication channels still dominate in these countries with the People's Republic of China (PRC) no exception. Since technology acceptance theories have been developed in an individualistic, industrialized, western context, there is a pressing need to understand its generalizability to other cultures. It is the intent of this study to investigate user acceptance of email, a major CMC in an oriental cultural context, the PRC. The finding provides evidence on the applicability of Technology Acceptance Model (TAM) across cultures. Thus by investigating technology acceptance beliefs in a developing country with Chinese culture, the validity of TAM is enhanced. With an in-depth understanding of cross-cultural technology diffusion process and outcome, organizations will be in a better position to exploit the benefits of the new communication media, especially in culturally distinct non-western economies that are at the receiving end of technology transfer.

INTRODUCTION

Information systems research reveals that there are different technology adoption and usage patterns when cultural difference is taken into account (Straub, 1994; Gefen and Straub, 1997; Straub, et al., 1997). However, the applicability of technology diffusion theories across cultures is still unclear due to inconsistent findings and observed differences in user acceptance of computer mediated communication technology (CMC) (Straub, 1994; Gefen and Straub, 1997; Straub, et al., 1997). For example, email is reported to be less favored as compared to FAX (Straub, 1994) in employees' media selection in a Japanese setting. Surveys conducted in the People's Republic of China (PRC) state-owned enterprises (Lu and Jiang, 2002) also reveals that traditional communication media (i.e., telephone and FAX) dominate.

The PRC is characterized as a culture that is distinctively different from that of North America, and is a typical transitional economy at the receiving end of information technology transfer. Thus, the cross-cultural validity of technology acceptance fundamentals explored in North America can not be justified without an examination on the applicability of technology acceptance models in the context of the PRC.

The results of this study would contribute to the CMC literature as to whether culture has a significant impact on the process and outcome of technology adoption, in this case, email. They would also help organizations in the PRC and other developing countries to understand the

influences of internal beliefs on email and hopefully would result in a better managed organizational technology diffusion.

LITERATURE REVIEW

The last decade has seen a wide array of CMC technologies developed and diffused as a result of technological innovations in computers and telecommunications (Rice, 1987). CMC systems are broadly defined as the electronic exchange of information using computer terminals joined via communication links (Sproull and Kiesler, 1986). As one of the most popular CMC systems, email has become an integral part of an office in developed countries (Markus, 1994).

In U.S. businesses, email is utilized primarily for information presentation, internal data, administrative purpose and internal discussion (Case, 1996). However, despite the apparent value of email as an efficient and effective communication channel, it is important to recognize that successful implementation of any new communication technologies in organizations is not guaranteed. One of the reasons accounted for the unsatisfactory user adoption is closely related to culture-bound values and communicative preferences inherent in CMC technologies (Ess, 2001).

This study focus on the task related use of email. Research indicates that email is mainly used for task-oriented applications (Steinfeld, 1986). Steinfeld found that task-related email information exchanges are used most frequently in organizations as compared to social usage. The task-related uses of email consist of exchanging information, asking questions and sharing opinions, while tasks involved include coordinating activities, distributing information, seeking information, and giving and receiving feedback on reports or ideas.

Technology Acceptance Models

The theoretical issue of user acceptance has attracted tremendous attention since information technology was widely applied in the 1980s. Research on technology user acceptance from social psychological perspective has proliferated since Davis (1989) proposed Technology Acceptance Model (TAM). Since then, due to its theoretical and statistical robustness, TAM has been accepted as the dominant model that explains and predicts user acceptance and usage behavior (Venkatesh and Davis, 2000). TAM adopts the reasoning logic of the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975). TRA posits that human behavior is the result of rational reasoning that is processed along the logical chain of beliefs-intention-behavior. It is only through internal beliefs that outside factors can influence user acceptance. TAM identifies two key beliefs determining user intention to use a technology, namely, perceived usefulness (PU) and perceived ease of use (PEOU) (Davis, 1989; Davis, et al., 1989).

In an attempt to incorporate social influence into the theory, TAM has been extended to TAM2 to include subjective norms (SN) as another behavioral belief salient to user acceptance of information technology (Venkatesh and Davis, 2000). SN is originally defined as a person's perception that most people who are important to the person think the person should or should not perform the behavior in question (Fishbein and Ajzen, 1975). Venkatesh and David (2000) operationalize SN in the context of information technology acceptance and measure it using items such as "people who are important to me think that I should use the system." SN is theorized to have a positive direct effect on PU via internalization effect. The underlying rationale states 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". TAM2 is believed to be an advancement of TAM to improve TAM's generalizability (Venkatesh and Davis, 2000).

IT Acceptance in Different Cultures

As more and more firms operate internationally, an understanding of the effects of cultural values on technology adoption and usage behavior becomes critical since management theories developed in one culture may not apply in other cultures (Watson, et al., 1994). Kedia and Bhagat (1988) propose that technology transfer effectiveness be most affected by variations in societal cultures. This proposition is especially important for technology transfer between two economies when the originator is a developed economy and the recipient is a developing economy. They suggested that management theories developed primarily in a Western context must incorporate cultural elements to remain useful in the Eastern context, since technology transfer must adapt to a new cultural environment to function well.

Recently, scholars have begun to explore the link between culture and user acceptance of technology (Straub et al., 2002). A few studies have examined user acceptance of information technology across distinct cultures. Hu et al. (1999) found that TAM did not explain user acceptance in a study conducted in Asia, contrary to the findings in the American literature. A three-country study testing the applicability of TAM across cultures indicates that TAM does not hold for Japan, suggesting that the model may not predict technology use across all cultures (Straub et al., 1997). Researchers thus cautioned against generalizing American-based user acceptance theory to different cultures.

In this study, we extend the TAM study to cover the context of PRC, which makes it one of the first studies to explore user technology acceptance in a transitional economy with Chinese culture.

THE RESEARCH MODEL

The research model in this study is based on the TAM framework with the TAM2 construct — SN included. We propose that TAM is applicable in China since internal beliefs eventually determine the decision making of technology adoption. Whereas cultural values could influence internal beliefs directly as antecedents or interact with those beliefs to impact the acceptance intention. Therefore, we hypothesize that PU and PEOU will determine one's intention to adopt a technology in the context of PRC. In addition to the widely validated finding of the belief-intention relationship in other settings and technologies, Case (1996) found that PU and PEOU were positively related to the positive attitudes toward email system.

We also adopt the reasoning logic of TAM on the PEOU — PU relationship. That is, other things being equal, the easier a technology is to use, the more useful it can be. We also test the TAM2 proposition on the SN — PU relationship that SN will have a positive direct effect on PU since "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)."

However, on the relationship of SN and intention to use, TAM2 suggests that SN influence intention to use a technology only conditionally (Venkatesh and Davis, 2000). Since information technology has been regarded highly by the PRC government as necessary for sustainable economic growth and the government has been promoting IT acceptance nationwide, we posit that SN will have a direct positive effect

on intention to use email in PRC. The rationale is that government policy plays an important role in the employees' decision making especially in a state-controlled economy, and that superiors' opinion on information technology acceptance is influential. Thus the following hypotheses are formulated. Figure 1 presents the path diagram of the research model.

Hypothesis 1: Perceived Usefulness (PU) has a positive direct effect on intention to use email in the context of Chinese mainland.

Hypothesis 2: Perceived Ease of Use (PEOU) has a positive direct effect on intention to use email in the context of Chinese mainland.

Hypothesis 3: Perceived Ease of Use (PEOU) has a positive direct effect on Perceived Usefulness (PU) of email in the context of Chinese mainland.

Hypothesis 4: Subjective Norm (SN) has a positive direct effect on Perceived Usefulness of email in the context of Chinese mainland.

Hypothesis 5: Subjective Norm (SN) has a positive direct effect on intention to use email in the context of Chinese mainland.

RESEARCH METHOD

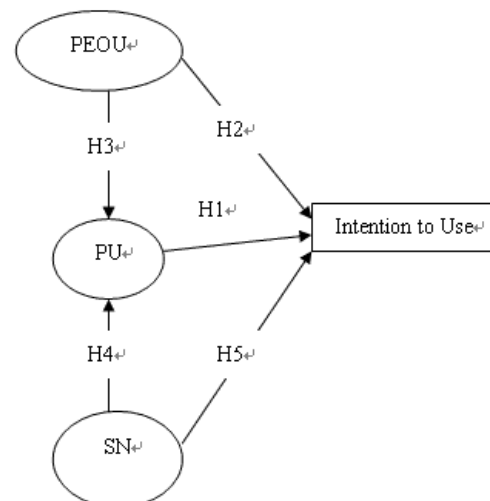
Survey Instrument

TAM2 constructs and instruments are adopted from Venkatesh and Davis (2000). Minor changes are made on each item to reflect e-mail use. Copies of the questionnaire were distributed to employees in a municipal government and several state-owned enterprises in Guangzhou, PRC, via the government agency's internal mail system that provides communication channels for state-owned organizations in the city. A total of 200 copies were sent out and 145 returned. At the end, 121 usable responses were used for data analysis with a response rate of 60.5%. The major reason for selecting state-owned organizations as research setting is that their employees are typical in holding the Chinese societal values and are among the least influenced groups in regard to the influx of western values. While in joint ventures, organizational culture may carry elements of western values inherent in the management style. Thus, the research setting affords better control of extraneous factors that may compound the findings.

Pre-testing and Translation

A pretest of the instruments was conducted with 15 undergraduate students in Chinese mainland. The purpose of the pretest was to ensure clarity in wording and to refine the questions if necessary. The refined measures were then tested on 4 employees from the municipal government and state-owned enterprises. The results of the pretest indicated that all items were clearly worded.

Figure 1. Research Model of the Hypothesized Relationship



Two-way translation (Brislin, 1970) was employed to ensure that instruments' meanings remain intact after translating from English to Chinese. First, measures were translated from English into Chinese, item by item, by the researchers. The Chinese questionnaire was then reverse-translated into English by an expert in translation. A comparison was then made of the two English versions of the questionnaire. Any variations in the meanings of the items would result in additional refinement of items in Chinese. After the refinement, new version of the Chinese questionnaire was translated back into English by a third person. Several iterations of this procedure were carried out until it was clear that the meaning of the Chinese language questionnaire was identical to that of the English version.

Data Analysis

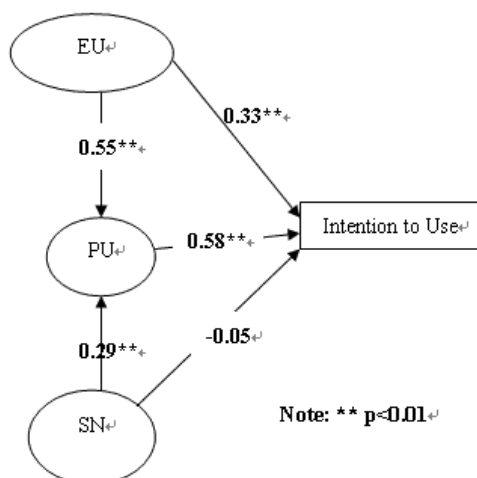
Among the 121 usable questionnaires, 73 (60.3%) of the respondents are male and 48 (39.7%) female. The majority of those responded are young with the average age between 25-34 years. Most are university graduates with monthly income in the range of RMB 2000-3000, which is about the average for Guanzhou.

Confirmatory factor analysis for the structural model was carried out using LISREL 8 software package (Joreskog and Sorbom, 1993). LISREL is used to test relationships between latent constructs which are indirectly inferred from multiple observed measures, and simultaneously test the validity of the indicators. Due to the small sample size, it was difficult to include all items in the proposed instruments in the test. Too many items and parameters could result in sizable random errors, leading to a poor fit of the model. As a result, items were aggregated. Researchers have proposed a method to create aggregated variables by summing the subsets of items within factors (Rahim and Magner, 1995). It is generally appropriate to aggregate them to construct two aggregate variables per factor when the number of measured items per factor is in the range of 4-7 (Bagozzi and Heatherton, 1994).

The four TAM constructs are represented by 2 aggregated variables each. All items were measured by a seven-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree), with higher values indicating greater degree of perception. Internal consistency was confirmed by Cronbach's α (with values greater than 0.80). All scales demonstrate acceptable reliability (Nunnally, 1967).

The proposed model was estimated using maximum-likelihood method. (Chou and Bentler, 1996). Confirmatory factor analysis was conducted to assess the measurement model based on the covariance matrix of the 8 aggregate variables and maximum-likelihood method. Factor loadings in the measurement model were all significant, indicating good definitions of the underlying factors with t-values all above the significant level.

Figure 2. Analysis of the Path Model with Path Coefficients



The structural models were evaluated on the basis of goodness-of-fit measures. Measures that are less sensitive to sample size or model complexity were examined first. For example, Chi-square to degrees of freedom is used instead of chi-square statistic which is sensitive to sample size or model complexity and may provide inappropriate indication of poor fit (Gefen, et al., 2000).

The model has a chi-square fit estimate of 28.87 ($df = 12$, $p < 0.0001$), while the chi-square/degrees of freedom ratio was 2.4, within the suggested level of 3 for this ratio (Gefen, et al., 2000). Rai et al. (2002) also recommend other measures for model fit testing that are less sensitive to sample size and the number of parameters. These measures include the root mean square error of approximation (RMSEA) (Browne and Cudek, 1993), the goodness-of-fit index (GFI) (Marsh et al., 1988), and the adjusted goodness-of-fit index (AGFI). In this study, GFI was .95 and AGFI was .84, greater than the customary 0.90 level for good fit (Bentler and Bonett, 1980); RMSEA was .10; and the standard root mean square residual (SRMSR) was .02, within 0.08 threshold of good fit; the normed fit index (NFI) was 0.97; the parsimony NFI was 0.42; the comparative fit index (CFI) was 0.98; the incremental fit index was 0.99; the relative fit index (RFI) was 0.94. The fit statistics suggest a satisfactory fit of the model to data. The squared multiple correlations (SMCs) are 0.56, which is used to express the extent to which the model explained the variance in the data set.

All the causal relationships in the path model are significant except for Hypothesis 5. The proposed direct positive impact of SN on Intention to Use was not detected. In other words, the compliance effect does not exist in this setting. According to Venkatesh and Davis (2000), compliance effect conveys an individual's perception that a social actor wants him or her to perform a specific behavior, and the social actor has the ability to reward or punish nonbehavior.

CONCLUSION

Does TAM model which was developed in North America fit a sample in the context of Chinese mainland? The answer seems to be a cautious "yes". Findings in this study support four out of five hypotheses. Findings seem to confirm that PU and EOU are the key determinants of user's intention to use a technology, and that EOU is the antecedent of PU, since the greater the

ease of use a technology is the more useful it can be (Venkatesh and Davis, 2000). SN is found to have a positive direct effect on PU via internalization effect in North America (Venkatesh and Davis, 2000).

However, the posited direct impact of SN on Intention to Use was not found. One reason to explain the incongruence of the finding in Hypothesis 5 may be the voluntariness of the system use. When system use is non-mandatory, the compliance-based effect of subjective norm on intention may not occur. Since email use for subjects in this study is not mandatory, the finding of this study is consistent with the basic TAM2 propositions.

This research is an attempt to investigate information technology acceptance in work place across cultures. We have reported an empirical test of the cross-cultural generalizability of the TAM-based theory. Based on findings generated via a rigorous method, we propose that TAM represents antecedents and determinants of user technology acceptance not only in the western developed countries but also in non-western transitional economies, such as the PRC.

To validate the general applicability of Technology Acceptance Model, more studies need to be carried out in different countries or cultures. Researchers have proposed some frameworks on the role of environment and culture in user technology acceptance. Yet it is still not clear what are the determinants of different patterns of user perception and acceptance across cultures. Future research direction may focus on whether culture or societal values have impact on users' internal beliefs for information technology adoption.

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