MOBILE COMMERCE IN THE EYES OF MOBILE USERS

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ABSTRACT

The proliferation of mobile technology and services has made mobile commerce reality in this country. This paper reports a study of continuance intention toward mobile commerce in a regional university. Structural equation modeling procedures were used to analyze data from 240 well educated mobile users. In the eyes of those mobile users, perceived usefulness and PIIT are strong determinants of their continuance intention. Contrary to common belief, social influence and perceived ease of mobile commerce are not.

INTRODUCTION

In the early years of this century studies were conducted to forecast adoption of wireless Internet services via mobile technology and the possible impacts of technology characteristics (perceived usefulness, perceived ease of use), personal characteristics (i.e., personal innovativeness) and context variables (i.e., social influences) (i.e, Lu et al., 2005). With continuous expansion of wireless networks and especially the popularity of mobile devices such as blackberry, iPhone, and iPad, mobile commerce (m-commerce) is actually making its presence in this country. The volume of mobile commerce in the US was estimated to reach $5 billion by the end of 2010 (ABI Research, 2010).

M-commerce is defined as the transactions of commodities, services, or information over the Internet through the use of mobile handheld devices (Mathew et al.,2004; Siau et al., 2001) M-commerce has generally been viewed as an extension of e-commerce beyond the static terminal of the PC/TV to anytime, anyplace, anywhere on mobile and other wireless devices (O'Dea; 2000; Clarke, 2001). This notion does not restrict mobile devices to mobile phones but any portable wireless Internet-enabled devices (Ktoridou, Epaminonda, & Kaufmann 2008).

As the proliferation of e-commerce and m-commerce, the focus of research in IS field has shifted from acceptance of mobile services or mobile commerce and service-oriented design (Maity, 2010; Malhotra and Malhotra, 2009; Vatanparast and Butt, 2010) to explanation of continuance intention (Venkatesh, Thong, Chan, Hu, and Brown, 2011; Zhou, 2011). Such e-commerce studies are under heavy influences of the unified theory of acceptance and use of technology (UTAUT) and the IS continuance model with the implicit assumption that usage is mainly determined by intention (Limayem, Hirt, and Cheung, 2007). A target issue is whether those identified as critical determinants or influencing factors of initial adoption are still effective on continuance intention. Venkatesh and his colleagues extended the theory of information systems (IS) continuance by expanding the belief set from perceived usefulness to include three

additional predictors identified in UTAUT, namely effort expectancy, social influence and facilitating conditions. Recent studies or models focusing on continuance intention paid more attention to external drivers such as social influences and facilitating conditions and tended to exclude PIIT, the internal motivation stimulus with the assumption that PIIT is only critical in initial adoption.

So far continuance intention study in mobile commerce is still one of the initials. Such research effort will definitely contribute to both IS continuance literature and e-commerce literature. To study user continuance intention toward mobile commerce, a research model and hypotheses will be developed to guide such research effort.

MODEL AND HYPOTHESIS DEVELOPMENT

Studies revealed that intention to adopt wireless services via mobile technology was mostly determined by perceived usefulness and ease of use which mediated the impacts from social influence and user personal innovativeness (Lu et al., 2005;). Several years later, a marketing study also declared that individual characteristics (such as innovativeness) and context (social factors) as groups of variables can affect acceptance of mobile services and technology (Maity, 2010; Yaseen & Zayad, 2010; Sukna, 2011). Acceptance comprises both initial adoption and post adoption continued use. This paper argues that the technology characteristics (perceived usefulness, perceived ease of use), personal characteristics (i.e., personal innovativeness) and context variables (i.e., social influences) that have influenced initial adoption will continue explaining individual continuance intention toward mobile commerce.

Social Influence

Social influence is how to convert our thoughts and perceptions in to our actions or reaction towards using any system by relying on the thoughts of the other people (Moore and Benbasat, 1991). Social influences in this study refer to perceived pressures from social networks to make or not to make a certain behavioral decision.). Support from influential others has an important impact on what action a potential adopter chooses to take because individuals adapt their attitudes, behaviors and beliefs to their social context (Salancik and Pfeffer, 1978). Social influences has been regarded a critical element in sociology and in innovation diffusion literature as well.

Drawing upon social information processing theory, Fulk and his colleagues (Fulk, 1993; Schmitz and Fulk, 1991) suggest that information passed through individuals' social networks influences their perception of a target technology. Social influences are stronger in friendship networks which affect people's attitudes and sense of support and attachment (Brass, Butterfield and Skaggs, 1998). Social influences have often been investigated as other people's opinions, superior influences, and peer influences. Venkatesh and Davis (2000) believed that social influence can affect the cognitive belief of perceived usefulness, regardless of the context. In the UTAUT model, social influences is further recognized as one of the four direct determinants of behavioral intention to adopt, together with performance expectancy, effort expectancy, and facilitating conditions (Venkatesh et al., 2003). A number of e-commerce studies incorporated this construct into their operational models and found some empirical support (e.g., Hsu and

Chiu, 2004; Lewis, Agarwal and Sambamurthy, 2003; Lu, Yu, Liu and Yao, 2003; Venkatesh, Morris, Davis and Davis, 2003). Mobile service studies discovered that typical in wireless mobile environment, a certain number of members of the subject's social network need to be users of the same features (Sarker and Wells, 2003). Mobile handhelds were being used for maintaining social connectedness among intimate friends (Jarvenpaa, Lang, Takeda and Tuunainen, 2003). That evidence is mostly from initial adoption studies.

Is social influence still strong in affecting continuance intention? A social perspective is often used in e-commerce studies. Recent studies investigating social influences on online consumer continuance intentions vary in its significance and influence pattern in different research contexts (Cheung and Lee, 2009; Grabner-Kraeuter and Waiguny, 2011; Kim et al, 2009; Sukna, 2011; Venkatesh, Thong, Chan, Hu, and Brown, 2011; Wang and Chiang, 2009; Yaseen & Zayed, 2010). The findings in common are that continuance intentions toward e-commerce applications or services are more or less, directly or indirectly influenced by the society around them. Perceived usefulness, rather than perceived ease of use, is identified serving as mediator of social influence much more often.

We believe it will more interesting to assume that both perceived usefulness and ease of use serve as the mediator of social influence, as it will make it easier to compare the resu8lts with those yielded from initial adoption studies (Siau, Nah and Sheng, 2004; Lu, Yao and Yu, 2005). Hence, we develop the following three hypotheses:

H1: Social influences have a direct positive impact on perceived usefulness.

H2: Social influences have a direct positive impact on perceived ease of use.

H3: Social influences have a direct positive impact on continuance intention toward mobile commerce.

Personal Innovativeness in Information Technology

Some researchers believe that most proximate influence on an individual's cognitive interpretations of information technology is factors related to the individual. Drawing upon Rogers' theory of the diffusion of innovations, Agarwal and Prasad (1998) argued that individuals with higher personal innovativeness are expected to develop more positive beliefs about the target technology. They described such personal innovativeness as symbolizing the risk-taking propensity that exists in certain individuals and not in others. They named this influential personal trait variable on technology innovation adoption behaviors personal innovativeness in information technology (PIIT) and defined it as the willingness of an individual to try out any new information technology. They hypothesized that individuals with higher levels of PIIT are expected to develop more positive perceptions about the innovation in terms of advantage, ease of use, compatibility, etc., and have more positive intentions toward use of a new IT/IS.

Over the years, the test results concerning PIIT in various contexts have not been consistent. Agarwal and Karahanna (2000), using the World Wide Web as the target technology, they tested

PIIT and playfulness in their research model and found them explaining 42% of the variance in cognitive absorption. But, neither PIIT nor playfulness were statistically significant predictors of perceived usefulness and perceived ease of use in their study. However, Lewis, Agarwal and Sambamurthy (2003) used survey entries from 161 faculty and instructors at a large, public university to examine influences from the individual, institutional, and social contexts in which they interacted with IT. They found PIIT having significant relationships with perceived usefulness and perceived ease of use. Thatcher, Srite and Stehina and Liu (2003) examined the pattern of relationships between dimensions of culture, qualitative and quantitative work overload, and PIIT. Based on data collected from 100 U.S. college students, findings suggest an indirect relationship from two dimensions of culture (i.e. uncertainty avoidance and power distance) to PIIT and direct relationships from both qualitative and quantitative overload to PIIT. Lu, Yao and Yu (2005) integrated PIIT into their model to explain how internal and external factors influencing user adoption of wireless Internet services via mobile technology. Their study found strong causal relationships between the social influences, personal innovativeness and the perceptual beliefs—usefulness and ease of use, which in turn impacted adoption intentions. Han, Mustonen, Seppanen, and Kallio (2006) collected data from 151 physicians using mobile communication technology in the healthcare sector in Finland. Their study results revealed important determinants of physicians' behavioural intentions in early exposure to the mobile system as perceived usefulness, the interaction effects of PIIT and age on ease of use, and of age on compatibility. Yi, Fiedler and Park (2006) examined PIIT as a moderator of the future use intention and as a direct determinant using data from 412 online buyers and data from 222 healthcare professionals adopting PDA. Across the markedly different adoption contexts, the study results consistently show that individual innovativeness is a direct determinant.

More recent studies began to integrate PIIT or personal innovativeness into e-commerce models. Keisidou, Sarigiannidis and Maditinos (2011) integrated PIIT into their theoretical framework explaining user acceptance of online shopping. They found in their study that PIIT, perceived security and product involvement have an effect on the attitude towards online shopping. Wu, Li and Fu (2011) believed that service provisions for pervasive and timely usage and individual psychological states are critical in determining adoption of mobile healthcare. Accordingly, perceived service availability (PSA) and personal innovativeness in IT PIIT may be the important drivers to be included in TAM and TPB. The empirical examination showed high predictive power for adoption intention and the influential role of these important variables.

To sum up, for adoption of innovative technology or technology based services, PIIT strongly amplify user perception of potential benefits and also heighten their confidence in their capabilities to handle the target technology or services. Meanwhile, PIIT as the innovative disposition also serve as the primary and direct determinant for adoption decision. Some researchers regard PIIT as individual characteristic with a persistent effect on the acceptance decisions across multiple technologies (Yi, Fiedler and Park, 2006). According to this logic, PIIT should also play important role in influencing post adoption continuance decision toward mobile commerce. Therefore, we propose:

H4: PIIT has a direct positive impact on perceived usefulness of mobile commerce.

H5: PIIT has a direct positive impact on perceived ease of using mobile commerce.

H6: PIIT has a direct positive impact on continuance intention toward mobile commerce.

Performance Expectancy

Performance expectancy in terms of usefulness has received adequate attention from academicians and practitioners in both initial adoption and continuance intention studies (Varshney, 2005; Lu, Yao and Yu, 2005). Usefulness of the applications is repeatedly recognized as a most critical determinant of user behavioral decisions, regardless of research contexts. Performance expectancy is found positively associated with continuance intention in most e-commerce studies (Barnes, 2011; Chou, Min, Chang and Lin, 2010; Kim et al, 2009; Sukna, 2011; Venkatesh, Thong, Chan, Hu, and Brown, 2011). In fact, performance expectancy, effort expectancy were both repeatedly identified significant predictors of continuance intentions (Chiu and Wang, 2008). In line with the literature, we hypothesize that

H7: Perceived usefulness has a direct positive impact on continuance intention toward mobile commerce.

Effort Expectancy

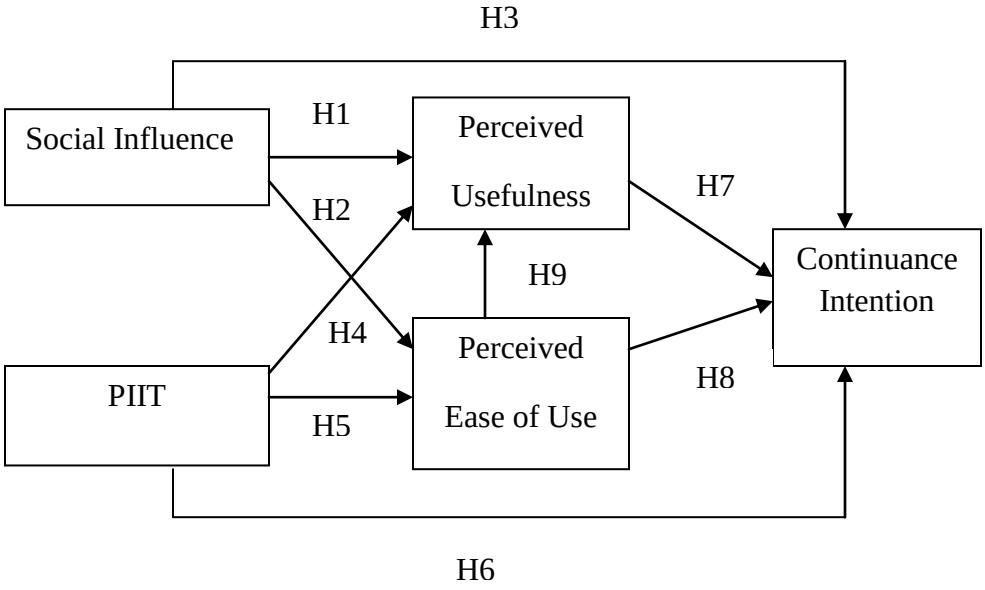
Ease of use is another critical determinant of technology or IS acceptance (Sukna, 2011; Kim et al, 2009). Utilitarian approach is the one mostly used in continuance intention toward technology acceptance studies as in initial adoption studies. Both perceived ease of use, perceived usefulness and usage cost significantly affect users' satisfaction which further determine user continuance intention with e-learning system (Chih, Lin and Chiu, 2011). Ease of use, though generally not as critical as perceived usefulness in serving as the determinant of continuance intention (Hu, Brown, Thong, Chan, and Tam, 2009), this construct is repeatedly illustrated as associated positively with perceived usefulness. In e-commerce studies, perceived ease of use, together with perceived usefulness, subjective norm, and consumers' satisfaction significantly influences continuance intention (Chen, Chen, and Chen, 2009). However, continuance intention of online services was not significantly associated with perceived ease of use or perceived usefulness, but with service quality; perceived usefulness was the only technology determinant of service quality (Hu, Brown, Thong, Chan, and Tam, 2009). It is only a recent phenomenon to pay attention to the post-adoption and continuance usage of mobile services. Perceived ease of use, perceived usefulness and usage cost significantly affect users' satisfaction, further determining their post-adoption behavior (Zhou, 2011). In line with the relevant literature, we hypothesize that

H8: Perceived ease of use has a direct positive effect on continuance intention toward mobile commerce.

H9: Perceived ease of use has a positive effect on perceived usefulness of mobile commerce.

Research Model

To sum up, this model (Figure 1) proposes that individual continuance intention toward mobile commerce is the combined effect of perceived usefulness, perceived ease of use, social influences, and personal innovativeness. Both social influences and personal innovativeness also directly impact both perceptions of usefulness and ease of use toward mobile commerce. Perceived usefulness of mobile commerce is affected by perceived ease of use. The emphasis of this model is on explaining the determinants of continuance intentions.



METHODOLOGY

A survey study design was adopted to collect data for testing the research model. The survey instrument was adapted from those used in a number of acceptance studies and current literature on mobile commerce. The focus was on continuance intention toward mobile commerce. The data was collected both online and offline from undergraduate and graduate students in a regional university in 2011. Of 276 participants, 240 (87%) were mobile commerce users. 141 (59%) were male users and 99 (41%) were female users. Sixty-four percent of the participants had a bachelor degree and 33% had a master degree. Almost half of the users were in the age range of 21 to 30. Thirty-three percent were in the age range of 31-40. Almost 64% had less than five years of m-commerce experience. Over 20% used mobile commerce for five or more years. Two-thirds of them expressed 100% likeliness to continue using mobile commerce. The five most-welcomed mobile services included mobile maps; email service available on a mobile device; mobile banking services; location-based mobile services; mobile news feeding and mobile searching services by frequency of selection.

The scale-wide Chronbach alpha values ran from .71 to .89 indicating good reliability. The research model was validated using structural equation modeling procedures (SEM).

RESULTS

A normality check was first performed to ensure suitability of the empirical data for predetermined statistical analysis procedures. Of all the variables in the measurement model, univariate skewness values range from –2.96 to 0.890; univariate kurtosis values range from –-1.888 to 12.467. According to Kline (1998), absolute values of univariate skew indexes greater than 3.0 and absolute values of the univariate kurtosis indexes greater than 8 are indications of extreme cases of violating normality assumption; the present data set is obviously a case for severe violation. Therefore, Bollen-Stine bootstrap procedures were run to control for the abnormal distribution (Byrne, 2009). Two-hundred and fifty bootstrap samples were requested. The p value obtained was greater than .05, the SEM procedures were continued for model testing. We empirically assessed convergent validity by examining the factor loadings. Individual item reliability was evidenced in the empirical data, since all the loadings exceed 0.50. The cross-construct correlation coefficient values are within the acceptable range as suggested by Kline (2001). We then checked the model fit.

The Measurement Model

A CFA measurement model was then created to check the model fit and convergent validity of each construct in the proposed model. Besides the usual measures used to assess model fit, Tucker–Lewis index (TLI, equivalent to the non-normed fit index) and root mean square error of approximation (RMSEA) were also selected. Those measures revealed a fairly reasonable model fit (Chi Square/df=2.95, RMR=.06, GFI=.88, AGFI= .826, IFI= .941, TLI= .922, CFI = .940, RMSEA= .090). Thus, we proceeded with structural path analysis.

The Structural Model

The structural model to confirm the hypothesized relations among the studied constructs was then built and examined. Model indexes indicate a moderately acceptable fit (Chi-square/df=2.95, NFI=0.911, IFI=0.939, TLI=0.922, CFI=0.939, RMSEA=0.09). Regression weights of path analysis reveal that four out of nine hypothesized relationships are supported by the empirical data: the relationships from PIIT to continuance intention (.322, $p<.001$) and from usefulness to continuance intention (.745, $p<.001$), and the relationships from perceived ease to usefulness (.765, $p<.001$) and from PIIT to ease (.724, $p<.001$). The significant causal relationships supported by this study are displayed in Figure 2. This figure also shows that 80 percent of the variance of the continuance intention is explained by the specified explanatory constructs. The perceived ease of use and PIIT constructs collectively explained 70 percent of the variance in perceived usefulness. PIIT explained 56 percent of the variance in perceived ease of use.

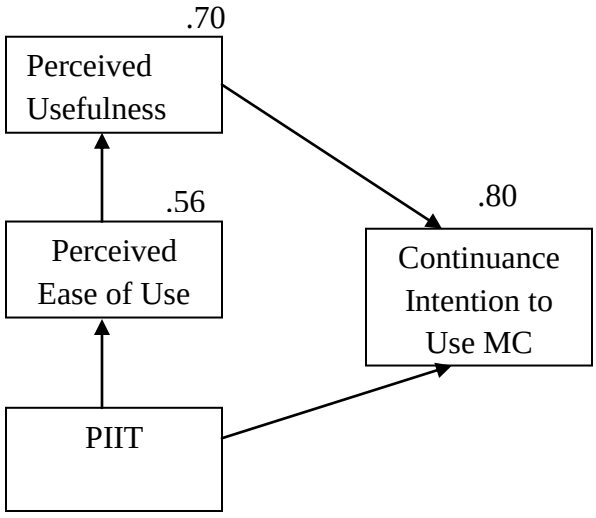


Figure 2 – Model Supported by Empirical Data

DISCUSSIONS AND CONCLUSIONS

Social influence as a strong antecedent of instrumental beliefs and determinant of initial adoption in many studies was not supported in our study. Hypotheses 1, 2, and 3 are thus rejected. It seems that social influence as a construct may not play equally important role among users of m-commerce on their continuance intention.

PIIT was empirically supported only as antecedent of perceived ease of using mobile commerce and as determinant of continuance intention toward mobile commerce. Thus, Hypothesis 4 is rejected and Hypotheses 5 and 6 are accepted. PIIT is often believed important to explain initial adoption, but seldom included in any continuance intention model. This finding is unique and needs to be confirmed in more replication studies. PIIT did not serve as an important antecedent of perceived usefulness of mobile commerce. This finding was similar to that in Lu, Yao and Yu's study (2005) of initial adoption of wireless Internet services via mobile technology. It is possible that boldness and curiosity in user characters may heighten their confidence in their capabilities to handle mobile commerce.

Hypothesis 7 is strongly supported in our study. Perceived usefulness in the eyes of the mobile commerce users is a critical determinant of their continuance intention toward mobile commerce. This finding confirms those in many studies investigating continuance intention. Another technical determinant of initial adoption, perceived ease of use, is not empirically supported (H8). However, its well-known impact on usefulness still remains in our study (H9).

To sum up, well educated mobile users in our study regarded perceived usefulness of m-commerce and their own personal innovativeness toward mobile technology the most critical determinants of their decision to continue using m-commerce. The ease of using mobile

technology indirectly influenced user continuance intention via perceived usefulness. PIIT, as with potential mobile users, had some impact on user perceived ease of use. Our findings seem to support that the Nomo logical net of continuance intention toward using mobile commerce is largely the same as continued use of information technology well after initial adoption - largely remains faithful to the theoretical tradition of planned behavior and reasoned action (Ortiz de Guinea and Markus, 2009). Some unique findings need to be confirmed in other studies to provide convincing explanations of continuance intention toward mobile commerce.

Overall, absolute cross-cultural differences in all analyses were relatively small compared with differences due to study and industry effects, to the need to explore the meaning of commitment across cultural and economic contexts (Fischer and Mansell, 2009).

References are available upon request from June Lu.