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Are personal innovativeness and social influence critical to continue with mobile commerce?

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Abstract

Purpose – The purpose of this paper is to report a study investigating the impact of personal innovativeness in information technology (PIIT) and social influence on user continuance intention toward mobile commerce (m-commerce) in the USA.

Design/methodology/approach – A survey was conducted among undergraduate and graduate mobile users in a regional university. Structural equation modeling procedures were deployed to analyse 323 valid data points.

Findings – The study found that among well-educated m-commerce users, user personal innovativeness as measured by PIIT and perceived usefulness, the determinants of initial adoption, remain as strong determinants of user continuance intention. PIIT also remains as the antecedent of perceived ease of use. Social influence has changed the pattern of influence on continuance intention.

Research limitations/implications – This study is unable to investigate m-commerce user expectations and satisfaction levels. The small and convenient sample does not offer guarantee of the findings.

Practical implications – M-commerce providers should pay adequate attention to personal innovativeness, since it affects mobile user willingness and capability to welcome and adapt to new services and features. They should always utilize social channels to gather feedback, to distribute new changes or features, and to exert positive influence.

Originality/value – This study is one of the few examining the effect of PIIT in a post-adoption context and confirms its long-term psychological influence on continuance intention toward m-commerce. This study is also one of the initial to use discursive power perspective to study social influence on continuance intention in the mobile context.

Keywords Perceptions, Continuance intention, Mobile commerce, Acceptance, Personal innovativeness, Social influence

Paper type Research paper

1. Introduction

Almost a decade ago, studies forecasted the adoption of wireless internet services via mobile technology and the possible impact of technology characteristics (perceived usefulness and perceived ease of use), personal characteristics (i.e. personal innovativeness), and context variables (i.e. social influences) (i.e. Lu *et al.*, 2003, 2005; Yang *et al.*, 2004). With the continuous improvement and expansion of wireless networks and especially the increasing popularity of mobile devices and apps, mobile commerce (m-commerce) is currently the hottest trend in the USA. This trend makes researching the continuous use of m-commerce very important.

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M-commerce has generally been viewed as an extension of e-commerce (the transactions of commodities, services, or information), moving beyond the static terminal of the PC/TV to anytime, anyplace, anywhere use of mobile devices (Clarke, 2008). In addition, m-commerce enables a whole set of unprecedented service capabilities, including location awareness, context sensing, and push delivery (Kourouthanassis and Giaglis, 2012). Despite rapid proliferation, the volume of m-commerce is only expected to make up 7 percent of overall e-commerce sales by 2016 and only 1 percent of general retail sales (Forrester Research, 2011). Mobile internet services in general are reportedly facing serious problems in terms of high rates of discontinuation, low profits, and shallow user bases (Hung *et al.*, 2007, 2012; Kim *et al.*, 2008). M-commerce users are not only technology users but also consumers. Determining how to increase their continuance intention becomes crucial to m-commerce development and to the success of m-commerce providers.

M-commerce is an IT-supported business innovation. Currently, the focus of acceptance research in the information systems (IS) field has shifted from adoption of mobile services and service-oriented design (Maity, 2010; Malhotra and Malhotra, 2009; Vatanparast and Butt, 2010) to explanations of continuance intention (Venkatesh *et al.*, 2011; Zhou, 2011a). A target issue is whether the identified determinants and antecedents of adoption will remain influential for continuance intention. In other words, whether and to what extent experience moderates the effects of the posited belief antecedents in technology acceptance models of which the findings mostly apply to early adoption (Lewis *et al.*, 2003). Venkatesh and his colleagues extended the theory of IS continuance by expanding the belief set from perceived usefulness to include three additional predictors identified in the unified theory of acceptance and use of technology (UTAUT). Most studies or models concerning continuance intentions toward mobile services tended to focus on the impact of transaction-based satisfaction (Zhao *et al.*, 2012; Zhou, 2011a), quality of information, system and platform (Lin and Chen, 2012), and external factors, such as social influences and monetary costs (Zhou, 2011b). Only a few paid more attention to mobile users in terms of habits (Kim, 2012), perceived value and familiarity (Ng and Kwahk, 2010), and trust toward mobile services (Akter *et al.*, 2011). Most research tended to exclude internal motivation stimuli such as personal innovativeness and external stimuli such as social influence from their determinant or antecedent lists. Traditionally, these factors were believed to be critical only in the initial adoption stage, and their impacts erode over time or diminish after adoption (Agarwal and Prasad, 1998; Lewis *et al.*, 2003; Venkatesh and Brown, 2001).

From a social perspective and a psychological perspective, I argue that both social influence as an external motivation stimulus and personal innovativeness as an internal motivation stimulus continue their impacts on mobile users' m-commerce post-adoption behaviors via their continuance intentions. From a consumer power perspective, social influence could be the impact of consumer discursive power formed through discourses via social channels. The decision to continue or discontinue can be regarded as a consequential exhibition of consumer power. From a psychological perspective, personal innovativeness as a personality trait has lasting effect on human behavior. However, very few studies explored its effect in a post-adoption context with strong empirical support even in IS field (Hong *et al.*, 2011; Sun, 2012). So far, m-commerce continuance studies are limited in the USA; a continuance study examining the simultaneous effects of both social influence and personal innovativeness that are claimed profound in mobile technology adoption (i.e. Lu *et al.*, 2003, 2005) is rare. Such a research effort will definitely contribute to both IS continuance literature and

e-commerce literature. To accomplish the study objective, after explaining the theory background, a theory model and related hypotheses are developed as guidance to data analysis. A discussion of findings and conclusions is followed by a description of implications, limitations, and future research directions.

2. M-commerce development in the USA

The proliferation of m-commerce in the USA, to a great extent, relies on the development of its wireless infrastructure (Zhang and Prybutok, 2005), emergence of touch-screen mobile devices and mobile apps, as well as the guidance and coordination of regulatory bodies. The USA has been leading the world with its well-developed wired internet and mature telecommunication networks which strongly support e-commerce transactions popular in this country. However, countries weak in telecommunication infrastructures and computing networks jumped onto the wireless wagon to take advantage of cost-effective mobile networks. This has created a situation where the USA is lagging behind Japan, Korea, and Europe in mobile penetration and deployment of relevant data services despite the invention of CDMA, the popular 3G mobile standard. Realizing the critical importance of mobile technologies to consumers and to the connectivity of the nation, the implementation of the Telecommunications Act of 1996 and later amendments show a critical change in universal-service concepts in the USA toward mobile communications and broadband internet connections (Parsons and Bixby, 2010).

Unlike many countries where growth of m-commerce is a function of policy interventions from the government(s), m-commerce in the USA is, to a large extent, the result of a free market with only a few exceptions, such as the US federal government supplying US$7.2 billion in the 2009-2010 budget year mainly for broadband rollout in rural areas (Noam, 2010). The consequence of this and other market forces have resulted in making the price of a phone call and using mobile data services in the USA relatively lower than those in China and Europe (Zhang and Prybutok, 2005; Hathaway-Zepeda, 2006).

Relative to many other countries, regulators in the USA play a modest role, with the Federal Communications Commission (FCC) being the agency that helps to ensure fair competition and consumer rights in its policies. Spectrum width provides a technological constraint on the operation of wireless communication services. In the USA, the FCC determines a complex set of license auctions (Li and Lyons, 2012) and organizes spectrum auctions to the telecommunication and wireless industry. The introduction of the iPhone provoked a flurry of activities in the US wireless market. The FCC exercises "primary jurisdiction" through hearings over issues such as early termination fees, restrictions on innovation, handset locking, and device portability to provide guidelines to today's wireless market (Haubenreich, 2008). Although sometimes slow and below expectations, the regulation implementation and policy-making process has resulted in preventing a monopoly in the industry and in protecting the ultimate benefits of the consumers. A recent econometric study showed that the number of mobile network operators appeared to be more in the USA in comparison to many other countries (Li and Lyons, 2012). And, facing relatively rapid growth of mobile communications and the decline in landline penetration in recent years in the USA, government regulations and laws in this country are falling behind. Scholars are passionately advocating that congress and federal regulation play a more active role in resolving the jumble of rights and responsibilities that currently emerge in the wireless market (Haubenreich, 2008), and the FCC should do more to promote mobile connectivity, especially in rural areas (Parsons and Bixby, 2010).

American consumers are accustomed to desktop computer-based e-commerce. A smooth transition to m-commerce is, thus, most desired. For over a decade, numerous wireless LANs, wireless hotspots, and wireless cities have gradually extended the fixed internet in this country. In a not-so-distant future, mobile broadband may be the internet connections of choice for many individuals and households (Beard *et al.*, 2011). The launch of the iPhone in 2007 provided an eye-catching touch-screen smartphone that allows easy access to the mobile web and a broad set of highly personalized, location-sensitive, and context-aware applications (Kourouthanassis and Giaglis, 2012). The mobile device revolution incurred the birth of tablet computers and attracted the IT and e-commerce giants such as Google, Microsoft, and Amazon, as well as innovative new players in the software industry. Micro browsers and mobile apps carried by smartphones and tablets offer users a familiar and enjoyable platform to satisfy their mobile needs. According to US Wireless Quick Facts, the wireless penetration rate by June 2012 reached 101 percent (CTIA-The Wireless Association, 2012). In total, 45 percent of American adults have a smartphone and 31 percent own a tablet computer (Brenner, 2013). The volume of m-commerce is growing at 39 percent each year and estimated to reach US$31 billion by 2016 (Kourouthanassis and Giaglis, 2012). The primary attention to consumer experience in terms of usefulness and ease of use, as reflected in the design of devices and mobile apps, has greatly contributed to the mobile boom. As a consequence a competitive mobile market, different industrial standards, proprietary software innovations, and a variety of technologies exist concurrently and result in incompatible networks and products (Beard *et al.*, 2011). Such circumstances give rise to the need to pay heed to mobile user continuance intentions.

3. Theory background

The research model is rooted in TAM 2 (Venkatesh and Davis, 2000) and UTAUT (Venkatesh *et al.*, 2003). Technology acceptance theory is recognized as one of the most influential extensions of the theory of reasoned action (TRA) by Fishbein and Ajzen (1975). Both TAM and TRA have strong behavioral elements and concur that behavior is primarily determined by behavioral intention, the extent to which an individual intends to perform a specific behavior. All forms of acceptance models suggest a strong tie between changes in human beliefs (perceptions) about the innovation characteristics and the changes in behavioral intentions regarding the innovation. Over the years, numerous studies have examined and confirmed the role of perceived usefulness and perceived ease of use in mediating the impacts on behavioral intentions from other factors. Once a model becomes well-established within a given domain, it often serves as a basis for studies in other areas (Venkatesh *et al.*, 2007). Because of its root in TRA, which is powerful in explaining volitional behaviors (Hale *et al.*, 2003), TAM has been widely used in studies concerning acceptance of innovative services such as online shopping (Chen, 2012), m-commerce (Chong *et al.*, 2012), and mobile services (Kim *et al.*, 2011; Zarmpou *et al.*, 2012; Zhou, 2011a), to name a few.

TAM models by design predict both initial adoption and post-adoption usage. Both TAM2 and UTAUT were tested in staged longitudinal studies and yielded strong empirical evidence of support in IS field. Due to this model's functionality, the fundamental elements have been integrated into the famous expectation-confirmation theory (ECT, Bhattacherjee, 2001). Recently, a number of e-commerce studies employed TAM models and found the primary model constructs continue to influence purchasing intentions in the post-adoption online context (Bianchi and Andrews, 2012; Liu and Forsythe, 2011; Taylor and Strutton, 2010). It seems that, while the ECT model

is better in explaining the process of change via confirmation through direct experience and user satisfaction, a TAM-based model is still effective in revealing the determinants and antecedents of post-adoption user intentions in different contexts. A TAM-based model also makes it easier to compare with prior adoption study findings.

Continuance intention is a mental state reflecting an individual's decision to repeat her current behavior and can be compared to intention to repurchase in marketing. In this study it is the intention to continue using m-commerce. Though the intention-behavior association in IT usage contexts is reported in the low-to-moderate range (Bhattacherjee *et al.*, 2008), continuance intention has been frequently used in various contexts to predict continued behavior (Bhattacherjee, 2001; Lin and Chen, 2012; Shin *et al.*, 2010; Taylor and Strutton, 2010). Prior research has suggested that continued use is not simply an extension of the adoption decision. These two behaviors are not necessarily mediated by the same antecedents that predict the adoption decision (see Ajzen, 2005; Limayem *et al.*, 2007). In other words, certain influencing factors in adoption studies might change or lose their impacts in continuance intention studies, and other new factors may come into the picture. For this same reason, the present study uses a TAM-based model instead of an ECT-based model.

Recently, a consumer discursive power model advocated by Denegri-Knott *et al.* (2006) is getting increased attention in marketing and consumer research literature. This perspective disposes the consumer sovereignty model (a passive, depressed consumer) and consumer resistance as posited by the cultural model. This model believes that the wills of consumers and producers are "far more overlapping, mutual and interdependent than commonly recognized" (Kozinets and Handelman, 2004, p. 671). Drawing on the Foucauldian perspective of power, the discursive model takes consumer power to be a (co)creative force that structures the possible field of co-creating and reproducing the market as the consequence of interaction and free exchange of knowledge and opinions (Denegri-Knott, 2004; Holt, 2002). This model claims that consumer discursive power is usually evidenced by behavioral manifestation (i.e. discourses via social channels) and decision making (i.e. ignore, adapt, reject, continue, or discontinue). Consumer power explains the nature and origin of consumer demand and justifies the role of marketing in satisfying it. This perspective sheds new light on social influences and user intention changes in acceptance research and should be useful in generating valuable implications.

4. Model and hypothesis development

This paper argues that both external and internal motivations impact user continuance intention toward m-commerce. Social influence constitutes a major external impact on m-commerce users. Personal innovativeness in information technology (PIIT) makes a primary source of internal motivation. Such impacts work on intentions directly and indirectly through user perceptions.

4.1 Social influence

Social influence in this study refers to the extent to which members of a social network influence one another's behavior (Rice *et al.*, 1990). This definition is rooted in social influence theory. According to Kelman (1958), the effects of social influence fall into three broad categories – compliance (people appear to agree with others, but actually keep their own opinions private), identification (people are influenced by someone who is liked and respected, such as a famous celebrity), and internalization (people agree to and accept a belief or behavior both publicly and privately). Social influence has been regarded as a critical element to decision making for people in sociology and in

behavioral science. The famous TRA (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) suggests that a person's behavioral intention depends on the person's attitude about the behavior and subjective norms. Subjective norm is the influence of people in one's social environment on one's behavioral intentions (i.e. the perception of whether people who are important to him think he should perform the behavior in question). This theory has served as the model foundation of TAM2 and UTAUT. The explanations of subjective norms have greatly influenced the formation of the measures of social influence in these two models and many other acceptance studies. Venkatesh and Davis (2000) believed that in voluntary settings, social influences are more likely to operate indirectly through utilitarian outcomes. In the UTAUT model, social influence is further recognized as a direct determinant of behavioral intention.

Moving beyond social influence theory, the social information processing approach affirms that support from influential others has an important impact on what action a person chooses to take, because individuals adapt their beliefs, attitudes, and behaviors to their social context Salancik and Pfeffer (1978). Also stemming from social influence, social network theory focusses on analysis of social channels, relationships, and the effect of social influence. Fulk and her colleagues (Fulk, 1993; Schmitz and Fulk, 1991) suggested that information passed through individuals' social networks influences their perceptions of a target technology. Namely, social networks transmit information, opinions, and behaviors (Christakis and Fowler, 2007). Those theories gave rise to the theory of consumer discursive power. Consumer discursive power is concerned with the discourses or communications which determine the workings of power, knowledge, or truth that span social relations (Denegri-Knott *et al.*, 2006). This perspective values any influence on an individual from the opinions and knowledge developed through social interactions. Using this perspective, social influence is the impact of consumer discursive power through social relations built via online and offline media. The advocators believe that individuals are simultaneously objectivized by institutional discourse and subjectivized by practices of the self. Any decision change reflects internalization of norms that take place via iterative processes of objectivization, where truths are established, and subjectivisation, where appropriate practices of the self result in the formation of a subject as a known, free, and empowered agent (Denegri-Knott *et al.*, 2006). According to this perspective, changes in mobile user perceptions and behavioral intentions in a social environment can be explained as the consequences of internalization of an external discourse of normalcy and of actual experience. Changes in perceptions or behavioral intentions may reflect practices of consumer resistance operating within existing discourses.

M-commerce users are exposed to the effect of interactions among people in the bigger social environment. Members in complex social networks including colleagues, experienced users, friends, family members, and celebrities are all likely to exert influence on one's behavioral intention. However, information and opinions from certain members may be valued more by the user for various reasons and, therefore, have a stronger impact on her decisions. Thus, the core measures of subjective norms still apply in this context. Prior research has identified secondary sources of information, such as TV and newspapers, as influential in voluntary settings (Rogers, 1995; Venkatesh and Brown, 2001). Thus, mass media makes another source of social influence.

A number of e-commerce studies incorporated social influence as a construct in their operational models and found some empirical support (e.g. Hsu and Chiu, 2004; Lewis *et al.*, 2003; Lu *et al.*, 2005). Recently, some even explored the components of social influence as a determinant of behavioral intention (Zhou, 2011b). Empirical

examination of social influence in m-commerce studies also showed its power in predicting consumer adoption decisions (Chong *et al.*, 2012) and in forecasting intentions to use mobile data services (Kim *et al.*, 2011). Social influence was found to be both an antecedent (Sadia, 2011) and a determinant of m-commerce adoption (Shin *et al.*, 2010; Wei *et al.*, 2009). Most supporting evidence has come from Asian and European countries and regions, where mobile networks and cell phones have been more popular than in the States (Chew, 2006). Relevant findings in this country have mainly come from studies conducted several years ago (Sarker and Wells, 2003; Siau *et al.*, 2004).

Does the impact of social influence diminish after adoption in the mobile context or in general? Drawing on the theory of consumption values (Sheth *et al.*, 1991), Kim *et al.* (2008) explored whether factors important in converting discontinuers into continuers differ from those effective in maintaining continuers in the context of mobile data services in Korea. They discovered stronger impact of social influence on discontinuers as compared to that on continuers. Their study focus (continuers vs discontinuers), however, differs from this study (whether social influence, as a proved determinant of adoption, differs in its influence on continuance intention). A similar social perspective, however, is often used in e-commerce continuance studies. Recent studies investigating social influence on online consumer continuance intentions vary in their findings regarding the significance and influence pattern in different research contexts (Cheung and Lee, 2009; Kim *et al.*, 2009; Venkatesh *et al.*, 2011; Wang and Chiang, 2009). The common findings are that user 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 much more often identified as a mediator of social influence. Again, most of those studies are conducted in other countries.

Based on mixed findings on social influence, this study proposes that influences from social circles have both a direct and indirect impact on continuance intentions toward m-commerce in this country with perceptions regarding usefulness and ease of use serving as its mediators. Thus, we develop the following three hypotheses:

H1a. Social influence has a direct positive impact on perceived usefulness.

H1b. Social influence has a direct positive impact on perceived ease of use.

H1c. Social influence has a direct positive impact on continuance intention toward m-commerce.

4.2 Personal innovativeness

Some researchers believe that the most proximate influence on an individual's cognitive interpretations of a target object comes from 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 adopt an innovation earlier. They believe that to predict individual behavior toward an innovation, this construct must be reconceptualized domain specific as opposed to globally. PIIT, thus, emerged as the willingness of an individual to try out any new information technology. Researchers described PIIT as symbolizing the risk-taking propensity that exists in certain individuals and not in others. Individuals with higher levels of PIIT are expected to develop more positive perceptions about the innovation and have more positive intentions toward use of new IT/IS. The implication

is obvious – PIIT is most effective in determining adoption of innovations, since it captures an individual's natural tendency to try out a new technology in multiple acceptance domains.

Over the years, individual psychological factors have attracted increasing attention in mobile contexts. The common understanding is that omission of personality variables would make intention formation appear more rational than it really is (Aldás-Manzano *et al.*, 2009). Some found PIIT a strong antecedent (i.e. Lu *et al.*, 2005; Hung *et al.*, 2007; Kwon *et al.*, 2007), while others found PIIT exerting a moderating effect on behavioral intentions (Han *et al.*, 2006; Yi *et al.*, 2006). Though self-efficacy as another psychological factor was recently discovered as a significant antecedent in a mobile service adoption study (Kim *et al.*, 2011), most m-commerce studies found personal innovativeness a primary determinant of adoption intentions (Aldás-Manzano *et al.*, 2009; Wu *et al.*, 2011; Yi *et al.*, 2006; Zarmpou *et al.*, 2012; Zhao *et al.*, 2012). However, there has been very little effort in exploring the effect of personal innovativeness in a post-adoption context.

Social psychologists believe that personal attributes are more stable and invariant across usage settings than innovation features or situational factors. Psychologists have declared the long lasting effect of personality on a broad range of conative responses including intentions and behaviors (Ajzen, 2005). Innovation research has a long history of studying personal innovativeness as a cause of differences in cognitive style (Rogers, 1995; Scott and Bruce, 1994). Louis and Sutton's (1991) research on switching gears explains that when novel situations, discrepancies, and deliberate initiatives are provided, active thinking is triggered and serves as a necessary condition for innovative use behavior. An individual with high PIIT is more likely to sense novel situations or discrepancies and subsequently engage in adaptive system use (ASU). According to Engeström *et al.* (1998), the innovative nature of ASU reflects active cognitive thinking which is associated with personal innovativeness. Researchers in IS often believe that users can continue discovering and adopting new features after the system has been adopted (Jasperson *et al.* 2005). This gives users opportunities to show their innovativeness in post-adoption behaviors. One research stream that incorporates individual differences in examining user post-adoption behavior is the acceptance of agile IS (Thong *et al.*, 2006; Hong *et al.*, 2011). This research stream is interested in user responses to IS characterized by frequent upgrades with a small number of new features released periodically. The argument is that if we consider agile IS as composed of many small innovations, users high in PIIT will be more accommodating of those periodic changes of agile IS. An innovative person is more likely to welcome innovations. By this logic, innovative people should be more willing to continue using agile systems. The study, however, failed to find empirical support to this postulation (Hong *et al.*, 2011). Another study recently confirms that PIIT positively moderates the impact of novel situations on ASU (Sun, 2012). In other words, innovative people are more likely to tolerate the risk associated with system changes and more likely to perform innovative system use.

Typically m-commerce, a business application driven by mobile technology, has constant innovations (technology and business) and upgrades of existing devices and applications. Given a persistent and general nature in trying out and accepting innovations across multiple technologies, personal innovativeness should also play an important role in influencing post-adoption continuance decisions toward m-commerce. M-commerce users with higher PIIT levels, because of their stronger risk-

tolerance and confidence in their capabilities to handle frequent changes, are more likely to continue usage. Thus, we propose the following:

H2a. Personal innovativeness measured in PIIT has a direct positive impact on perceived usefulness of m-commerce.

H2b. Personal innovativeness measured in PIIT has a direct positive impact on perceived ease of using m-commerce.

H2c. Personal innovativeness measured in PIIT has a direct positive impact on continuance intention toward m-commerce.

4.3 Perceived usefulness

Perceived usefulness as performance expectancy for target technology or service has received attention from scholars and practitioners in both initial adoption and continuance intention studies (Lewis *et al.*, 2003; Lu *et al.*, 2005; Taylor and Strutton, 2010). Usefulness of the target technology is repeatedly recognized as a critical determinant of user behavioral decisions, regardless of research contexts. Perceived usefulness is found positively associated with continuance intention in most e-commerce studies (Chou *et al.*, 2010; Kim *et al.*, 2009). Perceived usefulness has been repeatedly found an important determinant of continuance intention toward m-commerce in Taiwan (Hung *et al.*, 2007; Lin and Shih, 2008). In line with the literature, we hypothesize the same relationship for m-commerce users in the States:

H3. Perceived usefulness has a direct positive impact on user continuance intention toward m-commerce.

4.4 Perceived ease of use

Perceived ease of use (effort expectancy) refers to the overall mental effort of using m-commerce as a post-adoption experience. It has been found to be another primary determinant of technology acceptance (Sadia, 2011; Kim *et al.*, 2009). The role of this construct is also well researched. Ease of use, though generally believed to be not as critical as perceived usefulness in serving as a determinant of continuance intention, is repeatedly illustrated either as having a direct impact on post-adoption usage (Choi *et al.*, 2011; Taylor and Strutton, 2010) or as being associated positively with perceived usefulness (Liu and Forsythe, 2011; Zhou, 2011a). Similar to perceived usefulness, this construct is repeatedly found to mediate influences from other factors. In order to serve the research objectives and to keep in line with literature, we make the following hypotheses:

H4a. Perceived ease of use has a direct positive effect on user continuance intention toward m-commerce.

H4b. Perceived ease of use has a positive effect on perceived usefulness of m-commerce.

4.5 Research model

In summary, the research model (Figure 1) proposes that individual continuance intention toward m-commerce is the combined effect of perceived usefulness, ease of

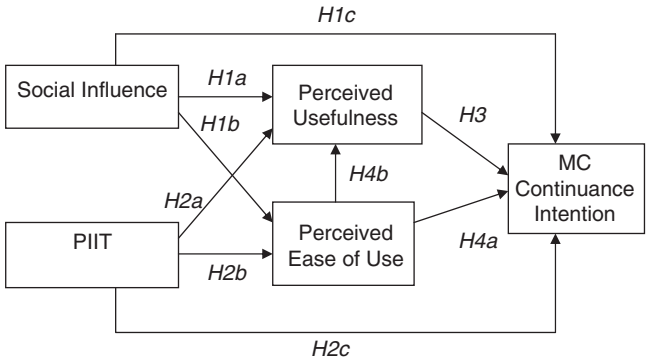


Figure 1.
Operational research model

use, social influence, and personal innovativeness measured in PIIT. The emphasis of this model is on explaining the impact of social influence and personal innovativeness on continuance intentions. Both social influence and personal innovativeness serve as antecedents and determinants of user continuance intentions toward m-commerce. As antecedents, social influence and personal innovativeness affect continuance intentions via perceived usefulness and ease of use of m-commerce. In fact, perceived usefulness and ease of use were both repeatedly identified as significant predictors of continuance intentions (Chiu and Wang, 2008; Taylor and Strutton, 2010). These two constructs are included in the model for consistency with past research and for comparing study findings.

5. Methodology

M-commerce in this study is a multi-dimensional activity of using mobile apps carried on a smartphone to accomplish a business transaction. A survey study design was adopted to collect data for testing the research model. Most constructs in the model had been validated in previous studies. The four-item ease of use and the four-item usefulness scales were adapted from the work of Davis (1989) and that of Moore and Benbasat (1991). Survey items of social influence were adapted from the work of Venkatesh *et al.* (2003) and used in the study of Lu *et al.* (2005). The four-item PIIT scale was from the work of Agarwal and Prasad (1998). The three-item continuance intention scale was from the study of Lee *et al.* (2007) (please see Appendix). All the survey items were modified to serve the current study objective; whether social influence and personal innovativeness affect continuance intention toward m-commerce as they affected adoption of wireless Internet mobile services. A seven-point Likert scale ranging from 1 to 7, with "1" for strongly disagree and "7" for strongly agree was employed for all the model-related survey items. The study was piloted in a graduate MIS class to examine whether the content, style, and format were correctly understood by the survey participants.

The data were collected from both undergraduate and graduate students from online and offline classes in a regional university in the 2011-2012 academic year. Of the 376 participants, valid data points from 323 (86 percent) users of m-commerce via smart phones were employed in the data analysis. Comparisons of the means on all the model variables between offline ($n = 105$) and online ($n = 218$) groups using independent t-tests did not show any significant differences (p-values vary from 0.058 to 0.877). Six types of m-commerce activities (Table I) from m-commerce literature (Choi *et al.*, 2011; Sharma and Gutiérrez, 2010) were included in the survey

Variable	Frequency (percentage)			
Gender	Male: 188 (58)		Female: 135 (42)	
Education	Bachelor degree: 205 (64)		Master degree: 113 (35)	
Age	21 ~ 30	158 (49)	31 ~ 40	128 (40)
	> 40	37 (11)		
M-commerce experience	⩽1 year	53 (16.4)	1-2 years	119 (36.8)
	3-5 years	84 (26)	⩾5 years	67 (20.7)
M-commerce activities[a]	Mobile ordering		88 (27)	
	Paid mobile downloading		136 (42)	
	Mobile shopping		119 (37)	
	Mobile banking		168 (52)	
	Mobile stock trading		54 (17)	
	Mobile booking or ticketing		88 (27)	
Possibility to continue	100%	215 (66.6)	75%	60 (18.6)

Table I.
Descriptive data

Notes: $n = 323$. [a]74 percent of the participants were involved in more than one type of m-commerce

with a consumer perspective. About 74 percent of the participants had experiences of using more than one type of m-commerce service. Two-thirds of them expressed 100 percent likeliness to continue using m-commerce.

To test the hypothesized relationships in the operation model, IBM SPSS 19 was used to check the reliability of the model constructs, and Amos Graphics 19 was used to run structural equation modeling (SEM) procedures, a well-accepted statistical data analysis procedure for model testing.

6. Results

Internal consistency of each construct in the model was examined using IBM SPSS 19. The scale-wide Cronbach α values ran from 0.85 to 0.99, clearly exceeding the threshold of 0.70 (Hair *et al.*, 2010) and, thus, indicating good scale reliability.

The research model was validated using SEM. 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 -2.765 to -0.05; univariate kurtosis values range from -1.03 to 11.034. According to Kline (2010), absolute values of univariate skew indexes >3.0 and absolute values of the univariate kurtosis indexes >8 are indications of extreme cases of violating normality assumption; the present data set is a case for violation. Therefore, Bollen-Stine bootstrap procedures were run to control for the abnormal distribution (Byrne, 2009). In total, 250 bootstrap samples were requested. The p-value obtained was >0.05, and the SEM procedures were thus continued for model testing.

We empirically assessed the convergent validity of the measurement model using confirmatory factor analysis (CFA). As illustrated in Table II, the factor loadings for the five constructs all exceed 0.60, and all were significant with their t-values. We also compared the composite reliability (CR) values with the average variance extracted (AVE) values. All the CR values exceed the AVE values, and all the AVE values exceed the threshold of 0.5. Thus, the desired convergent validity is achieved.

We finally tested for discriminant validity of the measurement model. Table III displays all the indexes used for this purpose. All the AVE values in the table are greater than the MSV values and greater than the ASV values. For each factor, the

Construct	Item code	Factor loading	Cronbach's α
Perceived usefulness	Usefulness1	0.782	0.853
	Usefulness2	0.810	
	Usefulness3	0.729	
	Usefulness4	0.727	
Perceived ease of use	Ease1	0.814	0.894
	Ease2	0.817	
	Ease3	0.877	
	Ease4	0.847	
Social influence	SInfluence1	0.991	0.917
	SInfluence2	0.740	
	SInfluence3	0.941	
PIIT	PIIT1	0.841	0.861
	PIIT2	0.706	
	PIIT3	0.828	
	PIIT4	0.808	
Continuance intention	CIntention1	0.999	0.994
	CIntention2	0.990	

Note: $n = 323$

Table II.
Variables, factor loadings and reliability values

square root of AVE is larger than its correlation coefficients with other factors. Thus, the metrics show reasonable discriminant validity (Hair *et al.*, 2010).

6.1 The measurement model

A CFA measurement model was then created to check the model fit of the proposed model. Besides the usual measures used to assess model fit, the Tucker-Lewis index (TLI, equivalent to the non-normed fit index) and the root mean square error of approximation (RMSEA) were also selected. Those measures revealed a fairly reasonable model fit (Table IV). Thus, we proceeded with structural path analysis.

6.2 The structural model

The structural model to confirm the hypothesized relationships among the studied constructs was then built and examined. Model indexes indicate a moderately acceptable fit (Table IV).

Regression weights of path analysis reveal that five out of nine hypothesized relationships are strongly supported by the empirical data. The significant causal relationships supported by this study are displayed in Figure 2. This figure also shows that 76 percent of the variance in continuance intention is explained by the specified constructs. The perceived ease of use and social influence constructs collectively explained 81 percent of the variance in perceived usefulness. Personal innovativeness measured in PIIT explained most of the 60 percent of the variance in perceived ease of use. It also exerts a strong indirect effect (0.60) on perceived usefulness via perceived ease of use. Though perceived ease of use does not have a strong direct impact on continuance intention, it has a strong mediated effect of 0.895 on this ultimate dependent construct via perceived usefulness. Both personal innovativeness and social influence have some indirect effects on continuance intention as well, but none is as strong. The effect size of personal innovativeness is larger (0.33) than that of social influence (0.11). As an additional finding, data analysis also reveals a small direct impact from social influence to personal innovativeness (0.10, $p < 0.01$).

Table III.
Reliability, convergent and discriminant validity, and correlation matrix

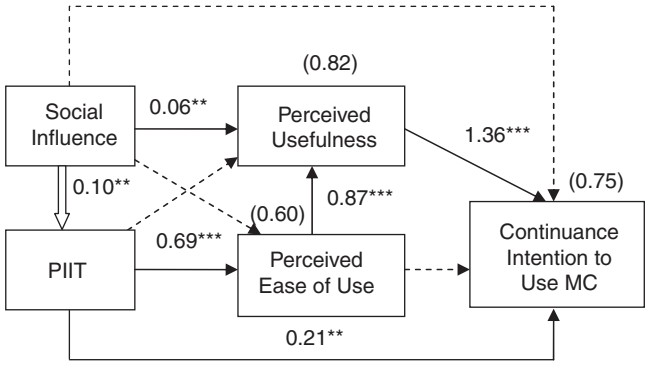
Factor	CR	AVE	MSV	ASV	Perceived usefulness	Perceived ease of use	PIIT	Social influence	Continuance intention
Perceived usefulness	0.907	0.582	0.572	0.422	0.840				
Perceived ease of use	0.946	0.704	0.571	0.340	0.722	0.839			
PIIT	0.925	0.636	0.571	0.355	0.660	0.756	0.797		
Social influence	0.956	0.805	0.058	0.028	0.242	0.108	0.165	0.897	
Continuance intention	0.997	0.985	0.672	0.399	0.820	0.723	0.621	0.127	0.992

Notes: $n = 323$. CR, composite reliability; AVE, average variance extracted; MSV, maximum shared squared variance; ASV, average shared squared variance. Values indicating square roots of AVEs are listed diagonally in the matrix

Out of the concern that continuers and discontinuers may differ in internalizing social influence as noticed in another study (Kim *et al.*, 2008), all the respondents were divided into two groups by their mean intention score: continuers ($n = 248$, mean intention score $\geqslant 5$) and discontinuers ($n = 28$, mean score $\leqslant 4$). Linear regression tests were performed using mean continuance intention, mean perceived usefulness, and mean perceived ease of use as dependent variables respectively. The test results are displayed in Table V. Different from the previous finding that social influence had a strong influence on discontinuers' perceptions but not on the continuers', social influence seems significantly stronger on the continuers regarding perceived usefulness of m-commerce in this study. The discontinuers seem more vulnerable to social influence when making a decision to continue or not to continue (R^2 change $= 0.267$). The measure "People who influence my behavior think that I should use m-commerce" appears to be the stronger cause of effect ($\beta = 0.686$, $t = 2.986$, $p = 0.002$).

Index	Measurement model	Structure model	Threshold
χ^2/df	2.70	2.46	<3
GFI	0.91	0.91	$\geqslant 0.9$
AGFI	0.87	0.87	$\geqslant 0.8$
IFI	0.96	0.97	$\geqslant 0.9$
TLI	0.95	0.96	$\geqslant 0.9$
CFI	0.96	0.97	$\geqslant 0.9$
RMSEA	0.07	0.06	<0.08

Table IV.
Model fit indexes



Notes: A number in parentheses indicates a variance. A dotted arrow indicates an insignificant relationship. An empty arrow indicates an additional finding. **, ***Significant at 0.01 and 0.001 levels, respectively

Figure 2.
Model supported by empirical data

Dependent variable	Independent variable: social influence Continuers ($n = 248$)	Discontinuers ($n = 28$)
Mean continuance intention	$F = 0.591$, $p = 0.554$	$F = 4.544$, $p = 0.021$
Mean perceived usefulness	$F = 5.321$, $p = 0.005$	$F = 1.198$, $p = 0.319$
Mean perceived ease of use	$F = 1.805$, $p = 0.167$	$F = 0.499$, $p = 0.613$

Table V.
The effects of social influence on continuers and discontinuers

Influenced by the attention to gender in UTAUT, a number of recent studies examined this effect and found gender moderating the impact of social influence (i.e. Cheng *et al.*, 2011; Pagani and Mirabello, 2012). The impacts of social influence on continuance intention and on perceptions are examined again, using gender as a grouping variable. The results are reported in Table VI. It seems that female respondents' continuance decisions are more vulnerable to social influence. The perceived ease of use of the male respondents is more exposed to social influence in this study. Again, the same measure appears to be the stronger cause of effect ($\beta = 0.215$, $t = 2.109$, $p = 0.037$).

7. Discussions

7.1 Findings

The hypotheses testing results are listed in Table VII. The data analysis results show clearly that social influence as a construct does not serve as a determinant of continuance intention toward m-commerce or of perceived ease of use in this study. *H1b* and *H1c* are thus rejected. As an antecedent, the impact of social influence on the whole is not very strong, either. The declining importance of social influence with time as noticed in the literature is supported in the study (Karahanna *et al.*, 1999; Venkatesh and Brown, 2001). However, the regression test shows that the item "My friends think that I should keep using m-commerce" has a significant influence on mean continuance intention ($t = 4.360$, $p = 0.000$). Peer pressure is still evident among

Table VI.
The effects of social influence on males and females

Dependent variable	Independent variable: social influence Male ($n = 156$)	Female ($n = 120$)
Mean continuance intention	$F = 3.583$, $p = 0.050$	$F = 7.641$, $p = 0.001$
Mean perceived usefulness	$F = 8.373$, $p = 0.000$	$F = 6.403$, $p = 0.002$
Mean perceived ease of use	$F = 5.778$, $p = 0.004$	$F = 2.251$, $p = 0.110$

Table VII.
Results of hypotheses testing

Hypothesis	Test result
H1a: social influences have a direct positive impact on perceived usefulness	0.06; $p = 0.004$
H1b: social influences have a direct positive impact on perceived ease of use	ns
H1c: social influences have a direct positive impact on continuance intention toward m-commerce	ns
H2a: PIIT has a direct positive impact on perceived usefulness of m-commerce	ns
H2b: PIIT has a direct positive impact on perceived ease of using m-commerce	0.685; $p = 0.001$
H2c: PIIT has a direct positive impact on continuance intention toward m-commerce	0.21; $p = 0.018$
H3: perceived usefulness has a direct positive impact on user continuance intention toward m-commerce	1.36; $p < 0.001$
H4a: perceived ease of use has a direct positive effect on user continuance intention toward m-commerce	ns
H4b: perceived ease of use has a positive effect on perceived usefulness of m-commerce	0.87; $p < 0.001$

the participants – m-commerce users gain and share their positive and/or negative experiences after adoption, which creates a certain impact in the social circle (Grabner-Kraeuter and Waiguny, 2011). Such peer pressure can also be regarded as consumer discursive power active in social circles. Further, social influence continues its impact on m-commerce users through perceived usefulness in the study. This finding seems to support the findings of previous studies (Venkatesh and Davis, 2000; Cheung and Lee, 2009; Wang and Chiang, 2009) that social influence works on continuance intention indirectly through user perceptions. Such mediation of influence seems to show the internalization through users' first-hand experience and beliefs as indicated in the consumer discursive power model. When grouping variables are used in this study, social influence shows some dynamic effects.

Personal innovativeness as measured by PIIT remains as an important determinant of continuance intention, as well as a significant antecedent of perceived ease of use as expected. This construct does not have a significant impact on perceived usefulness. Thus, *H2b* and *H2c* are accepted while *H2a* is rejected. In this study, the impact of personal innovativeness on the model is much stronger than social influence. A regression test shows that the effect is stronger among those who like to experiment with new technologies ($t = 3.95$, $p = 0.000$) and those who never hesitate to try out new information technologies ($t = 4.50$, $p = 0.000$). These findings, built upon Sun's study (2012) and the study by Hong *et al.* (2011), provide positive empirical support to the long-term psychological influence of personal innovativeness on continuance intention. In comparison, those two studies supplied special circumstances in which personal innovativeness shows effect in post-adoption context. And, such influence is both direct and indirect, mostly through perceived ease of use. This finding is similar to that in Lu *et al.*'s (2005) study in the initial adoption context and is logically in line with the stronger curiosity and higher confidence level in participants' own capabilities as often shown in more innovative mobile users. M-commerce is experiencing more frequent technology and business changes, as compared to other e-commerce models. Users with high personal innovativeness tend to be more accommodating of the periodic changes and thus more willing to stay with m-commerce. Such long-term effect of personal innovativeness has some practical value and need to be confirmed in more replication studies.

H3 is strongly supported in this study. We could thus induce that perceived usefulness of m-commerce seems to remain as a critical determinant of user continuance intention. This construct also serves as an important mediator of the influences from perceived ease of use and social influence. Such findings confirm the discoveries in recent studies investigating continuance intention (Chong *et al.*, 2012; Kim *et al.*, 2011; Sadia, 2011). We could infer that mobile users are more rational decision makers, when given the option to continue with m-commerce. Users are mainly looking for positive information to reinforce their past adoption decision (Karahanna *et al.*, 1999) and estimating the practical value to continue. This is captured by the perceived usefulness belief. Another recognized determinant of initial adoption, perceived ease of use, is not empirically supported as vital for continuance intention in this study. However, its well-known impact on perceived usefulness still remains. *H4a* is thus rejected, and *H4b* supported. This finding does not support Taylor and Strutton's (2010) finding but supports Liu and Forsythe's (2011) study. The fact that perceived ease of use loses its position as a determinant of continuance intention may well reflect its reported temporal dynamic nature (Venkatesh *et al.*, 2007), which helps to explain why ECT (Bhattacherjee, 2001) does not include this construct in the model.

The value of perceived ease of use as a strong predictor of perceived usefulness in post-adoption studies is shown in its ability to enhance perceived value of the target (Ko *et al.*, 2009). Users tend to perform a task on a system that is easy to access and use, rather than on a system that demands great mental effort to operate.

As an additional finding, social influence is discovered to have some causal effect on personal innovativeness ($p < 0.05$) in this study. Clark and Goldsmith (2006) had the similar discovery in their study that innovativeness was associated with susceptibility to informational influence despite a resistance to normative influence (to conform to the expectations of group members). Using the consumer discursive perspective, it could be a typical case of developing a certain ability or tendency to determine what actions to undertake in a particular field of action, after being exposed to certain truths or knowledge circulated within existing discourses (Denegri-Knott *et al.*, 2006). In social psychology, the social cultural approach to personality development holds that social stimuli can influence conscious judgments (Bargh and Pietromonaco, 1982). An individual's propensity or predisposition is embedded in networks of continuing social relations and affected by the interaction of chance, necessity, and purpose in all social actions (Aldrich and Zimmer, 1986). In other words, social factors have a powerful influence on cognition and information processing which, in turn, affects the formation of cognitive personality traits. M-commerce users share relevant information and perceptions in social circles. Feedback from others to encourage or discourage use of certain new or updated services and features ultimately affects the level of confidence and willingness to cope with changes in the mobile context.

Another additional finding partially supports the study by Kim *et al.* (2008) in Korea that social influence affects discontinuers more strongly, but directly on their intention instead of perceptions. For the continuers, social influence seems to impact their usefulness perceptions more profoundly in this study. It is possible that recent improvements in mobile devices and in mobile apps are so prominent that there is an increasing amount of positive feedback in social interactions. This helps enhance the utilitarian perceptions of the continuers. My study also shows that female respondents are more vulnerable to social influence when making continuance decisions than their male counterpart. This finding supports the conclusion from a study in mobile learning context in Taiwan (Cheng *et al.*, 2011). Limited by the sample size, those findings are subject to confirmation in future research efforts.

7.2 Implications

This study, with a focus on continuance intention toward m-commerce, is a response to calls for investigating the effects of the posited antecedents to key constructs in acceptance models that mainly found applicable to early adoption (Lewis *et al.*, 2003; Venkatesh *et al.*, 2007). It is also an initial effort to combine a consumer discursive power perspective in acceptance research to explore what underpins intentions toward m-commerce continuation. The theoretical implications are apparent: This study, as one of the initial efforts, confirms the predicted long-term psychological influence of personal innovativeness in a post-adoption study. It clearly demonstrates the powerful role of personal innovativeness as both a direct determinant of continuance intention and a significant antecedent of user perceptions in an m-commerce context. This study also shows personal innovativeness as having a stronger and more direct impact than that of social influence as external stimulus on continuance intention. Meanwhile, this study reveals that external stimuli from social contexts most likely need to be confirmed or internalized through perceived usefulness to show an impact. And, the

effect of social influence, in a post-adoption context, interacts with individual differences. Knowledge of the effect patterns from personal innovativeness and social influence will help to advance our understanding of the cognitive underpinnings of post-adoption behavioral decisions. Such knowledge will also help us to comprehend the power that controls consumer movement in an m-commerce context and how social circles should be utilized to induce a particular type of behavior (Denegri-Knott *et al.*, 2006).

Post-adoption use of m-commerce is highly dynamic because of constant changes in hardware, software, and business models. The practical implications are also evident – everyone lives in a social environment and, at some point in their lives, will be innovative at a higher or lower level. From a consumer behavior perspective, PIIT reflects a general desire to change, to seek novelty and to try new things in a specific domain. Innovative consumers tend to find innovatively designed products and services more desirable (Zolfagharian and Paswan, 2010). To forge continued use of m-commerce, m-commerce providers should pay adequate attention to inclusion of change propensity behavior data to improve the accuracy of demand estimates (Wood and Swait, 2002) and to facilitate usage decisions in the long run. Mobile apps and services should be designed as innovative and interesting to keep consumer intentions high. When promoting any new m-commerce features, a personality check should precede various promotional or training programs, so that new m-commerce changes can be customized for different types of users. Consumer psychologists proclaim that innovative consumers are usually dynamic, communicative, and cognitive, because novelty often requires cognitive effort (Wood and Swait, 2002). They have the ability to modify information about new concepts, ideas, products or services for their own use (Nirmala and Dewi, 2012). By this logic, m-commerce users higher in PIIT tend to be more knowledgeable about m-commerce technology and have the potential to influence the formation of positive or negative consumer power via discourses. M-commerce providers should implement the virtual customer integration methods recommended for new product development (Zolfagharian and Paswan, 2010), by actively identifying and approaching users high in PIIT to involve them in discourses between users and providers for co-designing new m-commerce apps and co-generating effective mobile marketing strategies.

Though social influence diminishes its power on continuance intention, m-commerce users are still exposed to strong peer influences and influences from valued ones, especially the female users and users with skeptical or negative views toward m-commerce. Words and opinions via existing discourses in social circles still affect user evaluation of m-commerce usefulness. Thus, practitioners should have a lot to gain by utilizing a discursive strategy to harness the power of social networking. The discursive strategy encourages marketers to actively participate in discourses to listen to their consumers' needs, and then act by social networking with creative products and effective ways to satisfy these consumer needs (Denegri-Knott *et al.*, 2006). In an m-commerce context, mobile social media can be embedded as discursive spaces for mobile users, sellers, and service providers to dialog openly. This strategy allows m-commerce providers to persuade users to internalize the positive views and correct practices. To manage m-commerce user loyalty using discursive strategy, the quality and novelty of the services and programs offered via mobile devices should be maintained on a continuous basis.

8. Conclusions

Since m-commerce makes up a part of mobile data services, the study findings seem to support the notion that, with all the constructs remaining the same, the nomological

net of continuance intention differs from that for initial adoption (Lu *et al.*, 2005). Specifically we can draw the following conclusions: among well-educated m-commerce users, perceived usefulness and user personal innovativeness as measured by PIIT serve as primary determinants of their continuance intention. Personal innovativeness also strongly affects user perceived ease of using m-commerce, which exerts a strong influence on their perceptions. Social influence is much less influential in comparison with personal innovativeness, but still dynamic within specific groups.

Nevertheless, this study, by design, does not investigate m-commerce user expectations and satisfaction levels. Thus, this makes it difficult to detect how antecedents change their impact on user perceptions after initial adoption. The small and convenient sample used does not offer a guarantee of highly reliable model testing results. Some unique findings need to be confirmed in future studies to provide convincing explanations. An expanded expectation-disconfirmation model with a staged longitudinal design, as used in the study by Venkatesh *et al.* (2011), and a narrowed-down m-commerce focus should be considered in the future to ensure a better understanding of the dynamics of m-commerce user behavioral decisions and to generate more specific implications for m-commerce practitioners.

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Appendix. Survey items for the theoretical constructs under study

Social influence

People who influence my behavior think that I should continue using m-commerce.

People who are important to me think that I should continue using m-commerce.

My friends think that I should keep using m-commerce.

Mass media influence me in using m-commerce (deleted, $r < 0.5$).

PIIT

I like to experiment with new technologies.

Among my peers, I am usually the first to try out new information technologies.

In general, I would not hesitate to try out new information technologies.

I would look for ways to experiment with new technologies.

Perceived usefulness

I find m-commerce useful in my daily life (such as web browsing, mobile shopping, etc.).

Using m-commerce enables me to accomplish tasks more quickly.

Using m-commerce enables me to accomplish transactions more quickly.

Using m-commerce increases my productivity (for example, makes my life easier).

Perceived ease of use

My interaction with m-commerce is clear and understandable.

It is easy for me to become skillful at using m-commerce.

I find m-commerce easy to use.

Learning to operate m-commerce is easy for me.

Continuance intention

I intend to continue using m-commerce in the future.

As a user, I would keep on using m-commerce in the future.

About the author

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