



An empirical examination of factors influencing the intention to use mobile payment

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ABSTRACT

With recent advances in mobile technologies, mobile commerce is having an increasingly profound impact on our daily lives, and beginning to offer interesting and advantageous new services. In particular, the mobile payment (m-payment) system has emerged, enabling users to pay for goods and services using their mobile devices (especially mobile phones) wherever they go. Mobile payment is anticipated to enjoy a bright future.

In this paper, we reviewed the relevant literature regarding mobile payment services, analyzed the impact of m-payment system characteristics and user-centric factors on m-payment usage across different types of mobile payment users, and suggested new directions for future research in this emerging field. To analyze the adoption behaviors of m-payment users, we proposed an m-payment research model which consists of two user-centric factors (personal innovativeness and m-payment knowledge) and four m-payment system characteristics (mobility, reachability, compatibility, and convenience). We evaluated the proposed model empirically, applying survey data collected from m-payment users regarding their perceptions on mobile payment. We also attempted to categorize m-payment users into early and late adopters and delineated the different factors for these two types of adopters that affect their intention to use m-payment.

The results indicate that the strong predictors of the intention to use m-payment are perceived ease of use and perceived usefulness. All respondents reported that the compatibility of m-payment was not the primary reason in their decision to adopt it. Interestingly, our findings indicate that early adopters value ease of use, confidently relying on their own m-payment knowledge, whereas late adopters respond very positively to the usefulness of m-payment, most notably reachability and convenience of usage. Moreover, late adopters' perceived ease of use is influenced by personal innovativeness, which can probably be best explained by the fact that innovative late adopters are tech-savvy and feel confident to use m-payment technologies for their needs.

Our study will assist managers in implementing appropriate business models and service strategies for different m-payment user groups, allowing them to exert appropriate time, effort, and investment for m-payment system development. Our study also provides directions for future mobile payment-related studies.

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1. Introduction

Mobile commerce involves the sale of goods, services, and contents via wireless devices, without time or space limitations (Au & Kauffman, 2008; Mallat, 2007). As mobile commerce increases in popularity, mobile payment will continue to facilitate secure electronic commercial transactions between organizations or individuals (Ondrus & Pigneur, 2006). In this study, mobile payment or m-payment is defined as any payment in which a mobile device

is utilized to initiate, authorize, and confirm a commercial transaction (Au & Kauffman, 2008). Mobile payment is a natural evolution of electronic payment, and enables feasible and convenient mobile commerce transactions (Mallat, 2007). M-payments are typically made remotely via premium rate SMS, WAP billing, Mobile Web, Direct-to-subscribers' bill and direct to credit cards. According to Juniper Research. (2008), the gross transaction value of payments made via mobile phone for digital goods (such as music, games and ticketing) and physical goods (such as gifts, books or consumer electronics) will exceed \$300 billion globally by 2013. The report predicts that the global annual gross transaction value will grow over 5 times and ticketing segment will represent over 40% of the global transaction value by 2013.

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Because electronic commerce organizations may achieve competitive advantage via the provision of mobile payments to customers, the issues associated with appropriate mobile payment usage are of critical importance (Au & Kauffman, 2008; Mallat, 2007; Ondrus & Pigneur, 2006). In particular, the mobile user's intention to use mobile payment is of considerable interest to researchers and practitioners, because financial institutions, trusted third parties, payment service providers, and systems, software and supporting service providers can benefit greatly from enhanced understanding of the key factors underlying mobile users' intention (Dahlberg, Mallat, & Öörni, 2003a; Dahlberg, Mallat, & Öörni, 2003b; Lim, 2007; Ondrus & Pigneur, 2006). Moreover, different user groups may perceive m-payment advantages differently and adopt new payment technologies accordingly. While there is a need to understand the user-group level behavior, there is little attempt to fill a gap in the user-group level research. In light of the current state of the existing research on m-payment, the objective of this study is to empirically assess the determinants of the intention to use m-payment. In order to achieve this objective, we propose a research model that consists of two user-centric factors and four m-payment system characteristics, two belief variables, and one user acceptance variable.

The technology acceptance model (TAM) is a well-recognized model used to explain IS adoption behavior (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). According to the TAM, adoption behavior is determined by the intention to utilize a particular system, which is, in turn, determined by the perceived usefulness and the perceived ease of use of the system. One major benefit of using the TAM is that it provides a framework by which the effect of external variables on system usage can be assessed. In order to adapt the TAM to the mobile payment context, we integrated it with user-centric factors and four m-payment system characteristics. Moreover, in order to further our understanding of the users' adoption behavior, we categorized m-payment users into early and late adopters and investigated the user-group level behavior.

The remainder of the paper is organized as follows: Section 2 develops the theoretical background of our study, focusing on the technology acceptance theories and m-payment. Section 3 presents the research model and hypotheses. Section 4 provides a discussion of the research methods. Section 5 provides the analysis of the survey results. Section 6 discusses the results. Section 7 follows with the summary, contributions, implications, and limitations of the study.

2. Theoretical background

In this section, the theoretical background of our study is developed with the literature review of the technology acceptance theories, mobile payment systems, mobile payment system characteristics, and individual differences.

2.1. Technology acceptance theories

A number of research models have been introduced to explain computer-usage behavior. Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA), which depicts user behavior from social psychology's point, is the theoretical basis of Theory of Planned Behavior (TPB) (Ajzen, 1991), Technology Acceptance Model (TAM) (Davis, 1986) and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003). TRA is very general in nature and attempts to explain almost any human behavior. According to TRA, a person's performance of a specified behavior is determined by his or her behavioral intention (BI) to perform the behavior, and BI is jointly determined by the

person's attitude and subjective norm concerning the behavior in question.

TAM is one of the first and the most influential research models to explain users' IT adoption behavior (Davis et al., 1989). The TAM has been recognized as a useful model of technology acceptance behaviors in a variety of IT contexts, and is currently widely applied among researchers of information systems in general. The fundamental rationale of the TAM is that IT users act rationally when they decide to use an IT. In the process of users' intention to use new IT, two belief variables – perceived usefulness (PU) and perceived ease of use (PEU) of the system – are the most salient factors in users' intention. Perceived usefulness is defined as the degree to which a person perceives that adopting the system will boost his/her job performance. Perceived ease of use is defined as the degree to which a person believes that adopting the system will be free of effort. Perceived usefulness has an immediate effect on adoption intention, whereas perceived ease of use has both an immediate effect and an indirect effect on adoption intention via perceived usefulness. In TAM2 (Venkatesh & Davis, 2000), an extended TAM, social and organizational variables such as subjective norm, image, job relevance, output quality, and result demonstrability are included in the model. All these factors are shown to have direct impact on PU. In addition, the study shows that subjective norm not only influences PU, but also has impact on user intention.

UTAUT (Venkatesh et al., 2003) proposes four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) as direct determinants of usage intention and behavior. Note that in UTAUT, performance expectancy is the same as TAM's perceived usefulness, and is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance." Like perceived ease of use in TAM, effort expectancy refers to "the degree of ease associated with the use of the system." Unlike TAM, UTAUT introduces moderating constructs (gender, age, experience, and voluntariness of use) which are posited to moderate the impact of the four key constructs on usage intention and behavior.

Even with the wealth of currently available research involving the TAM and UTAUT, the models continue to be explored and improved in new research (Luarn & Lin, 2005). In the new research, studies assessing the acceptance of new technologies with different user populations are clearly required. The TAM can be extended to investigate users' intention to use m-payment, as mobile payment systems are a type of new information technology.

The individual differences and system characteristics are the two primary constructs that have been recognized in the past research. Individual differences were deemed to be the most significant variables to IS success in the theoretical model put forward by Zmud (1979). The importance of individual difference variables in new technology acceptance was also underlined by Nelson (1990). Moreover, the significant relationship between individual differences and IT acceptance has been demonstrated in several empirical studies involving the TAM (Agarwal & Prasad, 1999; Venkatesh, 2000). The integration of individual differences into the system design is considered to be beneficial to human mobile device interactions (Mallat, 2007; Ondrus & Pigneur, 2006). As such, assessing the effects of individual differences in m-payment adoption would be of critical importance.

Mobile payment system characteristics constitute another category of external variables that may potentially affect users' intention to adopt new IS. Davis (1989) suggested that the design characteristics of a system exert immediate effects on perceived usefulness as well as indirect effects via perceived ease of use. M-payment system features are also thought to play a vital role in the usage of m-payments. However, the assumptions regarding the manner in which the acceptance of m-payment systems will be

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