



## Mobile payment services adoption across time: An empirical study of the effects of behavioral beliefs, social influences, and personal traits

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### ABSTRACT

Mobile payment is an emerging and important application of mobile commerce. The adoption and use of mobile payment services are critical for both service providers and investors to profit from such an innovation. The present study attempts to identify the determinants of pre-adoption of mobile payment services and explore the temporal evolution of these determinants across the pre-adoption and post-adoption stages from a holistic perspective including behavioral beliefs, social influences, and personal traits. A research model that reflects the characteristics and usage contexts of mobile payment services is developed and empirically tested by using structural equation modeling on datasets consisting of 483 potential adopters and 156 current users of a mobile payment service in China. Our findings show that behavioral beliefs in combination with social influences and personal traits are all important determinants for mobile payment services adoption and use, but their impacts on behavioral intention do vary across in different stages. Theoretical and practical implications of the findings are presented.

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### 1. Introduction

Mobile payment is one of the most critical drivers for successful mobile commerce. Mobile payment refers to a payments for goods, services, and bills using a mobile device using wireless and other communication technologies (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008). Given the widespread use of mobile devices and users' needs for convenient and timely payment, mobile payment is expected to become an important channel for conducting financial transactions. Once realized it could become an additional revenue stream to service providers and investors. Already, a large number of commercial organizations have invested substantially in mobile payment services to reap its prominent profits. For instance, Nokia invested \$70 million in Obopay to enter mobile payment market in April 2009, China mobile bought 20% of PuDong bank stake (about \$5.9 billion) to develop mobile payment services in May 2010, and Google ventures invested \$100 million into mobile payment business in May 2010. Nonetheless, the expected business value that could be derived from mobile payment services relies on its acceptance by the consumers as their favorite payment channel.

In the contemporary information systems literature, research on mobile payment services acceptance focuses mainly on notions of instrumentality, e.g. perceived usefulness and perceived ease of

use (Chen, 2008; Dahlberg et al., 2008). On the other hand, literature from behavioral sciences and individual psychology suggests that social influences and personal traits (e.g., subjective norms, social image and individual innovativeness) are potentially important explanatory variables in technology adoption as well (Agarwal & Karahanna, 2000; Agarwal & Prasad, 1998; Venkatesh, Morris, Davis, & Davis, 2003; Wu & Lederer, 2009). It is useful to have a holistic view on identifying the critical determinants of mobile payment services adoption incorporating behavioral beliefs, social influences and personal traits.

In addition, most of the extant studies on user beliefs and attitudes toward mobile payment services were conducted after the system was adopted (e.g., Chen, 2008; Schierz, Schilke, & Wirtz, 2009). The results of these studies on beliefs and external stimuli that users hold for continued use of mobile payment services may not be the same as for initial adoption, or the degree of influence may differ (Karahanna, Straub, & Chervany, 1999). Identification of individuals' pre-adoption beliefs and attitudes on mobile payment services and an understanding of the temporal evolution of these factors across the pre-adoption and post-adoption stages is, therefore, crucial for understanding and managing the individuals' initial adoption and subsequent use of mobile payment services.

In view of the current state of the existing research on mobile payment, the objective of this study is to empirically test a theoretically grounded model on mobile payment services adoption that incorporates behavioral beliefs, social influences, and personal traits. In order to capture the temporal evolution of behavioral

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beliefs, social influences, personal traits, and behavior across different stages of the innovation decision process, we examine these determinants on the pre-adoption stage of mobile payment services and empirically compare the impacts of these factors between the pre-adoption and post-adoption phases. Specifically, the study investigates (1) *to what extent individual perceptions of mobile payment is attributed to social influences and personal traits*; (2) *whether behavioral beliefs such as positive utility and negative utility explain mobile payment adoption*; (3) *how does the influence of the components of behavioral intention (i.e., behavioral beliefs, social influences, and personal traits) on intention to use mobile payment services change over from the pre-adoption stage to post-adoption stage*. In this way, this research attempts to contribute to a better theoretical understanding of the antecedents of pre-adoption of mobile payment services and the differential impact of these factors across pre-adoption and post-adoption stages. Also, this study offers organizations practical insights for managing users' acceptance during each phase of the adoption process.

The rest of this paper is organized as follows. An overview of information systems and technology adoption research is presented in Section 2. In Section 3, we propose the conceptual model and the research hypotheses. Next, we describe the research methodology in Section 4, followed by the analysis of empirical findings in Section 5. Then, we present an extended discussion of the results in Section 6. In Section 7, we conclude with a discussion on the theoretical and practical implications. Finally, limitations and future research are presented in Section 8.

## 2. Theoretical background

The theory of reasoned action (TRA) and theory of planned behavior (TPB) have been widely used as the primary theoretical framework for understanding and explaining individuals adoption behavior in field of information system (Ajzen, 1991; Ajzen, Fishbein, & Heilbroner, 1980). According to TRA and TPB, an individual's intention to adopt the innovation is determined by attitude and subjective norms, which can be traced back to an individual's behavioral and normative beliefs. Behavioral belief reflects an individual's positive or negative evaluation on performing the behavior, while normative belief refers to an individual's perception of social pressures to adopt or not adopt the innovation. The impact of these two type factors on behavioral intention may vary from person to person (Ajzen et al., 1980; Lu, Yao, & Yu, 2005).

Drawing on TRA and TPB, Davis (1989) proposed the technology acceptance model (TAM) that has been tested and extended by a large number of empirical studies (Chau, 1996; Davis, 1989; Legris, Ingham, & Collerette, 2003; Venkatesh & Davis, 2000; Wu, Chen, & Lin, 2007; Wu & Wang, 2005). The original TAM examined the mediating role of perceived usefulness and perceived ease of use and their relationships between external variables and the probability of information systems adoption (Wu & Wang, 2005). For a long time TAM proved to be a useful theoretical model in helping to understand and explain usage behavior in information systems implementation (Legris et al., 2003). Later, Venkatesh and Davis (2000) proposed TAM2 by including subjective norms as a determinant of perceived usefulness in the original TAM model. Based on a thorough meta-analysis of major technology acceptance studies, Legris et al. (2003) declared that the TAM and TAM2 explained only 40% of the variance in use. They concluded that it may be difficult to increase the predictive capacity of TAM, if it is not integrated into a broader model. Corresponding to this criticism, Venkatesh et al. (2003) developed a unified theory of acceptance and use of technology model (UTAUT) based on a thorough review of user adoption literature and eight prominent models including TRA, TPB, TAM, and the innovation diffusion theory.

As TAM and TAM2 were originally built to ease managing MIS activities in the workplace by measuring the quality of delivered systems (Davis, 1989; Venkatesh & Davis, 2000), the main focus of the TAM-related research perspectives remained confined to understanding adoption process within organizational settings (Hong & Tam, 2006). Although social influence is considered in the TAM2 and particularly in UTAUT, it assesses a kind of normative forces in compliance with organizational goals (Lu et al., 2005). Such influence is therefore different from the social pressures that an individual consumer faces in a free adoption choice context.

Other important work in technology acceptance, notably innovation diffusion theory has been validated by a large number of studies in both organizational settings and individual settings (Choudhury & Karahanna, 2008; Kim, Mirusmonov, & Lee, 2010; Mallat, 2007; Wu, Wang, & Lin, 2007). Proposed by Rogers (1983), the innovation diffusion theory (IDT) includes five significant innovation characteristics: relative advantage, compatibility, complexity, trialability, and observability. Yet, a meta-analysis conducted by Tornatzky and Klein (1982) indicates that, of these attributes, only relative advantage, compatibility, and complexity were consistently related to adoption or utilization decisions. In addition, these traditional models generally neglect the impact of personal innovativeness on adoption which is a critical factor for explaining individual consumer adoption behavior, especially in individual settings (Agarwal & Prasad, 1998). Finally, several studies have shown that the impact of some factors (e.g., behavioral beliefs, social influences, and personal traits) on intention to use IS, varies at different stages of IS initial adoption/continued use (Karahanna et al., 1999; Legris et al., 2003).

Recognizing the potential differences in IS adoption decisions between workplace and home, as well as the widening scope of the elements of an IS study, Lu et al. (2005) conducted an empirical study to identify factors driving the pre-adoption of wireless internet services via mobile technology (WIMT) in the contexts beyond work setting. They included factors such as influences from friends and family members, personal innovativeness, and image concerns that are typically ignored in organizational innovation research. The authors found that the initial adoption of WIMT was driven by a mix of factors that include instrumental beliefs, social influences and personal traits. The present study follows and further develops the work of Lu et al. (2005), by proposing and integrating framework that encompasses specific characteristics of the mobile payment services in non-work settings, and exploring the temporal evolution of these factors across the pre-adoption and post-adoption stages.

## 3. Conceptual model and research hypotheses

The current study seeks to develop a research framework of mobile payment adoption by drawing on the extant literature on innovation adoption and consumer decision behavior. Having examined prior information systems adoption research and related consumer decision behavior literature, the present study focus on three sets of adoption drivers, namely, behavioral beliefs, social influences, and personal traits. Fig. 1 presents the research model showing the proposed hypotheses. In essence, the current study proposes that (1) relative benefit and compatibility as two positive valence factors in behavioral beliefs may positively influence behavioral intention; (2) perceived risk and perceived fee as two negative valence factors may negatively influence behavioral intention; (3) social influences and personal traits may have both direct and indirect (through relative benefit and perceived risk) influences on behavioral intention. Theoretical justifications of the hypotheses are presented below.

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