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Determinants of users' intention to adopt wireless technology: An empirical study by integrating TTF with TAM

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ABSTRACT

This paper reported the results of a survey study and provided evidences of empirically testing a model that integrates both technology acceptance model (TAM) and task-technology fit (TTF) model in understanding the determinants of users' intention to use wireless technology in organizations. Questionnaires were distributed to organizations that bring mobile commerce into practice through the wireless handheld devices. The results indicated that both technology acceptance model and task-technology fit model are robust models by themselves. First, both perceived usefulness and ease of use significantly influence users' behavior intention to utilize wireless technology. Perceived ease of use has significant effect on perceived usefulness. Second, characteristics of technology and task significantly predict the fit between these two constructs. Significant effect of characteristics of technology on perceived ease of use and usefulness were observed. Finally, significant relationships between TAM and TTF model were also observed. Task-technology fit is a significant direct predictor of technology adoption intention. Overall, users' intention to adopt wireless technology in organizations was determined directly by fit between characteristics of task and technology as well as users' perceived ease of use and usefulness.

1. Introduction

With the popularization of mobile devices such as laptops, mobile phones and personal digital assistances (PDAs), the number of world wide wireless technology users is increasing. Research firm Ovum expected that by 2006 there will be over 1760 million mobile commerce (m-commerce) users in the world which was raised from 980 million people in 2002. These large amounts of users generates USD 22.2 million mobile commerce revenues globally and the number is expected to reach 88 billion by 2009 (Juniper Research). Riding on the wave of the success of electronic commerce on the World Wide Web (WWW), the market has been making a push towards mobile commerce services (Shih & Shim, 2002).

The magnitude of these figures highlights that the proliferation of wireless handheld devices is beginning to impact the global business environment. In addition, this trend provides the potential for organizations and users to perform various commerce-related tasks without regard to time and location. Specifically, the wireless technology enable organizations to conduct business in more efficient and effective ways and thus can offer many advantages for companies and individuals such as empowering the sales force, coordinating remote employees, giving workers mobility, improving customer services, and capturing new markets. However, not every worker intends to adopt wireless technology in accomplishing their tasks. Why some users have higher intention to adopt mobile devices while others are less willing to become a mobile worker is the question in current study.

In addressing the issue of users' adoption (utilization) of new information system/information technology (IS/IT), both technology acceptance model (TAM) and task-technology fit (TTF) model are important theoretical bases in information systems field. These two popular models have been used in considerable quantities of researches to understand the determinants of user acceptance of information technology (i.e., Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Goodhue, 1998; Goodhue, Klein, & March, 2000; Goodhue & Thompson, 1995; Taylor & Todd, 1995; Venkatesh & Davis, 2000; Zigurs, Buckland, Connolly, & Wilson, 1999). However, researches on determinants of users' adoption of wireless technology have hardly been found. In addition, although an abundance of evidence has shown the robustness of the above two models in predicting user adoption of information technology, a model that integrates constructs from both may offer a significant improvement over either model alone.

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The development of wireless technology and the mobile services are important issues in the next wave of e-commerce, thus the first goal of current work is to investigate the determinants of user acceptance of wireless technology in an organization context. Specifically, the applications in handheld devices are characterized by small screen size, text-based design, limited processing and battery power. Why will users adopt wireless technology in their works even if they recognize the limitations inherent in handheld devices? In predicting user acceptance of technology, TAM focuses on two determinants on users' intention to adopt new technology: perceived ease of use and perceived usefulness. In current study, the influence of these two predicators in determining users' intention to adopt new technology was examined.

Further, unlike the behaviors supported by desktop interfaces, handheld service environments are designed to support more task-oriented uses (Buyukkokten, Garcia-Molina, Paepcke, & Winograd, 2000). Accordingly, the task-technology fit model which highlights the fitness between task and technology is particularly suitable in determining users' intention to adopt wireless technology. The TTF model suggests that users will be more willing to utilize a new technology if it fits better with their tasks. Thus, the second goal of current study is to integrate TTF with TAM to investigate the determinants of user acceptance of wireless technology. In order to reach the second objective, current study adapts and validates the integrated model of TAM and TTF proposed by Dishaw and Strong (1999). The research context discussed in this study focuses on the utilitarian use of wireless technology in organizations, rather than the hedonic purpose of personal use in daily life.

2. Literature review

2.1. Mobile commerce

Mobile commerce refers to "e-commerce activities via mobile devices, such as phones or personal digital assistants" (Mennecke & Strader, 2002). There are a variety of wireless services contribute to the mobile commerce market, and Shih and Shim (2002) suggested that wireless services can be categorized into two groups: consumer-based and business-based. The former refers to commerce activities that happened everyday and can be conducted by every wireless device users. Such activities include, for example, downloading music or pictures, finding the nearest gas station, or receiving weather news by someone's mobile phone or PDA or other mobile devices. Meanwhile, business-based mobile commerce services describe "business applications that are applied in a corporate or business environment to facilitate business transactions and to improve productivity within a company". Business person and employees from all kinds of industries are possible users of such business-based mobile-commerce activities.

Fang, Chan, Brzezinski, and Xu (2006) identified three categories of tasks performed on wireless handheld devices: (1) general tasks that do not involve transactions and gaming, (2) gaming tasks, and (3) transactional tasks. The goal of general tasks is to seek information or to communicate with other parties. People who perform transactional tasks aim to commit financial transactions. The goal of performing gaming tasks is entertainment. Fang et al. (2006) employed a scenario-based questionnaire to collect the user's intention to perform different tasks under the mobile context. The task scripts described in the questionnaire represent a wide range of mobile applications and are real tasks performed on wireless handheld devices. However, it is possible that not each participant is familiar with the tasks included in the questionnaire and thus the validity of the questionnaire might be somewhat limited.

In this study, we focus on the business-based mobile commerce services which involve general tasks defined by Fang et al. (2006). For example, the insurance personnel use their PDA or laptop computer to access the client database and provide personalized insurance plan immediately. Further, the doctors or medical personnel can use PDA or cellular phones to control the patient's condition in time.

2.2. Technology acceptance model

Technology acceptance model was first introduced by Davis (1986, 1989). TAM was an adaptation of theory of reasoned action (TRA) and described that user attitude toward an information system/information technology was determined by two particular beliefs, perceived usefulness (PU) and perceived ease of use (PEOU). The attitude is in turn lead to behavioral intention (BI) to use (accept) the technology, and then generate the actual usage behavior. A specific application system is perceived to be usefulness by prospective users if they believe the system will improve or facilitate their job performance within an organizational context. The system is perceived to be ease of use if the prospective user believes that the use of the system will be free of effort.

Among the above-mentioned constructs, conclusions drawn from Davis et al. (1989) study indicated that only behavioral intention, perceived usefulness and perceived ease of use are three major constructs in explaining user behavior. Furthermore, Szajna (1996) empirically tested the revised TAM suggested by Davis et al. (1989) in which the attitude construct was excluded (see Fig. 1). The data indicated that the revised TAM has consistently done well in predicting intentions. The attitude construct was taken out by many other studies to simplify the model (e.g., Adams, Nelson, & Todd, 1992; Chau, 1996; Lu & Gustafson, 1994; Venkatesh & Davis, 1996, 2000). In current study, we employ a simplified model of TAM which excluded attitude.

A cumulated empirical studies has provided the evidence of significant explanatory power and the parsimony of TAM (i.e., Mathieson, 1991; Adams et al., 1992; Taylor & Todd, 1995) and the instruments have also been validated in a variety of research papers (i.e., Doll, Hendrickson, & Deng, 1998; Hendrickson & Latta, 1996; Hendrickson, Massey, & Cronan, 1993; Segars & Grover, 1993; Subramaniam, 1994; Szajna, 1996). Further, a number of recent studies have successfully adopted TAM to study the acceptance of Internet related technologies, such as e-mail (e.g., Karahanna & Straub, 1999), World Wide Web (e.g., Atkinson & Kydd, 1997; Chang & Chung, 2001; Lederer, Maupin, Sena, & Zhuang, 2000; Moon & Kim, 2001; Teo, Lim, & Lai, 1999; Selim, 2003; Van der Heijden, 2003; Sánchez-Franco & Roldán, 2005; Castañeda, Muñoz-Leiva, & Luque, 2007), blog usage (e.g., Hsu & Lin, 2008), and Instant Messaging (e.g., Li, Chau, & Lou, 2005). Therefore, using TAM as the basis for studying individual's acceptance of wireless Internet through mobile devices is a highly valid approach.

A very important assumption in TAM is that the prospective users' usage of a given information system or technology is volitional or at the discretion of themselves. The mobile devices we

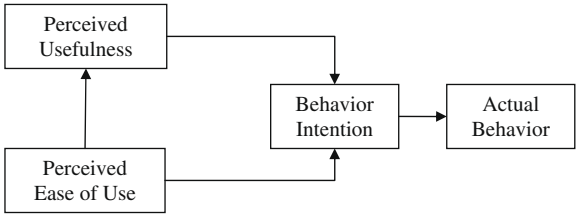

Fig. 1. Technology acceptance model.