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Understanding the Adoption of Multipurpose Information Appliances: The Case of Mobile Data Services

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We have come to a stage when information technology (IT) innovations have permeated every walk of life. Many new technologies can be used for many different purposes and in different contexts other than the workplace. The current study attempts to understand individual adoption of IT innovations that are used beyond work settings. We define a new class of IT innovations called multipurpose information appliances, which are personal, universally accessible, and multipurpose. The ubiquitous nature of these appliances has led to a constant permeability between the separate contexts of social life. An adoption model that reflects the unique characteristics and usage contexts of multipurpose information appliances was developed. The model consists of five sets of adoption factors and was tested using data collected on mobile data services adoption. Our findings show that the determinants of multipurpose information appliance adoption decisions are not only different from those in the workplace, but are also dependent on the nature of the target technology and its usage context. Theoretical and practical implications of the findings are discussed.

Key words: technology adoption and usage; IT innovations in nonwork settings; information appliances; mobile data services; user perceptions
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1. Introduction

While technology adoption research has traditionally been focused on information technologies (IT) that aim at enhancing organizational productivity and effectiveness, we are witnessing waves of IT innovations that encompass a broad range of usage contexts beyond the work setting. The proliferation of Internet and mobile communications services in everyday life has led to a blurring of boundaries between the public and private spheres of life (ITU 2004). The ubiquitous nature of these services and their impact on a person's lifestyle call into question the appropriateness of applying traditional organization-centric IT adoption models to understanding IT that are increasingly being used to satisfy both work and personal needs.

The current study attempts to extend the scope of innovation adoption research to an emerging class of IT innovations that we refer to as multipurpose information appliances. According to Bergman (2000), information appliances are devices or instruments designed to provide their users with various types of information: data, video, images, etc. Recognizing the increasingly diversified usage contexts of information appliances, we further define multipurpose information appliances as IT artifacts that (1) have a one-to-one binding with the user, (2) offer ubiquitous services and access, and (3) provide a suite of utilitarian and hedonic functions.

The first characteristic indicates the intimate relationship between the user and the artifact. It implies

that the artifact is an extension of the self and is perceived as a personal possession that is not shared with others. The second describes the IT artifact's ubiquitous accessibility, independent of the user's location and time of access. The third characteristic pertains to the value generated for the user, extending beyond work-related performance gains to hedonic and enjoyment values. Examples of multipurpose information appliances include smart phones, personal digital assistants (PDAs), handheld consumer devices with Internet access (e.g., Sony PlayStation Portable), and the accompanying suite of accessible services (see Bergman 2000 for more examples). As more and more services are becoming accessible by a single mobile device, it is envisaged that the scope of information appliances will only expand further in the future. This will have a transformational impact on society as a whole and the lifestyle pattern of its citizens (Agarwal and Lucas 2005).

Because of their personal, universal accessibility and multipurpose characteristics, multipurpose information appliances are expected to be associated with a set of adoption drivers that are different in part from those identified for innovations in the workplace. Neglecting these characteristics and directly applying adoption models developed for organizational IT innovations would be inappropriate. Indeed, traditional adoption models fall short of explaining the rapid diffusion of innovations such as P2P services or mobile services (Lyytinen and Yoo 2002).

According to Lee (1999), the value of information systems (IS) research lies in its continuous efforts to understand the complex phenomena where users, technologies, and social settings interact with and transform each other. The current study represents such an effort to increase our understanding of multipurpose information appliances that are being used in previously unexplored settings. A better understanding of how a technology is adopted to support different lifestyle purposes may provide new insights into technology usage in the workplace because these cross-purpose technologies may first be adopted for personal use and then extended to the workplace, or vice versa. This work also echoes the view of Benbasat and Zmud (2003) that factors and phenomena closely associated with the IT artifact being investigated should come into play as central elements of an IS study.

This research focuses on two major research questions: (1) What are the factors that determine the adoption of multipurpose information appliances in nonwork settings? (2) How do these factors affect users' intentions to adopt these technologies?

In the next section, we provide an overview of IT adoption research in nonwork settings. Section 3 introduces the theoretical framework, which identifies determinants and their impact on adoption. Next, we report an empirical study based on an online survey. Findings are presented in §5, followed by a discussion on the theoretical and practical implications of the work in §6. Section 7 outlines future research, and §8 concludes the paper.

2. Background

2.1. Research on IT Adoption in Nonwork Settings

For the past two decades, a variety of theoretical perspectives have been advanced to address individual adoption of IT innovations. Popular examples include the technology acceptance model (Davis et al. 1989), the theory of planned behavior (Ajzen 1991), and the innovation diffusion theory (Rogers 1995). With a few exceptions, the main focus of these research perspectives has been confined to understanding adoption processes within organizational settings, where IT has been regarded as a tool to improve task performance.

Recognizing the widening scope of IT usage, a number of research studies have in recent years examined technology usage in settings other than the workplace. However, these studies either were not free from the conventional performance/work-oriented conception of IT use or they did not clearly address users' IT adoption decisions. For example, Venkatesh and Vitalari (1992) studied the adoption of personal computers for home use but maintained the perspective that treated personal computers (PCs) as a tool for work. Kraut et al. (1999) studied Internet usage in households. However, the main emphasis of the study was on providing a snapshot of Internet usage patterns by household members rather than on understanding their adoption decisions. Kim et al. (2002) investigated PC adoption in homes, but their research subjects were business professionals who considered home settings to be extensions of

their offices—home offices. Lee (2003) described how users perceive the features of P2P file-sharing systems, but the study did not explicitly investigate individual users' adoption behavior.

Recognizing the potential differences in IT adoption decisions between workplace and home, Venkatesh and Brown (2001) conducted a pioneering study to identify factors driving the adoption of PCs at home. The authors included factors such as influences from friends and family members, cost, and status concerns that are typically ignored in organizational innovation research. They successfully assembled a set of constructs specific to the context of PC usage at home. The authors found that home PC adoption was driven by a mix of utilitarian, hedonic, and social factors. We follow and further develop the work of Venkatesh and Brown (2001) by proposing an integrated framework that encompasses specific characteristics of the target IT and its usage contexts in nonwork settings.

2.2. Mobile Data Services

The multipurpose information appliance of interest here is mobile data services (MDS). MDS is defined as *an assortment of digital data services that can be accessed using a mobile device over a wide geographic area*.[1] MDS enables people to exchange messages, pictures, and e-mails; check flight schedules; book concert tickets; and enjoy games while on the road. These services have been in great demand in countries with high mobile penetration rates (ITU 2005). Our definition of MDS does not differentiate between services and the access devices. They are treated as a holistic whole. This is necessary because mobile services and access devices are tightly coupled to create value to users.

As a kind of multipurpose information appliances, MDS possesses the three characteristics presented in §1. First, MDS users have exclusive access to its platform (e.g., a mobile phone). Like other personal possessions, users are less likely to share their mobile phones with others, which enables them to use MDS in ways that suit their personal needs. Second, MDS users can access services anywhere, anytime. Third, combined with its mobility and its repertoire of applications that support different lifestyle purposes, MDS enables users to engage in various activities ranging from leisure (e.g., playing games and downloading music) to information acquisition (e.g., acquiring weather, news, and market information). Unlike organizational IT applications, which are designed to support a specific group of corporate users, MDS is intended for individuals who have different needs and expectations.

[1] This definition excludes devices such as laptops, PDAs, and small desktop PCs that can connect to designated transmission stations through local wireless connections (e.g., Bluetooth and Wi-Fi).

3. Research Framework and Model Development

The current study seeks to develop a research framework by drawing on the extant literature on innovation adoption, consumer behavior, and psychology. This interdisciplinary approach offers perspectives from diverse research disciplines that can complement each other in developing a synergistic framework to study the adoption of multipurpose information appliances. Having examined prior IT adoption research and related consumer behavior and psychology literature, we focus on five sets of adoption drivers: general technology perceptions, technology-specific perceptions, user psychographics, social influence, and demographics. The main constructs of the theoretical framework are summarized in Table 1.

General technology perceptions are established beliefs about technology usage. These beliefs have been studied extensively across a variety of technology contexts. Although our focus differs from those of prior studies, established research bases in technology adoption serve as useful references for the current work. Because both contexts pertain to the adoption of IT artifacts, factors found to be salient in technology adoption in general are expected to exert influence on the adoption of multipurpose information appliances. On the other hand, technology-specific perceptions are unique to the characteristics

Table 1 Constructs of the Theoretical Framework

Construct categories	Constructs
General technology perceptions	Perceived usefulness, perceived ease of use
Technology-specific perceptions	Perceived service availability, perceived monetary value
Psychographics	Perceived enjoyment, need for uniqueness
Social influence	Social influence
Demographics	Gender, age

and usage contexts of the IT artifact under study (Benbasat and Zmud 2003). As multipurpose information appliances become omnipresent in our daily lives, the ways that people use them and the reasons behind their usage should vary depending on the many different contexts of daily life. For example, people may consider portability an important aspect when using a notebook PC, but not when using a desktop PC. Dividing technology perceptions into general and specific categories is an important aspect of our research framework, as it provides leeway for future research to flexibly control the investigation boundaries according to various usage contexts for different IT innovations.

The remaining three sets of drivers are derived from consumer behavior and psychology research. Research in these areas has highlighted the close link between user psychographics and consumer behavior (Engel et al. 2001, Schiffman and Kanuk 2004). User psychographics refer to profiles of users based on their psychological and behavioral traits (Hoyer and MacInnis 2004). Given our focus on personal usage, psychographics are included in our model to account for a user's intrinsic qualities, personal values, and desires, which are likely to impact his or her adoption decision. Also, social influences have been reported to play an important role in consumer behavior (Bearden and Etzel 1982, Fisher and Price 1992) and in IT adoption decisions in nonwork settings (Venkatesh and Brown 2001). Finally, demographic factors have always been included in market research and consumer studies, and they have been increasingly incorporated in IT adoption research (Gefen and Straub 1997, Venkatesh and Morris 2000, Venkatesh et al. 2003b).

A research model is proposed based on the five sets of adoption drivers. These drivers are hypothesized to influence the adoption intention of multipurpose information appliances. Adoption intention instead of adoption behavior is used as the dependent variable because adoption intention is more appropriate when the IT artifact is still in the early stages of its diffusion cycle, which is the case with MDS. Furthermore, intention has been well established as a good predictor of behavior that mediates the effect of other determinants on behavior (Ajzen 1991, Sheppard et al. 1988, Venkatesh and Brown 2001, Venkatesh et al. 2003b). We elaborate on each set of adoption drivers and their relationships below.

3.1. General Technology Perceptions

We focus on two technology perceptions that have been consistently shown to have a significant impact on adoption: perceived usefulness (PU) and perceived ease of use (PEU). According to a recent article that reviewed eight widely employed IT adoption models (Venkatesh et al. 2003b), these two perceptions are the most influential predictors of adoption.[2] PU is defined as the degree to which a technology is perceived as providing benefits in performing certain activities (Davis 1989). PU has been associated with instrumentality in achieving a valued goal (Davis et al. 1989). Considering that multipurpose information appliances are tools to help users achieve personal goals, it is hypothesized that PU would directly affect adoption intention.

Hypothesis 1. *PU will have a direct positive influence on adoption intention.*

PEU is defined as the extent to which a technology is perceived as being easy to understand and use (Davis 1989). PEU has been shown to affect adoption intention in two ways (Davis et al. 1989): (1) by indirectly influencing intention through perceived usefulness, and (2) by directly influencing intention. Following the established findings in the literature, we hypothesize that:

Hypothesis 2A. *PEU will positively affect adoption intention.*

Hypothesis 2B. *PEU will positively affect perceived usefulness.*

3.2. Technology-Specific Perceptions

Technology-specific perceptions pertain to the unique features of the IT artifact and its particular usage contexts. In this research, we focus on two technology beliefs, namely perceived service availability (PSA) and perceived monetary value (PMV). These two perceptions are specific to the multipurpose information appliance in this study (i.e., MDS). Perceived service availability is defined as the extent to which an information appliance is perceived as being able to provide pervasive and timely connections. Accessing

[2] Instead of PU and PEU, Venkatesh et al. (2003b) refer to these factors as performance expectancy and effort expectancy, respectively.

information at anytime and from anywhere provides users with increased convenience and productivity in daily activities. Without the guarantee of pervasive and timely connections, the unique usefulness of information appliances would be seriously undermined. In fact, Islam and Fayad (2003) highlight the challenges facing the ubiquitous availability of mobile services. For example, universal roaming remains a technical problem to be resolved. From this perspective, PSA is expected to directly affect the perceived usefulness of the technology. It can also be viewed as a factor that may impede or facilitate adoption intention (i.e., facilitating conditions). According to Venkatesh et al. (2003b), facilitating conditions refer to perceptions of environmental factors that support the use of a system. Venkatesh (2000) found that facilitating conditions exert an influence on PEU. Thus, it is expected that PSA would have an indirect impact on adoption intention via PEU. Thus, we hypothesize the following:

Hypothesis 3A. *PSA will have a positive influence on perceived usefulness*.

Hypothesis 3B. *PSA will have a positive influence on PEU*.

For IT in work settings, usage costs would not be a big issue to end users. For multipurpose information appliances, the usage cost is likely to be borne by the user. It follows that the price of the technology should be an important consideration for users in their adoption decisions. Research reveals that most consumers cognitively encode prices in ways that are meaningful to them, such as "expensive" or "cheap" (Jacoby and Olson 1977). This occurs even when they are not familiar with the product of interest, as they instead refer to existing classifications of similar experiences (Monroe 1990). According to Monroe and Krishnan (1985), such a subjective (perceived) price can be both an indicator of the amount of sacrifice associated with the purchase of a product and an indicator of product quality. That is, a high perceived price leads to high perceived quality. At the same time, it may represent a high perceived monetary sacrifice in exchange for the good. It has been suggested that consumers go through a mental accounting process (i.e., a cognitive trade-off between perceptions of quality and sacrifice), which results in a balanced perception of monetary value (Dodds et al. 1991). The PMV is positive when perceptions of quality are greater than perceptions of sacrifice (Monroe and Krishnan 1985). PMV was found to affect consumers' intention to adopt a product (Cronin et al. 2000, Dodds et al. 1991, Zeithaml 1988). In other words, the greater the PMV a user associates with the use of the technology, the more likely he or she will adopt it.

Hypothesis 4. *PMV will have a positive influence on adoption intention*.

3.3. User Psychographics

The role of psychographics as determinants of various behaviors is well established in information systems, psychology, and consumer behavior research (e.g., Agarwal and Prasad 1998, Davis et al. 1992, Rokeach 1973, Schiffman and Kanuk 2004). While there are a variety of personal characteristics reported in the literature, two are identified to be relevant to multipurpose information appliances: perceived enjoyment (PENJ) and need for uniqueness (NU).

In consumer research, seeking pleasurable and joyful experiences is recognized as a basic personal desire (Rokeach 1973). According to Davis et al. (1992), PENJ is defined as the extent to which the activity of using an innovation is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated. Several studies suggest the saliency of PENJ in explaining IT adoption (Davis et al. 1992, Van der Heijden 2004, Venkatesh 2000). Davis et al. (1992) theorized PENJ to be an intrinsic motivation that directly influences intention to use PCs. Venkatesh (2000) found that PENJ might have an indirect impact on intention via PEU. Starbuck and Webster (1991) suggested that PENJ contributes to extrinsic motivation (PU). In the current research context, for example, if a user needs to kill time while he or she waits for a train, services such as downloadable games, horoscopes, and video clips can be perceived as very useful, because these services can be instrumental in providing an outlet for passing the time. Integrating the different perspectives, it is hypothesized that PENJ will exert direct effects as well as indirect effects via PEU and PU on adoption intention.

Hypothesis 5A. *PENJ will have a positive influence on adoption intention*.

Hypothesis 5B. *PENJ will positively influence PU.*

Hypothesis 5C. *PENJ will positively influence PEU.*

In contrast to the need to have congruent behavioral norms with others (i.e., social norms), a person's need to feel different from others has received very little attention in technology adoption research. However, people at times exhibit a strong need to maintain their uniqueness (Pepinsky 1961). This need, which is labeled uniqueness (or counterconformity) motivation in social psychology, is based on the assumption that although people are often influenced by the behavioral norms of others, they do not necessarily value a high degree of similarity relative to others (Snyder and Fromkin 1977). Furthermore, people may attempt to buoy their self-concept by engaging themselves in self-distinguishing behaviors (Tepper et al. 2001). In other words, one can yield to social pressure to conform and at the same time attempt to have one's NU satisfied by pursuing distinguishing behaviors.[3]

Because possessions are often perceived as extensions of the self (Belk 1988), people may want to show themselves to be different from others by acquiring and using products that are recognizable symbols of uniqueness (Tepper 1997, Lynn and Harris 1997). Similarly, adopting new products and innovations can also be interpreted as behavior that affirms counterconformity (Tepper 1997, Thompson and Haytko 1997). Indeed, it has been reported that people seek innovations as a means of establishing social differentiation (Fisher and Price 1992). The increasingly popular mobile avatar service in countries such as South Korea and Japan is a good case in point.

[3] Cyworld of South Korea is a good example. Cyworld is one of the most popular websites in South Korea because of its personal blogging service, the "mini-home page service," which has attracted more than 10 million users over the last three years (The Korea Chamber of Commerce and Industry 2005). Recent demographic figures show that over 90% of Korean Internet users in their 20s have subscribed to Cyworld (*The Korea Times* 2005), implying that the service has become a social trend that young Korean Internet users cannot easily refuse to join. The interesting fact is that while many Koreans use the mini home page as a tool to communicate with friends and create virtual bonds with other Cyworld community members, they also spend several hours a day decorating their home pages to present their "self-image" to others (Jung and Youn 2004).

The quest for uniqueness varies among individuals and thus can be captured as a personal trait. Identifying personal traits has been one of the primary bases for predicting human decision processes, including consumer behavior (Engel et al. 2001, Hoyer and MacInnis 2004, Schiffman and Kanuk 2004). In IS research, personal traits have been identified and shown to influence adoption and use (Agarwal and Prasad 1998). In the current study, NU is defined as the individual's tendency to seek uniqueness through the adoption and use of symbolic products or innovations for the purpose of enhancing the self-concept. Accordingly, NU is theorized to be instrumental in enhancing both an individual's self-concept and his or her self-perceived social status (Tepper et al. 2001). Following this line of reasoning, NU is hypothesized to affect adoption intention in two ways. First, NU is expected to influence intention directly by satisfying personal desires. That is, when a user finds that being highly similar to others is unpleasant, he or she will use information appliances to lessen this threat to his or her identity. Second, creating uniqueness via the use of multipurpose information appliances helps to achieve a distinct status within a social hierarchy and thus is instrumental in achieving a valued goal. This entails an indirect effect via PU.

Hypothesis 6A. *NU will have a direct positive influence on adoption intention.*

Hypothesis 6B. *NU will have a direct positive influence on PU.*

3.4. Social Influence

Social influence is driven by social values that define normal behavior for the group or society to which an individual belongs (Engel et al. 2001). In the current study, social influence (SI) is defined as the extent to which users believe that "important others" would approve or disapprove of their performing a given behavior (Ajzen 1991). The SI from peers, superiors, and family members has been found to affect consumer behavior (e.g., Childers and Rao 1992, Fisher and Price 1992) as well as IT adoption decisions at home (Venkatesh and Brown 2001). According to the consumer behavior literature (Bearden and Etzel 1982, Fisher and Price 1992), when usage of an innovation is seen as a form of public consumption, such usage is

significantly influenced by friends and colleagues. In a survey of young people, Carroll et al. (2002) found that those who do not use mobile technology (e.g., SMS, chatting, and e-mail) appear to struggle to maintain their social links. Thus, using mobile services that are widely accepted by group members can often be a way to maintain membership and secure support through increased interactions within the group. In turn, the assured membership could be instrumental in achieving a valued outcome, such as improved status within a social group.

The SI that leads an individual to use a technology has been found to affect adoption intention directly (e.g., Venkatesh and Morris 2000, Venkatesh et al. 2003b) and indirectly via PU (e.g., Venkatesh and Davis 2000). Therefore, we hypothesize the following:

Hypothesis 7A. *SI will have a direct positive influence on adoption intention*.

Hypothesis 7B. *SI will have a direct positive influence on PU*.

3.5. Demographics

Studies have reported that demographic characteristics play an important role in technology acceptance (Rogers 1995, Zmud 1979). Of the many demographic variables, the current study focuses on age and gender. Gender-related differences in attitudes toward computers have been reported by Whitley (1997) and Venkatesh et al. (2000). Researchers have found significant differences between men's and women's perceptions of IT adoption and use (e.g., Gefen and Straub 1997, Venkatesh and Morris 2000). In general, men tend to be more aggressive and take more risks than do women (Areni and Kiecker 1993), thus they tend to show a greater interest in IT products such as PCs (Mitchell and Walsh 2004). Therefore, it is hypothesized that:

Hypothesis 8. *Men are more likely than women to adopt multipurpose information appliances*.

Like gender, age has been theorized to influence people's decision-making processes. Consumer behavior researchers view that people of similar ages, so-called "generations" or "age cohorts" who have gone through similar experiences, tend to share common values and needs. Therefore, capturing the differences in such age groups is considered important to understanding consumers (Schiffman and Kanuk 2004). In the context of IT adoption, the effect of age differences on a user's perception of adoption intention was investigated by Morris and Venkatesh (2000). Brancheau and Wetherbe (1990) found age to be a significant variable explaining usage behavior. According to innovation diffusion research, young individuals are very likely to adopt a new technology because of their tendency to pursue innovativeness (Rogers 1995).

Hypothesis 9. *Younger persons are more likely than older persons to adopt multipurpose information appliances*.

The research model is shown in Figure 1. In summary, the model attempts to integrate the influences related to technology features and the individual's utilitarian, hedonic, and social needs, as well as the causal links between them.

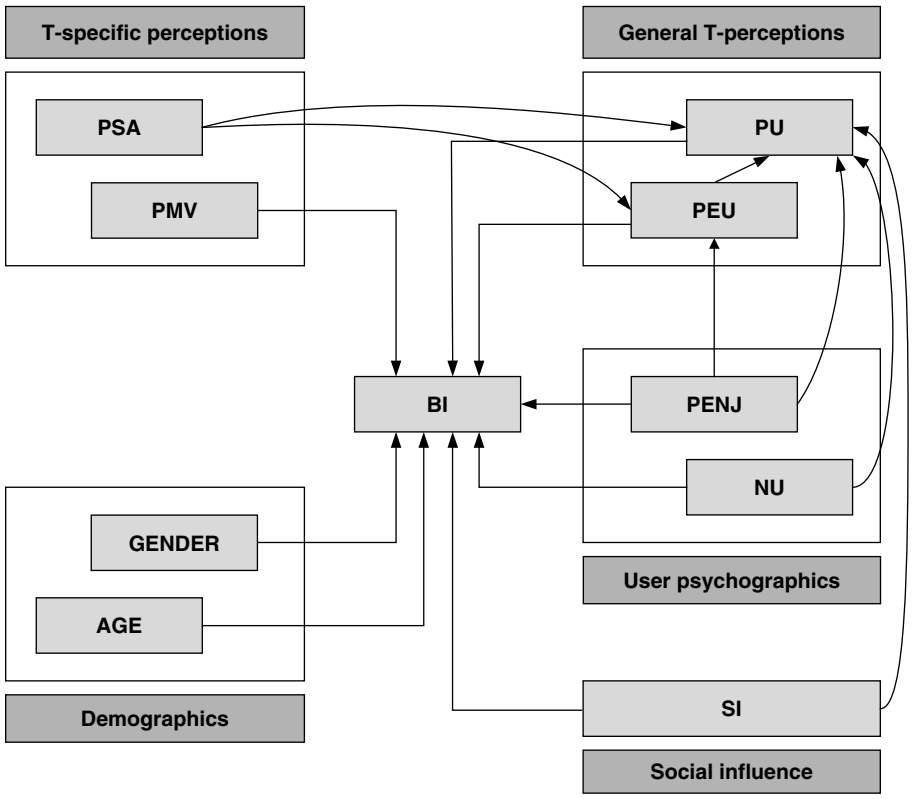
4. Research Methodology

4.1. Data Collection

The research model was empirically tested using data from an online survey conducted via an e-government portal in Hong Kong. The portal had previously been developed to provide electronic access for Hong Kong residents to various governmental services, including filing tax returns and renewing drivers' licenses. It runs on a membership basis, and membership is free to any permanent resident in Hong Kong. As stated earlier, the multipurpose information appliances studied here is MDS. Hong Kong is a suitable place for MDS adoption research because the penetration of mobile phones and Internet access is among the highest in the world (ITU 2004, 2005).[4] People in Hong Kong are well aware of MDS through either direct/indirect usage or media exposure. We believe findings from the current study would yield meaningful insights into the adoption of multipurpose information appliances in general and MDS in particular.

[4] Hong Kong was ranked first in the 2002 International Telecommunication Union (ITU) mobile/Internet index, which measures how developed each economy is in terms of mobile/Internet infrastructure, usage, and market development, while also capturing how well that economy might take advantage of future information and communication technology advances.

Figure 1 Research Model



Notes. T (technology); PU (perceived usefulness); PEU (perceived ease of use); PSA (perceived service availability); PMV (perceived monetary value); PENJ (perceived enjoyment); NU (need for uniqueness); SI (social influence); BI (behavioral intention).

4.2. Survey Questionnaire

MDS encompasses a wide variety of services, and different services may give rise to different perceptions and have different types of appeal to users.[5] This study focuses on mobile infotainment services (i.e., information acquisition + entertainment). By focusing on a single, well-defined set of mobile services, we are able to elicit reliable responses from the subjects. Another motivation to focus on mobile infotainment services is that these services have become very popular worldwide (ITU 2004). They have permeated into the personal life and social web of many users, exerting their impacts beyond organizational boundaries. Examples of entertainment services include mobile gaming, mobile video/audio services, and gambling; examples of information services include information content such as news headlines, sports updates, financial information, weather, traffic information, etc. These services have been contributing to the burgeoning revenues of mobile operators and content providers in recent years. The large economic stake of mobile infotainment services provides a compelling necessity to understand consumers' motivations and perceptions behind their adoption.

At the beginning of the questionnaire, respondents were asked about their potential use of infotainment services using a five-point scale: (1) entirely personal, (2) mainly personal, (3) half personal and half business, (4) mainly business, and (5) entirely business. To further confine the degree of nonwork usage, respondents were then asked who would pay for the MDS and were presented with four possible responses: (1) myself, (2) parents or family, (3) my employer, or

[5] To address this issue, the questionnaire presented three different categories of services: transaction services, communication services, and infotainment services, with relevant service examples. Each respondent was asked to choose the category that he or she would be most interested in using. The respondent was then required to answer questions related to the chosen category.

(4) others. Only the responses from those who would use MDS for nonwork purposes (entirely personal, mainly personal, or at least 50% personal) *and* whose bill would be paid by either themselves or their parents/family were used in the analysis.

4.3. Instrument Development

The instruments used in this study were extracted from previous studies and reworded to suit the context of MDS. (See the appendix for the set of items and constructs in the questionnaire.) The questionnaire was administered in Chinese. To obtain a good level of translation equivalence, a back-translation (Brislin 1980) was conducted. Two bilingual (Chinese and English) research assistants and a professional translator independently translated the English questions into Chinese. The three independently translated Chinese question sets were then reviewed by a committee made up of the initial translators. The translators found no serious discrepancies between the three sets of questions, so they were combined into a single Chinese question set. This Chinese question set was translated back to English by another professional independent translator. To check the translation equivalence, all four translators got together to compare the original English questions with the back-translated questions. Based on the discussion among the translators, a final set of questions was produced.[6]

4.4. Data-Collection Procedure

An e-mail soliciting participation in the survey was sent to members of the portal. In the e-mail, a direct link to the electronic questionnaire was embedded. Also, a banner advertisement for the survey leading participants to the questionnaire was displayed on the main page of the portal. Participation was limited to mobile phone users among website members. To encourage participation, the respondents were given the chance to win mobile phones and MP3 players through a lucky draw.

The survey lasted for three weeks. Two weeks after it was launched, a reminder e-mail was sent to members of the website. Of the 2,249 responses from potential users, 1,448 valid responses were obtained. A total of 1,328 responses met the sampling criteria (i.e., usage purpose and payer). Among the valid respondents, 808 described themselves as potential users of infotainment services. Table 2 summarizes the descriptive statistics of the potential users of infotainment services.

Table 2 Descriptive Statistics of Potential User Group (Infotainment)

Demographics	Infotainment user group ($N = 808$) (%)
Gender	
Male	54.70
Female	45.30
Age	
<20	12.00
20–29	35.64
30–39	31.68
40–49	16.96
50–59	2.97
>60	0.74
Education: Level completed	
Elementary school	4.83
Middle/high school	44.93
(2 year) College	12.87
Bachelor's degree	24.50
Master's degree	6.19
Doctoral degree	0.12
Associate degree	4.33
Professional degree	2.23
Annual income in HKD	
0∼50 K	60.02
50∼100 K	7.43
100∼150 K	8.91
150∼200 K	6.93
200∼250 K	5.20
>250 K	11.51

4.5. Instrument Validity and Reliability

Confirmatory factor analyses were performed using LISREL 8.50 to check the validity of the measurement model. The fit of the measurement model was estimated with various indices (see Table 3). The normalized chi-square (i.e., chi-square/d.f.) and the observed values for the goodness-of-fit index, adjusted goodness-of-fit index, normalized fit index, non-normalized fit index, and comparative fit index were all within the recommended levels (Chau 1997, Hair et al. 1998), representing good model fit. The observed values of the root mean square residual and the root mean square error of approximation were well within

[6] This is a combination of two translation methods suggested by Brislin (1980): back-translation and the committee approach. In each translation process (i.e., initial translation and back-translation), the translators of the individual question sets participated in a discussion (committee) to reach a consensus on a single question.

Table 3 Fit Indices for the Measurement and Structural Models

Fit indices	Thresholds	Measurement model	Structural model
Chi-sq. (d.f.)	—	1,027.33 (296)	1,195.16 (343)
Chi-sq./d.f.	—	3.47	3.48
Goodness-of-fit index	≥0.90	0.91	0.91
Adjusted goodness-of-fit index	≥0.80	0.89	0.88
Normalized fit index	≥0.90	0.95	0.95
Nonnormalized fit index	≥0.90	0.96	0.95
Comparative fit index	≥0.90	0.97	0.96
Root mean square residual	≤0.10	0.04	0.05
Root mean square error of approximation	≤0.08	0.06	0.06

the recommended cutoff values of 0.10 for root mean square residual and 0.08 for root mean square error of approximation for goodness of fit (Hair et al. 1998).

The psychometric properties of the constructs and items are summarized in Table 4. The composite reliability estimate for each construct ranged from 0.88 to 0.96, exceeding the 0.70 acceptable threshold value (Hair et al. 1998). The average variances extracted, ranging from 0.71 to 0.86, were all above the recommended 0.50 level (Hair et al. 1998). In other words, more than one half of the variances observed in the items were accounted for by their hypothesized constructs. According to Comrey (1973), factor loadings in excess of 0.70 can be considered excellent in demonstrating convergent validity. All the factor loadings were greater than 0.70, and the cross loadings were less than 0.38. To examine discriminant validity, the correlations between the constructs were compared with the average variances extracted from the individual constructs (Fornell and Larcker 1981). All the correlations were lower than the average variances extracted, indicating adequate discriminant validity.

Finally, to check for the possibility of common method variance, Harman's single-factor test (Podsakoff et al. 2003) was conducted. The screen plot test and eigenvalues clearly revealed the presence of six to eight factors among the measures. In addition, no general factor was apparent in the unrotated factor structure, suggesting that common method variance is not likely to be of great concern in the current study.

5. Empirical Results

A structural equation analysis was performed (again using LISREL 8.50) to test the model. The structural equation approach is especially useful for understanding multiple and interrelated dependence relationships simultaneously (Hair et al. 1998) and is appropriate for testing theoretically justified models such as the one used in this study (Bentler and Bonnett 1980). The same set of fit indices was used to examine the fit of the structural model (see Table 3). Again, all the indices suggested a fairly good fit. Table 5 shows the mean and standard deviation of each construct.

5.1. Hypotheses Testing

Table 6 shows that most of the causal relationships in the research model were supported as hypothesized. The strong effects of PENJ (Hypothesis 5A), PMV (Hypothesis 4), and SI (Hypothesis 7A) on adoption intention are noticeable. The effects of PSA on PU (Hypothesis 3A) and on PEU (Hypothesis 3B) were also found to be significant. The effect of age

Table 4 AVEs, Correlations, and Composite Reliabilities

	PU	PENJ	PSA	PEU	SI	PMV	BI	NU	C.R.
PU	**0.71**								**0.88**
PENJ	0.44	**0.81**							**0.94**
PSA	0.29	0.41	**0.79**						**0.92**
PEU	0.20	0.29	0.53	**0.84**					**0.95**
SI	0.29	0.24	0.19	0.22	**0.82**				**0.93**
PMV	0.22	0.22	0.25	0.25	0.29	**0.76**			**0.91**
BI	0.31	0.38	0.27	0.31	0.38	0.35	**0.76**		**0.90**
NU	0.11	0.08	0.03	0.03	0.18	0.08	0.16	**0.86**	**0.96**

Notes. PU (perceived usefulness); PENJ (perceived enjoyment); PSA (perceived service availability); PEU (perceived ease of use); SI (social influence); PMV (perceived monetary value); BI (behavioral intention); NU (need for uniqueness); C.R. (composite reliability). All correlations were significant at $p < 0.01$.

Table 5 Statistics of Construct Items

Construct measurement	Measurement items	
	Mean	Standard deviation
Perceived usefulness		
PU1	4.27	1.23
PU2	4.48	1.25
PU3	4.27	1.23
Perceived enjoyment		
PENJ1	4.82	1.27
PENJ2	4.79	1.21
PENJ3	4.99	1.24
PENJ4	5.01	1.21
Perceived service availability		
PSA1	5.07	1.32
PSA2	5.01	1.27
PSA3	4.94	1.30
Perceived ease of use		
PEU1	5.01	1.31
PEU2	4.96	1.31
PEU3	4.95	1.30
PEU4	4.95	1.29
Social influence		
SI1	4.37	1.34
SI2	4.08	1.32
SI3	4.03	1.30
Perceived monetary value		
PMV1	3.95	1.35
PMV2	4.09	1.28
PMV3	4.22	1.25
Behavioral intention		
BI1	4.06	1.25
BI2	4.46	1.29
BI3	4.06	1.32
Need for uniqueness		
NU1	3.47	1.52
NU2	3.51	1.55
NU3	3.48	1.54
NU4	3.55	1.56

Notes. PU (perceived usefulness); PENJ (perceived enjoyment); PSA (perceived service availability); PEU (perceived ease of use); SI (social influence); PMV (perceived monetary value); BI (behavioral intention); NU (need for uniqueness).

on adoption intention (Hypothesis 9) and the effect of PEU (Hypothesis 2B) and NU (Hypothesis 6B) on PU were found to be insignificant. Also, the impact of PU on intention (Hypothesis 1) was not as salient as it was in prior adoption studies, where PU played a dominant role in determining adoption intention. All other hypothesized relationships were supported. The research model explained 59% of the variance in adoption intention, 54% of the variance in PU, and 56% of the variance in PEU.

5.2. Multisample Analysis Between Men and Women

As hypothesized, the result shows that men are more likely than women to adopt MDS. Although we did not develop hypotheses on the effect of gender on other constructs, to understand the gender differences in our context, a multisample analysis was conducted to test for differences in the strength of the path coefficients in the model between men and women. Following the procedures outlined by Joreskog and Sorbom (1993), one path coefficient was first constrained to be equal across the two groups. The resulting model fit was compared to a base model in which all paths were freely estimated using a chi-square difference test (Table 6). The results showed that the impact of PU on adoption intention was different between men and women. The effect of NU on PU (Hypothesis 6B) was significant for men but not for women.

6. Discussion

In the current study, we investigated the adoption of multipurpose information appliances that support a wide range of lifestyle purposes. The information appliance studied here was MDS. We developed and empirically tested an adoption model that incorporated the usage context and the unique features of MDS. Five sets of adoption drivers were proposed and tested using data collected from an online survey. Figure 2 highlights the major statistical findings. Theoretical and managerial implications are further elaborated below.

6.1. Theoretical Implications

The current study suggests a number of implications for research. First, previous adoption studies have focused on the compliance aspect of SI on individuals. This is appropriate given the organizational settings of previous research. As usage context expands beyond work settings, our results indicate that both the desire to be unique in a community and the need to comply with a social group can exist at the same time. Both are found to be significant in explaining adoption intention. This is an intriguing finding because it indicates that information appliances are not only tools to achieve utilitarian goals or means to signal social compliance; they have become personal accessories that are strongly tied to one's individual identity. In a way, this observation challenges

Table 6 Summary of Results

Variables	R^2	Beta	Hypothesis	Male ($N = 442$)	Female ($N = 366$)	Chi-sq. difference¶
BI	0.59			$R^2 = 0.60$	$R^2 = 0.58$	
PU (H1)		0.09*	Supported	0.11*	0.07	Different
PEU (H2A)		0.15***	Supported	0.16***	0.14***	NS
PMV (H4)		0.20***	Supported	0.21***	0.18***	NS
PENJ (H5A)		0.25***	Supported	0.23***	0.25***	NS
NU (H6A)		0.10***	Supported	0.07*	0.14***	NS
SI (H7A)		0.22***	Supported	0.26***	0.19***	NS
Gender (H8)		0.12*	Supported			
Age (H9)		0.001	Not supported			
PU	0.54			$R^2 = 0.51$	$R^2 = 0.59$	
PEU (H2B)		−0.01	Not supported	−0.001	−0.05	NS
PSA (H3A)		0.21***	Supported	0.18*	0.22*	NS
PENJ (H5B)		0.40***	Supported	0.40***	0.43***	NS
NU (H6B)		0.03	Not Supported	0.08**	−0.03	Different
SI (H7B)		0.19***	Supported	0.14***	0.25***	NS
PEU	0.56			$R^2 = 0.56$	$R^2 = 0.56$	
PSA (H3B)		0.75***	Supported	0.76***	0.72***	NS
PENJ (H5C)		0.13**	Supported	0.10*	0.18**	NS

Notes. BI (behavioral intention); PU (perceived usefulness); PEU (perceived ease of use); PMV (perceived monetary value); PENJ (perceived enjoyment); NU (need for uniqueness); PSA (perceived service availability); SI (social influence); Different (different result); NS (not significant); $^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

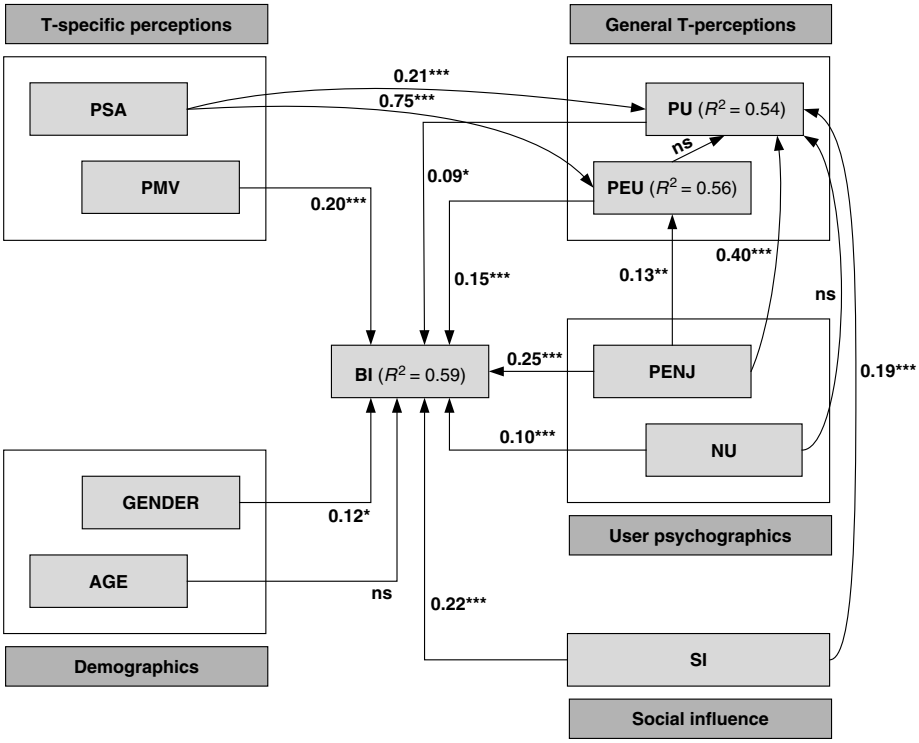
¶: Significant chi-square difference of the coefficients between the male group and female group refers to a difference in the strength of the path coefficients between the two groups.

Carr's (2004) claim that IT services have become commodities and are nondifferentiable from each other. The current findings suggest a different path of development—there is an intrinsic force from the demand side to intensify the extent and nature of personalization of information appliances and their supporting services. The result will be an ever-increasing variety of products and services, contrary to the path of commoditization advocated by Carr. We encourage researchers to further investigate whether information appliances are perceived as personal accessories. If information appliances and their associated services are indeed perceived and rendered as personal accessories, then the traditional utilitarian view of innovation adoption needs to be expanded to incorporate psychological and consumer considerations in studying adoption behavior.

Second, another intriguing finding is the rather weak impact of PU on adoption intention. In fact, it had no impact for female users on MDS adoption. Also, the mediating role of PU is found to be insignificant. This contrasts sharply with previous findings based on work settings. One plausible explanation is that information appliances have become so pervasive that very few people dispute their usefulness. Furthermore, from a technical standpoint, information appliances as an innovation are not disruptive in nature. Their technology trajectory can be reasonably predicted by the public, at least in the short run, given the immense promotion by vendors and the availability of technology information. Many of the advertising messages are designed to have emotional appeal rather than to highlight the functionalities of the innovation. These advertisements appeal to the intrinsic social needs and personal desires of individuals, which they may not consciously be aware of and may not be able to articulate. The shift from advocating utilitarian advantages to fulfilling personal desires in advertisement communications further dilutes the impact of PU on adoption intention.

Compared with multipurpose information appliances, innovations for organizational adoption are assimilated in the workplace through a very different path. Users in general are passive, and one important objective for management is to help employees establish a favorable attitude toward the innovation. Tradi-

Figure 2 Results



Notes. T (technology); PU (perceived usefulness); PEU (perceived ease of use); PSA (perceived service availability); PMV (perceived monetary value); PENJ (perceived enjoyment); NU (need for uniqueness); SI (social influence); BI (behavioral intention); $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$; ns (not significant).

tional innovation literature suggests that the focus be on the innovation's usefulness. In this case, employees can easily tell whether the innovation is useful in helping them to complete their tasks, resulting in a salient impact on adoption intention. Our findings suggest that should the context of the innovation extend beyond work settings, general technology adoption models such as the Technology Acceptance Model (Davis 1989) may need to be refined or expanded to capture the different usage contexts.

Third, users' psychographics, which reflect their intrinsic motivations, personal values, and dispositions, were found to exert strong effects on adoption intention. Noticeably, perceived enjoyment was the strongest factor in explaining adoption intention as well as in explaining PU (see Table 6). Similar results have been found in a recent study of hedonic system adoption (Van der Heijden 2004), where PENJ and PEU were stronger determinants of intention than was perceived usefulness. The strong role of the pleasurable and enjoyment perceptions re-emphasizes the need to include constructs that reflect the core properties of the IT artifact and its specific usage context in IS research (Benbasat and Zmud 2003).

Fourth, the impact of PMV has not received much attention in previous IS adoption research because most prior studies focused on user behavior in organizational settings, where users did not pay for information systems or technologies. However, our results show that the perception of value for money is a very important determinant of MDS adoption. This study is one of the first attempts to include user perceptions of value for money in IT adoption research. Further studies on the impact of PMV will be needed in view of the increasing number of commercially available IT services. To this end, IS researchers should consult the extant literature on pricing and product bundling in marketing research to address IT adoption phenomena beyond the workplace.

Finally, of the two demographic variables tested in this study (age and gender), only gender had a relatively small effect on adoption intention: Men

are more likely than women to adopt MDS. Subsequent data analysis with regard to the effect of gender via multisample analysis (see §5.2) indicated that men put more weight on factors that are instrumental in achieving a valued goal (i.e., perceived usefulness → intention; need for uniqueness → perceived usefulness). Our results have similarities with earlier findings and stereotypical depictions of gender differences, such as that men are more goal oriented and externally motivated (Areni and Kiecker 1993), allowing them to pay more attention to instrumental factors like usefulness (Venkatesh and Morris 2000), and that men tend to show a greater interest than women in novel IT products and use more of them (e.g., Mitchell and Walsh 2004). While this study replicates some existing patterns, researchers should interpret the results with caution. Will such a pattern of gender differences continue to be pervasive in different contexts, or will it continue in the future? As Slyke et al. (2002) note, there is evidence that women are rapidly catching up with men in many IT-related activities, such as the use of e-mail and the Internet. Despite calls for research on gender differences, relatively few such studies have been conducted in IS (Gefen and Straub 1997) or in consumer behavior research (Mitchell and Walsh 2004). More research is warranted to understand the role of gender in IT adoption and use.

6.2. Managerial Implications

Our findings also provide implications for managers involved in the development of information appliances and their applications. First, the salient effect of PEU on intention implies that PEU plays a primary role in shaping users' adoption decisions. As Venkatesh et al. (2003a, p. 55) state, the mobile experience is largely about "saving time, varying location, and convenience." Compared to conventional IT use in work settings, where users have very limited choices of what technology to use for a given task, users of multipurpose information appliances have a relatively wide range of alternatives that would require less effort to use (e.g., newspapers and magazines from kiosks, listening to a radio or Walkman). Furthermore, given the small form factors of information appliances (e.g., small screens and inconvenient keypads), ease of use should be a central issue for users. Prior adoption literature (especially those studies that adopted a technology acceptance model perspective) tended to posit ease of use or usability as secondary to usefulness. Our results suggest that, depending on the IT innovations and their usage contexts, the prominence of usefulness over ease of use may not always hold—ease of use can be more important than usefulness in making adoption decisions.

Second, the significant impact of the NU on intention is consistent with the view in consumer behavior research that the NU plays an important role in people's judgment and choice behavior (Simonson and Nowlis 2000). People with a high NU tend to consume or choose novel products (e.g., Lynn and Harris 1997, Tepper 2001). Indeed, from unique ring tones to attention-drawing services such as mobile movie and digital mobile broadcasting,[7] many new mobile services that seem to help users establish their uniqueness and gain recognition are becoming available. Some of these services have been extremely successful.[8] Such commercial success and the development of services that enhance users' self-concepts provide evidence that the uniqueness motivation is important. The implication for practitioners is clear: Application developers, service providers, and marketers can leverage this aspect of user behavior—the desire to enhance one's self-concept by differentiating oneself from others—to expand their user bases and their sources of revenue. However, the life span of unique services could be short. Once a service becomes popular among many users, it quickly loses its uniqueness. To maintain a high level of satisfaction among customers, new services that are creative and unique need to be introduced continually and in a timely fashion.

Third, our results indicate a salient service availability effect on PEU. Indeed, the early stages of offering the third-generation (3G) services in a few countries, including Japan and South Korea, have shown

[7] Digital mobile broadcasting service allows MDS users to watch TV programs in real time with a mobile device such as a mobile phone. It has been available in Japan and South Korea since 2005.

[8] For example, a "ring-back tone service," available in South Korea, allows users to download a unique, customized tone during standby (not the ring tone for arriving calls). It has had enthusiastic responses from users. Launched in May 2002, the service attracted more than 3 million users during the first three months (Ha 2002).

that a limited geographical service area can slow its adoption. This result is consistent with previous arguments (Venkatesh 2000, Venkatesh et al. 2003b) suggesting that the effect of facilitating conditions (i.e., perceived service availability in this case) is salient in explaining PEU. The more users perceive that multipurpose information appliances provide pervasive and instant connectivity, the more they find them to be useful. For service providers, the implication is straightforward—their networks need to be universally available and reliable to attract users. Also, network interconnectivity is a key determinant of service availability. Unlike geographic coverage, network interconnectivity deals with the ability of one service provider to route traffic to other providers, including its competitors. While basic services such as voice or short message services (SMS) communications are interconnected among providers, novel services such as location-based services and real-time video conferencing are yet to be fully connected. Part of the reason is the resistance by incumbent providers to open their networks to new entrants to the market. In the absence of network interconnectivity, the incumbent will benefit from its captured market share and prevent others from taking advantage of its positive network externality effect.

Fourth, the strong direct/indirect impact of SI on intention indicates that multipurpose information appliances provides users with a means to reinforce their social links and their feelings of group affiliation. Our findings suggest that it is possible to take advantage of the many different social groups in society through fine market segmentation. Recent attempts by some mobile service providers to promote services to small, highly targeted consumer groups seem to be moving in this direction. For example, KTF, a service provider in South Korea, has launched several service brands targeted at specific consumer groups, such as college students (the brand name "Na"); teenagers age 13 to 18 ("Bigi"); or young, high-income career women ("Drama").

7. Limitations and Future Research

There are limitations to this study that should be taken into account when interpreting the findings. One limitation originates from the biases inherent in most online survey-based research. The study did not include users who do not use e-mail and thus excluded the elderly and the noncomputer-literate segments of the population. While this limitation is noted, it should not undermine our results because, according to Rogers (1995), early adopters tend to be young and educated. The profile of our subjects falls into this category. Another potential limitation is that the current study focused on potential users' intention rather than current users' actual behavior. However, our focus on potential users is thought to be appropriate, given that the development of MDS is still in its infancy,[9] where MDS operators have a keen interest in increasing the subscriber base.

There are interesting issues for future research in addition to those suggested earlier. While this study focuses on infotainment mobile services, many different types of IT innovations (products and services) are currently available to individual IT users in the market, and many more will be available in the future. Because different innovations are designed to interact with users in different contexts, factors influencing the adoption decisions in regard to such different innovations are expected to vary across users. To add richness and depth to the understanding of multipurpose information appliance adoption in different social settings, more empirical research on the adoption processes of different types of innovations in various contexts should be conducted. For example, it would be interesting to see how users' adoption processes vary between different mobile data services, such as wireless communications services (short-messaging services and multimedia message services) and infotainment services. It has been argued that people's preferences for infotainment and interpersonal communication are sufficiently independent of each other (Kraut et al. 1999).

Compared to the effect of the functional usefulness of a system, that of ease of use has been underestimated by IT adoption researchers. Market surveys of mobile users indicate that users' biggest frustration comes from usability (Forrester Research 2002,

[9] The platform technologies suitable for various data services, such as 2.5G GPRS (General Radio Packet Services) and 3G standards, became available only recently. For example, GPRS services were deployed in Europe in 2001, and 3G services were commercialized in Japan and South Korea in 2002 and in Hong Kong in 2004.

Yankee Group Research 2002). The effect of ease of use on users' acceptance of a system has been emphasized in human computer interaction for a long time. The rationale behind the importance of ease of use is rather simple: If users do not understand how to interact with a system, they cannot move even one step with it, no matter how useful it is. PEU is closely related to usability design in that both are concerned with enhancing the way people interact with a system (Nielsen 1993). Researchers in the usability design research community recognize that well-designed IT products can support people in their everyday life, because IT is no longer just for work (Preece et al. 2002). Usability design deals with how non IT-specialists view IT and what they feel about new innovations and their impact on their lives, so good usability design can increase the value of IT products in the market (Carroll 1997). Studying how these design characteristics influence users' adoption and usage behavior in different settings will be of great interest to both academics and practitioners.

8. Conclusion

The current study attempts to understand individual adoption of IT innovations that are used beyond conventional work settings. We define a new class of IT innovations called multipurpose information appliances, which are personal, universal accessible, and multipurpose. The ubiquitous nature of these appliances has led to a constant permeability between the separate contexts of social life. A research model that reflects the unique characteristics and usage contexts of multipurpose information appliances was developed and empirically tested based on an online survey designed for potential users of MDS. Our findings show that the determinants of multipurpose information appliance adoption decisions are not only different from those in the work place, but are also dependent on the nature of the target technology and its usage context. As IT becomes ubiquitous and omnipresent, we believe the IS research community should expand its research focus to phenomena outside of the workplace to keep in pace with the development of the society at large.

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Appendix. List of Model Constructs and Items

Constructs	Item no.	Question items	Source
Perceived usefulness	PU 1	Using MDS would increase my chances of achieving things that are important to me.	Davis (1989)
	PU 2	I would find MDS to be useful in my daily life.	
	PU 3	Using MDS would help me accomplish things more quickly.	
Perceived ease of use	PEU 1	I expect that learning how to use MDS would be easy for me.	Davis (1989)
	PEU 2	I expect that my interaction with MDS would be clear and understandable.	
	PEU 3	I would find MDS to be easy to use.	
	PEU 4	I expect that it would be easy for me to become skillful at using MDS.	
Perceived enjoyment	PENJ 1	I expect that using MDS would be enjoyable.	Davis et al. (1992)
	PENJ 2	I expect that using MDS would be pleasurable.	
	PENJ 3	I expect to have fun using MDS.	
	PENJ 4	I expect that using MDS would be interesting.	
Need for uniqueness	NU 1	I often think of the things I buy and do in terms of how I can use them to shape a more unusual personal image.	Tepper et al. (2001)
	NU 2	I am often on the lookout for new products or brands that will add to my personal uniqueness.	
	NU 3	I actively seek to develop my personal uniqueness by buying special products or brands.	

Appendix (cont'd.)

Constructs	Item no.	Question items	Source
Need for uniqueness	NU 4	Buying and using products that are interesting and unusual assists me in establishing a distinctive image.	
Social influence	SI 1	People who are important to me would want me to use MDS.	Mathieson (1991)
	SI 2	People who influence my behavior would think I should use MDS.	
	SI 3	People whose opinions I value would prefer me to use MDS.	
Perceived monetary value	PMV 1	I expect that MDS would be reasonably priced.	Dodds et al. (1991)
	PMV 2	MDS would offer a good value for the money.	
	PMV 3	I believe that at the current price, MDS would provide a good value.	
Perceived service availability	PSA 1	I expect that I would be able to use MDS at anytime, anywhere.	Venkatesh (2000)
	PSA 2	I would find MDS to be easily accessible and portable.	
	PSA 3	I expect that MDS would be available to use whenever I need it.	
Behavioral intention	BI 1	I intend to use MDS in the future.	Davis (1989)
	BI 2	I expect that I would use MDS in the future.	
	BI 3	I expect to use MDS frequently in the future.	

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