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Perceived risk, usage frequency of mobile banking services

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Abstract

Purpose – This study discusses the effects of diffusion and adopters of mobile banking services (MBSs), perceived risk, brand awareness, and brand image of MBS providers, on attitude toward using MBSs, and on intention to use MBSs. In accordance with sample usage frequency in MBSs, this study subgroups the sample population into several behavioral segments (frequent/infrequent users) to concentrate sample characteristics and the behavioral models.

Design/methodology/approach – Data from the 610 valid questionnaires collected in Taiwan were analyzed by SPSS and LISREL. In accordance with sample usage frequency in MBSs, this study subgroups the sample population into several behavioral segments (frequent/infrequent users) to concentrate sample characteristics and the behavioral models.

Findings – Analytical results demonstrate that mobile banking users with different behavioral patterns have dissimilar perceptions of innovation benefits and risk. Moreover, brand awareness and brand image of the MBSs provider are crucial exogenous factors associated with attitude and intention to use MBSs. Finally, this study presents several suggestions for researchers, bankers, and marketers.

Originality/value – This study examined MBSs in Taiwan, with an enhanced investigation model includes diffusion of innovation, TPA, second-order risk sub-dimensions, and brand effects on attitude and intention. The contributions of this study includes: this is the first study that incorporate brand awareness, and brand image in discussing mobile banking adoption behavior; meanwhile, this study incorporate a five factors risk structure, discussing perceived risk detailed in financial risk, performance risk, time risk, psychological risk, and privacy risk. Furthermore, this study is the first study that has differentiated between different consumer types: frequent and infrequent users. The findings of this study is practical in providing MBS for bankers.

Keywords Behaviour intention, E-commerce, IT diffusion and adoption, Mobile banking, Risk factor, Structure equation model, Behaviour, Banking, Risk analysis

Paper type Research paper

1. Introduction

Online banking is increasingly common. Financial institutions deliver online services via various electronic channels, subsequently diminishing the importance of conventional branch networks. The newly emerging channels of online banking and rapidly increasing penetration rates of mobile phones motivate this study. A financial institution failing to offer desired mobile services may lose clients.

According to Gartner's prediction of leading trends of 2012 in mobile applications, mobile commerce remains the most important one. Gartner further forecasts that mobile devices will replace PCs as the main device to access the internet. As for the third quarter of 2012, IPSOS indicated that "The era of Multi-Screen has come, and smartphones account for the purchasing behavior of 65% of mobile device users." According to that report, 66 percent of the smartphone holders in Taiwan access the internet via a smartphone at least once daily; approximately 57 percent of the customers perform mobile searches; and 40 percent of the customers shop via mobile

phones (IPSOS, 2012). These statistics reflect vigorous growth in the scale of m-commerce. However, mobile banking remains in its infancy, and international adoption rates demonstrate the strong potential of m-commerce (FRB, 2012). Therefore, elucidating the factors influencing attitude and behavioral intention towards adopting (or continuing to use) mobile banking is of priority concern for further developing mobile banking services (MBSs).

A customer satisfaction survey conducted by ComScore Inc (2012) revealed that nearly 70 percent of the customers were satisfied with their financial institution's web site. Online banking has increased and mobile banking has gained popularity, especially in mobile app usage. The number of online banking customers has more than doubled since 2004. Approximately 66 percent of online banking customers paid their bills online, while 29 percent of those paying their bills online also used their bank, credit card provider, and third parties. Security is the main reason cited for not paying bills online.

As an effective means of accessing financial business services for consumers, mobile banking has a high probability of success since it follows the success of online banking (Brown *et al.*, 2003). Mobile banking integrates mobile communication technology and equipment to access various banking and financial services (Xie *et al.*, 2009). Therefore, by integrating mobile communication technology and banking financial services, mobile banking has become increasingly flexible, as evidenced by the ability of users to access financial services of banks without time, place, and space constraints. Recent literature (Sanayei *et al.*, 2011; Liisa, 2010; Puschel and Mazzon, 2010; Hernan *et al.*, 2010; Cruz and Laukkanen, 2010; Singh *et al.*, 2010) has investigated the feasibility of incorporating mobile banking with various methods and conceptual frameworks.

Innovation and diffusion of innovation (DOI) are thus complex concepts as technology and service characteristics impact the characteristics of MBSs (Mohr, 2001). Therefore, bankers are interested in adoption processes, as well as the frequency of different customers as adopters. While investigating acceptance and spread of technology in mobile services, DOI theory (Rogers, 1995) and the technology acceptance model (TAM) (Davis, 1989), including other theories such as the theory of reasoned action (Ajzen and Fishbein, 1980), theory of planned behavior (Ajzen, 1985), as well as extensions of TAM (e.g. Venkatesh *et al.*, 2003) are conventionally adopted theories. As for research into promulgation of innovation, innovation diffusion theory is the most widely adopted framework, having been applied to explore the diffusion and adoption of mobile services (e.g. Lu and Yu, 2006; Lu *et al.*, 2003; Gilbert and Han, 2005). Lin (2011) also indicated that DOI is a well-structured model for investigating mobile banking adoption behavior. Therefore, this study characterizes consumer behavior in relation to MBSs by using the DOI theory.

The proposed conceptual framework is based on social psychology theory, innovation of diffusion and technology adoption frameworks. The proposed framework integrates three aspects of predictor variables that thoroughly elucidate consumer adoption of mobile banking. Meanwhile, since consumer attitudes towards an online service are likely conditioned based on previous attitudes towards a brand associated with that web site (Laudon and Traver, 2004; Shankar *et al.*, 1998), this study investigates the innovation and diffusion patterns of MBSs, as well as how risk concerns, brand awareness, brand image, and different consumer behaviors impact usage frequency. The sample population consists of Taiwanese bank customers. In addition to the feasibility of the research methodology, results of a quantitative

empirical survey provide further insight into the relationship between these research constructs.

The rest of this paper is organized as follows. Section 2 introduces the proposed framework and hypotheses. Sections 3 then describes the proposed method used to test the framework. Next, Section 4 summarizes the analytical results. Recommendations for future research are described in Section 5 and conclusions are drawn in Section 6.

2. Conceptual framework and hypotheses

Figure 1 displays the conceptual framework, visual representation of the theoretical model directing data collection and empirical analysis. Independent variables are the components of DOI (i.e. relative advantage, compatibility, complexity, trialability, and observability), brand association (i.e. brand awareness and brand image), and perceived risk (i.e. financial, performance, time, psychology, and privacy risk). The mediator variable is the attitude towards MBSs. Whether these variables increase customer intention to use MBSs is evaluated. The following subsections discuss relevant literature and hypotheses.

2.1 Diffusion of MBSs

The prevalence of mobile technology in daily life has increased the popularity of mobile banking. The conceptual framework is based on DOI theory, considered as one of the most popular theories that explore factors affecting an individual to adopt an innovation or a new technology. Rogers defined diffusion as "the adoption of an innovation over time by the given social system"; diffusion processes subsequently lead to the acceptance or penetration of a new idea, behavior, or physical innovation
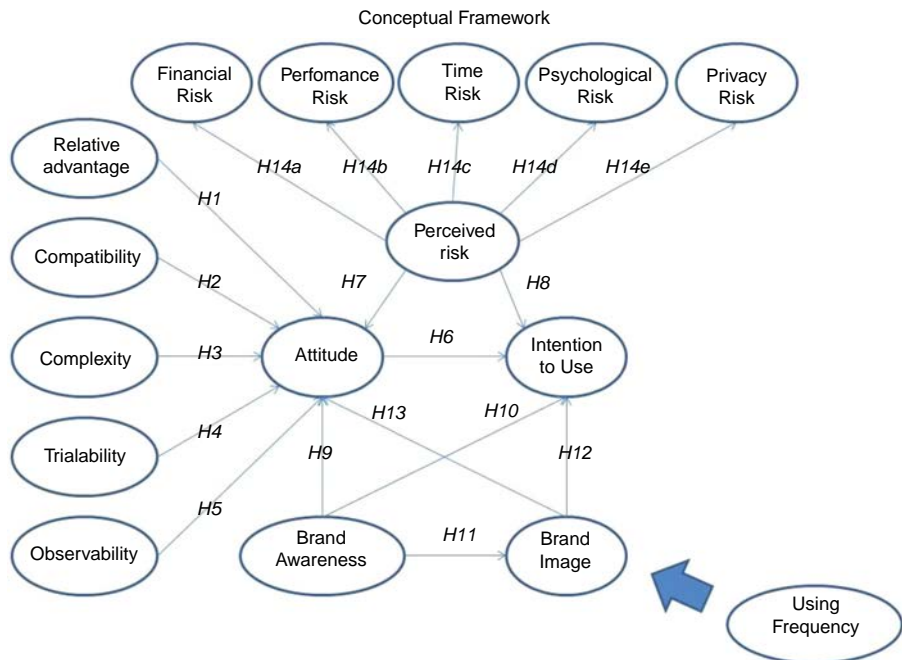
Figure 1.
Conceptual framework

(Rogers, 1995). Research on product-related characteristics of innovation has generally evaluated innovation with product characteristics involving five constructs: relative advantage, compatibility, complexity, trialability, and observability (Moore and Benbasat, 1991).

As relative advantage refers to "the degree to which an innovation is perceived to be better than the idea it supersedes" (Karayanni, 2003; Rogers, 1983) evidence suggests that when users perceive that a new technology has distinct advantages over the old technology, the likelihood of users adopting the technology increases (Lee *et al.*, 2003; Leung and Albert, 2003; Rogers, 1983; McCloskey, 2006; Rogers, 2003; Moore and Benbasat, 1991). Studies on mobile banking adoption have described benefits of such services such as immediacy, convenience, and affordability to customers (Lin, 2011). Such advantages of mobile banking imply that consumer-perceived MBSs are excellent services that can be accessed without time and location constraints, subsequently improving service performance and service efficiency. Therefore, hypothesize that customers who perceive the distinct advantages of mobile banking are more likely to have positive attitude toward it. We thus posit the following:

H1. Highly perceived relative advantage of MBSs positively affects attitudes towards using MBSs.

Rogers (1995) generally defined "compatibility" as how an innovation is assumed to be consistent with sociocultural values and beliefs, experiences, as well as the needs of potential adopters. Compatibility is also essential to innovation since conformance to a user's lifestyle can significantly increase the rate of adoption (Rogers, 2003). Incompatibility between an innovation and existing products/services may inhibit an adopter's acceptance. Related research demonstrated that compatibility is a significant antecedent in determining consumer attitudes towards adopting internet banking (Ndubisi and Sinti, 2006), as well as towards the adoption of virtual store (Chen *et al.*, 2004), m-payment (Chen, 2008), and mobile banking practices (Koenig-Lewis *et al.*, 2010; Lin, 2011). Obviously, DOI theory has clarified how compatibility affects consumer willingness to adopt an innovation (Rogers, 1995, 1962). Numerous recent studies have also provided supporting evidence (Kim and Lee, 2008; Lin *et al.*, 2009; Zitter *et al.*, 2009). We thus posit the following:

H2. High perceived compatibility of MBSs positively affects attitudes towards using MBSs.

As for complexity, an innovation perceived as complex or difficult to use is unlikely to be adopted (Rogers, 1995). Cheung *et al.* (2000) defined complexity as the extent to which an innovation can be considered relatively difficult to understand and use, they also found that complexity adversely impacts internet usage. Given the user-friendly interfaces of MBSs, users view them as easy to use, subsequently forming positive attitudes towards them (Lin, 2011). If not perceived as user friendly, a considerable amount of mobile technology-related research has suggested that the perceived complexity of the innovation inhibits users' intention to use mobile banking services (Au and Kauffman, 2008; Ondrus and Pigneur, 2006). Users are reluctant to use MBSs if such services requires more mental effort than traditional banking services, or are time consuming or frustrating. Therefore, for users finding it too complex to learn how to use MBSs, the positive attitude of consumers towards MBSs

and their intention to use them decrease. Therefore, we hypothesize that perceived complexity inhibits the use of MBSs. We thus posit the following:

H3. High perceived complexity of MBSs adversely affects attitudes towards using MBSs.

Trialability refer to the high likelihood of individuals to adopt an innovation when they can first evaluate it. Potential adopters who are allowed to experiment with an innovation feel more comfortable with it and are more likely to adopt it (Agarwal and Prasad, 1998; Rogers, 2003). Tan and Teo (2000) also asserted that if given an opportunity to evaluate the innovation, customers minimize certain unknown fears, leading to acceptance. Therefore, repeated evaluation of an MBS and assistance in mobile banking usage during the trial period can reduce uncertainty about mobile banking, ultimately creating a positive consumer attitude toward using MBSs. We thus posit the following:

H4. High perceived trialability of MBSs positively affects attitudes towards using MBSs.

Finally, an innovation which is visible and facilitates communication among an individual's personal networks creates positive attitudes towards it (Rogers, 1995). Moore and Benbasat (1991) simplified the original construct by dividing observability into two constructs: visibility and result demonstrability. Therefore, when an individual's friends discuss the use of an MBS, while of them one is using a MBS, use status is disclosed and potential consumers of MBS have positive attitudes towards that MBS. Through such exposure, customers acquire knowledge about mobile banking and its benefits, thus facilitating adoption. We thus posit the following:

H5. High perceived observability of MBSs positively affects attitudes towards using MBSs.

2.2 Attitude
According to the theory of reasoned action (Ajzen and Fishbein, 1980) and theory of planned behavior (Ajzen, 1985), technology patterns, perceptions of risk, brand image, and brand awareness affect attitudes towards using MBSs. Therefore, increasing innovation patterns decrease perceived risk. Meanwhile, an increasing perceived brand awareness and brand image, improves consumer attitudes towards using mobile MBSs.

Attitude comprises beliefs about the outcomes of individuals behaving in a particular way, multiplied by their valuation of consequences. Therefore, behavior of individuals are predicted by their attitudes towards that behavior and by how they perceive other individuals as viewing them when they behave in that way. We thus posit the following:

H6. Individual attitudes towards using MBSs are positively related to their intention to MBSs.

2.3 Brand
Given the advantages of price transparency, information publicity, and mobility in m-commerce, Sinha (2000) suggested that branding of virtual commerce is not as important as that of physical business. Nevertheless, related research suggests that

price is not the only decision-making priority when consumers become tired of comparing prices after the vigorous emergence of a virtual business (Smith *et al.*, 1999). Given the ability of brand awareness to offer relevant information about a brand, product, or service, consumers unfamiliar with that brand cannot make purchasing decisions based on the brand image of product or service. Therefore, as is assumed here, consumers spend more time on web sites owned by favored organizations than on those of non-favored organizations. We thus posit the following:

H9. Brand awareness of individuals is positively related to their attitudes towards using MBSs.

H10. Brand awareness of individuals is positively related to their intention to use MBSs.

Christodoulides and de Chernatony (2004) concluded that online brand awareness affects brand image, explaining why price is not the only one decision-making priority in virtual shopping. We thus posit the following:

H11. Brand awareness of individuals is positively related to their brand image of that mobile banking web site.

Consumers purchase services from providers with a good brand image, owing to the ability of the latter to provide superior quality service (Shankar *et al.*, 1998). Ruyter *et al.* (2001) suggested that company reputation and brand image definitely affect customer purchasing decisions regarding electronic services, since brand image becomes the symbol of consumer buying intention with information asymmetry. Laudon and Traver (2004) further noted that virtual business brand refers the image and service quality of that business, enabling further buying action of that web site. We thus posit the following:

H12. The brand image of individuals is positively related to their intention to use MBSs.

Most related studies confer that a good brand image positively affects attitudes towards that brand (Shwu-Lng and Chen-Lien, 2009; Sevier, 2001; Bogart and Lehman, 1973; Moore and Steve, 2000; Ravi *et al.*, 2005; Da Silva and Alwi, 2006; Wong and Merrilees, 1998; Vahie and Paswan, 2006). Kotler (2000) suggested that an improved brand image of products or services, decreases consumer-perceived risk, leading to a positive attitude towards that product or service, and increasing the intention to use or buy that product or service. Therefore, brand image significantly affects brand attitude, purchasing behavior, and marketing strategy (Biel, 1992). We thus posit the following:

H13. The brand image of individuals is positively related to their attitude towards using MBSs.

2.4 Perceived risk
According to the Federal Reserve (FRB, 2012), consumer adoption of mobile banking and mobile payment technologies are impeded by security concerns and the possibility

of hackers accessing consumers' phones remotely. Consumer attitudes regarding whether mobile banking or mobile payment technologies are adequately secure is correlated with their use of these technologies. Therefore, consumer-perceived risk is important when deciding whether to acquire of a new technology or services (Sylvie and Xiaoyan, 2005). Kailani and Kumar indicated that in a society in which uncertainty aversion is high, perceived risk associated with e-buying behavior is also high, negatively impacting e-commerce. For contemporary mobile commerce, Wu and Wang (2005) found a statistically significant relationship between perceived risk and intention to use mobile commerce in Taiwan.

In the context of online transactions, perceived risk is generally defined as a perception about implicit risk in using the open internet infrastructure to exchange private information, and it is often operationalized as a multi-dimensional construct. Zhao *et al.* (2008) pointed out that the Chinese consumer-perceived risks toward internet banking services adoption are privacy, finance, security, and performance risks, which prevent these consumers from adopting internet banking. Featherman and Pavlou (2003) and Littler and Melanthiou (2006), hypothesized that perceived risk is composed of five dimensions in the context of retail banking services: financial, performance, time, psychological, and security risks. We thus posit the following:

H14. Perceived risk is a joint factor of perceived financial risk, perceived performance risk, perceived time risk, perceived psychological risk, and perceived privacy risk.

Financial risk: The major perceived financial risk is likely to relate to the potential loss because of deficiencies in the operating system or misappropriation of funds through illegal external access (Littler and Melanthiou, 2006). We thus posit the following:

H14a. Perceived financial risk positively related to perceived risk.

Performance risk: The major perceived performance risk is that there are several factors that might be perceived as adversely affecting the performance of the MBS (Littler and Melanthiou, 2006). These may relate to the ability of the consumer to undertake the transaction, or to effect the transaction within what is considered a reasonable time. In the meantime, the effectiveness of the mobile service including the download speed, and the time take to move from one part of the mobile service to another may also have some bearing. Thus, the risk that the new service will not meet the requirements of the consumer. We thus posit the following:

H14b. Perceived performance risk positively related to perceived risk.

Time risk: Consumers may have to devote additional time to learning, or using a product or service. If MBS requires significant learning time then the time risk may be considered high (Littler and Melanthiou, 2006). In the case of MBSs the time risk may be related to the length of time involved in learning and using this offers. We thus posit the following:

H14c. Perceived time risk positively related to perceived risk.

Psychological risk: The major perceived psychological risk is that the consumer's self-perception may be adversely affected by the adoption of MBSs (Littler and

Melanthiou, 2006). Thus, the failure of MBSs to be compatible with self-image. We thus posit the following:

H14d. Perceived psychological risk is positively related to perceived risk.

Privacy risk: As is well known, privacy may the most serious disadvantage of MBSs with concerns over external intrusion resulting in the scrutiny of personal financial details and even the removal of money from accounts (Littler and Melanthiou, 2006). Therefore, widespread concern over the privacy of the internet or a smart phone when used to purchase financial products has been noted. We thus posit the following:

H14e. Perceived privacy risk is positively related to perceived risk.

Customers generally perceive risk owing to doubts related to the degree of inconsistency between customers' judgment and real behavior, as well as the failure of technology to deliver its anticipated outcome and its subsequent loss (Chen, 2008; Koenig-Lewis *et al.*, 2010; Lee *et al.*, 2007). Although associated with internet transactions for quite some time, risk may increase in importance for transactions via mobile devices (Gewald *et al.*, 2006; Ndubisi and Sinti, 2006). As for mobile banking, perceived risk is even more important, owing to the threat of privacy and security concerns (Luarn and Lin, 2005). Namely, mobility increases the threat of security violations arising from the required infrastructure for wireless applications. Therefore, MBSs users are concerned about risk since more points in the telecommunication process can be found between mobile phones than between fixed devices (Corradi *et al.*, 2001). Additionally, some users are concerned with the possibility that hackers access their bank accounts via stolen PIN codes (Poon, 2008). Perceived risk is thus more likely to adversely impact the adoption of MBSs. We thus posit the following:

H7. Perceived risk associated with MBSs is negatively related to attitude toward using MBSs.

H8. Perceived risk associated with MBSs is negatively related to intention to adopt MBSs.

2.5 Volume segmentation

According to Perfetto and Woodside (2009), volume segmentation has become an increasingly feasible segmentation strategy. Therefore, when users in a product category include both high-income and low-income ones, their demographic profiles are distinguishable from each other; in addition, their consumption profiles differ substantially. While suggesting that high-volume consumers are more valuable than low-volume ones, Twedt (1964) summarized his findings by suggesting that "what can be said is that the heavy-using household buys more, buys more often, and buys more different brands" (Twedt, 1964, p. 71). Therefore, heavy users represent an attractive segment for many firms, owing to their relatively small group size that accounts for a very large volume (Goldsmith and Litvin, 1999; Goldsmith, 2000; Goldsmith and d'Hauteville, 1998; Woodside *et al.*, 1987). Finally, Spotts and Mahoney (1991) further suggested that researchers select user categories to ensure that the characteristics of the market segments are distinguishable from each other. Therefore, this study

investigates the differences between frequent users of MBS. We thus posit the following:

H15. The characteristics profile of frequent MBS users significantly differs from that of less frequent ones.

3. Methodology
Adoption of MBSs grew in 2012. During the second quarter of 2011, 16 percent of all mobile users used their mobile devices to acquire financial information. Of this group, nearly 75 percent used their devices to interact with their bank at least once weekly. This penetration resembles that for individuals using desktop or laptop computers for online banking.

Although many consumers pay bills online using mobile devices, security remains of priority concern. Many financial institutions are inactive in social media, and their customers are unaware of their online presence. Banks must learn how to serve their customers via the internet by ensuring that banking is user-friendly and secure.

To evaluate the hypothesized model empirically, this study sent out questionnaires from December 1, 2011 to January 31, 2012. The questionnaires were delivered to all chosen subjects, i.e. customers of a physical retail bank. Totally, 700 questionnaires were delivered, and 656 were returned; of which, 610 were valid. Table I presents information related to sample descriptive statistics. According to Sichtmann (2007), customers and non-customers have different levels of trust in a corporate brand, leading to different buying behaviors. To our knowledge, no model has differentiated between various consumer types, as addressed by the following research questions: "Do active/seldom MBS users differ?" and "Does perceived risk affect consumer behavior?"

To identify why individuals seldom use MBSs, this study first divided the sample population into frequent-user (366 respondents; those who use MBSs some times a day, some times a week, some times per month, and sometimes per season), and infrequent user groups (244 respondents; those who have never used MBSs or only one time more than a season).

Based on exploratory factor analysis (EFA), this study attempts to determine whether any obvious deviation occurs from the structure of adopted constructs. As a rigorous research methodology, path analysis has become the conventional approach in social science research (Li and Calantone, 1998; Chaudhuri and Morris, 2001; Hair et al., 2010). Therefore, in this study, underlying relationships among research constructs are analyzed using confirmatory factor analysis (CFA) and structural equation modeling (SEM). In particular, this study investigates whether data conform to the multi-normality requirement because the SEM test is based on multi-normality (McDonald and Ho, 2002). Moreover, the proposed model is evaluated via a two-stage structural equation framework. Furthermore, CFA is performed to evaluate construct validity, both convergent and discriminant validity, before applying SEM.

3.1 Measures
Item responses were on a five-point Likert-type scale, ranging from 1 for "strongly disagree" to 5 for "strongly agree." The hypothesized model has 14 constructs:

Characteristics	Category	Frequent users		Infrequent users		Full sample	
		Times	Percent	Times	Percent	No.	Percent
Gender	Male	161	44.0	132	54.1	293	48.0
	Female	205	56.0	112	45.9	317	52.0
Age	Under 20 years	14	3.8	19	7.8	33	5.4
	21-30 years	150	41.0	88	36.1	238	39.0
	31-40 years	110	30.1	75	30.7	185	30.3
	41-50 years	49	13.4	39	16.0	88	14.4
	Above 51 years	43	11.7	23	9.4	66	10.8
Education	Under junior high school	7	1.9	3	1.2	10	1.6
	Senior high school	24	6.6	9	3.7	33	5.4
	Vocational school	77	21.0	39	16.0	116	19.0
	College school	156	42.6	105	43.0	261	42.8
	Graduate school	102	27.9	88	36.1	190	31.1
Occupation	Information industry	40	10.9	23	9.4	63	10.3
	Electronic industry	76	20.8	45	18.4	121	19.8
	Service industry	98	26.8	64	26.2	162	26.6
	Manufacturing industry	28	7.7	27	11.1	55	9.0
	Tourism industry	16	4.4	6	2.5	22	3.6
	Mass broadcasting	4	1.1	2	0.8	6	1.0
	Students	36	9.8	30	12.3	66	10.8
	Others	68	18.6	47	19.3	115	18.9
Monthly income	Less than 15,000	42	11.5	23	9.4	65	10.7
	15,000-35,000	149	40.7	100	41.0	249	40.8
	35,000-55,000	107	29.2	65	26.6	172	28.2
	55,000-75,000	31	8.5	28	11.5	59	9.7
	75,000-100,000	31	8.5	14	5.7	45	7.4
	More than 100,000	6	1.6	14	5.7	20	3.3
Experience of using internet	Less than 3 years	18	4.9	12	4.9	30	4.9
	3-6 years	16	4.4	25	10.2	41	6.7
	6-9 years	100	27.3	57	23.4	157	25.7
	More than 9 years	232	63.4	150	61.5	382	62.6
No. of mobile bank accounts you have	Zero	0		176	72.1	176	28.9
	One	196	53.6	44	18.0	240	39.9
	Two	103	28.1	19	7.8	122	20.0
	Three	57	15.6	5	2	62	10.2
	More than three	10	2.7	0	0	10	1.6
Frequency of using MBS	Never	0	0	176	72.0	176	28.8
	Times per day	36	9.8	0	0	36	5.9
	Times per week	91	24.8	0	0	91	14.9
	Times per month	113	30.8	0	0	113	18.5
	Times per season	126	34.4	0	0	126	20.6
	Once more than a season	0	0	68	28.0	68	11.1

Table I.
Sample descriptive statistics – frequency and full

relative advantage, compatibility, complexity, trialability, observability, financial risk, performance risk, time risk, psychological risk, privacy risk, attitude, intention to use, brand image, and brand awareness. Questionnaire items were modified from previous studies, owing to that the measures adopted in this study were originally developed for American consumers in the USA. Therefore, applying these measures to a different cultural group (i.e. ethnic Chinese) may be problematic. To solve this problem, several methods were adopted. To enhance face validity, a group of Chinese expert judges (both practitioners and academics) qualitatively tested an initial list of

items. Second, despite the deletion of all items of these constructs revised from previous literature without items, the questionnaire translated from English to Chinese in a tripartite process that included language, back-translation, and a third-party re-translation have verified the wording of questions into a more fittingly status. This should reaffirm the extent to which the translation is an understandable and conceptually consistent attempt to evaluate each scale item (Kotabe and Helsen, 2000).

The items for perceived risk dimensions were revised from the study of Featherman and Pavlou (2003). The two items used to evaluate behavior, attitude, and intention to use MBSs were revised from the study of Gardner and Amoroso (2004); the DOI items were revised from the study of Rogers (1962); brand image items were revised from the study of Aaker (1996), and items for brand awareness were revised from the study of Keller (1993).

Data were collected at the entrance to one of the largest retail bank branches in Taipei, Taiwan, ensuring that the 610 valid questionnaires were representative. While the sampling bank branch a busy banking service provider in Taiwan (with a 6.2 percent market share of all branches in Taiwan), its headquarters is also the most advanced e-management and mobile management banker in this industry. Therefore, the customers of this physical channel should be representative of the requirements of this study. The questionnaire had 52 quantitative items to which the subjects responded.

Of the 610 Taiwanese retail banking users, 317 were male (52 percent) and 293 were female (48 percent). Most respondents were in the age groups of 21-30 years old (238; 39 percent), and 31-40 years old (185; 30.3 percent). Most respondents had acquired an undergraduate (261; 42.8 percent) or a graduate school degree (190; 31.1 percent). Most respondents had used the internet for more than nine years (382; 62.6 percent); in addition, more than 71.1 percent of the respondents had more than one mobile banking account. Totally, 366 respondents (i.e. those who frequently use MBSs some times daily, some times weekly, some times monthly, and sometimes per season), and 244 respondents never used MBSs or one time more than a season.

In the frequent user group: 161 were male (56 percent) and 205 were female (44 percent). Most respondents were in the age groups of 21-30 years old (150; 41 percent), and 31-40 years old (110; 30.1 percent). Most respondents had acquired an undergraduate (156; 42.6 percent), or a graduate school degree (102; 27.9 percent). Most respondents had used the internet for more than nine years (232; 63.4 percent), and all subjects in the frequent user group had more than one mobile banking account. Of the subjects in the infrequent user group, 132 were male (54.1 percent) and 112 were female (45.9 percent). Most respondents were in the age groups of 21-30 years old (88; 36.1 percent), and 31-40 years old (75; 30.7 percent). Most respondents had acquired an undergraduate (105; 43 percent), or a graduate school degree (88; 36.1.9 percent). Most respondents had used the internet for more than nine years (150; 61.5 percent), and 72.1 percent of subjects in the infrequent user group did not have a mobile banking account.

4. Empirical results

The sample size ($n = 610$) was considered sufficiently large for model specification and further analysis. Even with the multi-group analysis of frequency (366/244) subgroups, the sample size remained sufficient (Sichtmann, 2007). This study also analyzed univariate and multivariate outliers, revealing no significant violations. Since data normality affects statistical results (Pedhazur and Schmelkin, 1991; Tabachnick and Fidell, 2007), testing for multivariate data normality is essential. In particular, SEM is

necessary to satisfy the assumption of data normality, implying that observed variables must be distributed normally (Gravetter and Wallnau, 2000). Moreover, when testing for multivariate data normality, the analytical results indicate that the kurtosis value ranged from −0.742 to −0.138, and the skewness value ranged from −0.823 to −0.105, thus satisfying the valuation criteria (ranging from −2 to +2) suggested by Mardia (1985). Therefore, all valuables correlate with the assumed multivariate distribution. Tables II-IV summarize items related to each construct in the proposed model.

The proposed measurement model was evaluated using LISREL 8.53 (Joreskog and Sorborn, 1993, 1989). Table V summarizes the fit statistics. According to this table, the χ^2 statistics are significant at the 0.05 level, i.e. a common level for a relatively large sample (Doney and Cannon, 1997). The values of comparative fit index (CFI), non-normed fit index (NNFI), root mean square error of approximation (RMSEA), and standardized root mean residual (SRMR) are acceptable for the research model, based on the criteria suggested by Hu and Bentler (1999, 1995) (0.94 for CFI and NNFI; 0.082 for RMSEA; and 0.087 for SRMR). Notably, model specifications do not need to be modified since all goodness-of-fit indices were acceptable and the conceptual model was developed based on theory. Next, this study evaluated the measurement model and structural path model.

4.1 Evaluation of measurement model
To achieve a qualified model specification, this study evaluated the quality and adequacy of the measurement model by assessing unidimensionality, reliability, convergent validity, and discriminant validity. First, unidimensionality was determined by performing principal component analyses for all items. Analytical results indicate that all items had loadings > 0.68 on the hypothesized factors. Thus, no significant cross-loading was found via EFA, supporting the unidimensionality of each hypothesized construct.

For composite reliability, analytical results indicate that all Cronbach's α values exceeded the recommended 0.6 threshold (Bagozzi and Yi, 1988; Fornell and Lacrker, 1981). Convergent validity was then assessed by examining t-statistics related to factor loadings in a CFA setting. The fact that all t-statistics are statistically significant at the 0.05 level implies that all indicator variables are adequate measures of their respective constructs, demonstrating convergent validity (Hoyle and Panter, 1995; Rao and Troshani, 2007). Moreover, average variances extracted for all constructs exceeded 0.50 (Tables II-IV), indicating convergent validity (Fornell and Lacrker, 1981; Hair et al., 1998).

Finally, discriminant validity was performed using the procedure of Anderson (1987) and Bagozzi and Phillips (1982). Whether the χ^2 values were significantly lower for unconstrained models when the φ coefficient was constrained to unity was then evaluated using a battery of χ^2 difference tests (Anderson, 1987). The critical values for χ^2 difference at a significance level of 0.05 exceeded 3.84 for all possible pairs of constructs, with this outcome demonstrating discriminant validity. Thus, we conclude that the hypothesized constructs are supported based on reliability and validity standards.

Tables V and VI present the evaluation results for overall model fit, as well as summarizes the research hypotheses. Figures 2 and 3 display the estimated coefficients of the hypothesized model (statistically significant path coefficients are represented by solid lines).

Table II.
Survey instruments I

Models	Item-construct loading Standardized		t-value		Cronbach's α		Average variance extracted Frequent/seldom		References
Item	Frequent/seldom		Frequent/seldom		Frequent/seldom		Frequent	seldom	
Relative advantage					0.925	0.923	0.81	0.79	Rogers (1962)
Using MBSs makes services more quickly	0.84	0.83	23.34	21.52					
Using MBSs makes services more simplify	0.93	0.89	25.76	22.41					
Using MBSs improves service performance	0.72	0.75	22.56	19.64					
Using MBSs improves service efficiency	0.92	0.94	25.33	23.05					
Compatibility					0.819	0.825	0.75	0.76	Rogers (1962)
I have used these services	0.81	0.8	21.84	20.12					
I have demands for using mobile banking service	0.83	0.81	22.26	21.31					
MBSs are accessible for someone who has internet access	0.82	0.79	20.46	18.54					
Complexity					0.893	0.901	0.82	0.81	Rogers (1962)
Learning to use MBSs is complex for me	0.74	0.81	21.34	20.22					
High-level facilities are needed for MBSs	0.86	0.85	20.71	21.51					
Using an MBS is complex	0.78	0.72	18.54	17.34					
Trialbility					0.751	0.788	0.68	0.71	Rogers (1962)
When using an MBS, I try to test all functions provided by the MBS repeatedly	0.91	0.86	21.36	21.52					
I know MBSs have the functions I need	0.73	0.82	24.26	22.41					
I used to fully use MBSs and test all the functions	0.78	0.79	21.95	19.64					
I try to understand the functions when using MBSs	0.89	0.93	20.31	21.52					
I'll test the functions of MBS by continuous playing the MBS	0.91	0.79	19.52	22.41					
Observability					0.837	0.829	0.72	0.75	Rogers (1962)
Friends around me discuss the use MBSs	0.81	0.85	28.41	22.28					
I know someone who is using MBSs	0.83	0.81	26.65	24.16					
I know the use status of the population	0.79	0.78	23.51	17.24					

Models Item	Item-construct loading Standardized Frequent/Seldom		t-value Frequent/seldom	Cronbach's α Frequent/seldom		Average variance extracted Frequent/seldom		References
Brand awareness				0.917	0.911	0.75	0.81	Keller (1993)
Whenever I think of MBSs, I first link to the brand	0.89	0.88	28.34 27.25					
Whenever I need to use MBSs, I'll think of that brand	0.92	0.86	29.76 26.41					
I'm familiar with that brand	0.88	0.85	27.56 24.64					
I think it is easy to remember that brand	0.91	0.9	28.63 27.05					
Brand image				0.875	0.849	0.70	0.81	Aaker (1996)
I think that MBSs brand has a good image	0.91	0.89	28.45 27.52					
I think the services provided by that brand make me feel at ease	0.93	0.86	30.21 25.16					
I think the brand value that the MBS provider is quite different from that of other brands	0.89	0.85	26.58 19.64					
I think that MBS brand has its own characteristics	0.86	0.91	25.17 29.24					
I have a clear image of that MBS brand	0.91	0.85	27.29 26.35					
Whenever I think of that MBS brand, in feel trust	0.96	0.89	31.61 28.92					
Attitude				0.923	0.881	0.88	0.90	Gardner and Amoroso (2004)
Using MBSs makes me feel happy	0.83	0.85	23.84 25.17					
Using MBSs is interesting	0.88	0.87	26.57 28.41					
Using MBSs makes me feel at ease	0.91	0.92	29.12 30.21					
I enjoy doing online transactions via MBSs	0.94	0.90	31.28 29.04					
Intention				0.916	0.926	0.81	0.85	
I'll use MBSs in my job	0.93	0.92	31.06 30.94					
I'll try to use MBSs to complete financial transactions	0.95	0.89	32.54 27.45					
I'll use MBSs in the future	0.89	0.93	27.19 31.92					
I'll keep using MBSs in the future	0.92	0.89	31.02 28.19					

Table III.
Survey instruments II

Models	Item-construct loading		t-value		Cronbach's α		Average variance extracted		References
	Standardized								
Item	Frequent	seldom	Frequent	seldom	Frequent	seldom	Frequent	seldom	
Financial risk					0.942	0.941	0.78	0.73	Featherman and Pavlou (2003)
Risk of being barred from my account exists	0.75	0.81	25.06	21.15					
Financial risk exists when using MBSS	0.76	0.78	23.54	17.94					
A mistake when using the MBSS may cause financial damage	0.86	0.91	21.18	20.02					
Performance risk					0.930	0.947	0.84	0.86	
The performance of the MBSS is inferior to a bank's offline branch-office	0.71	0.81	23.64	21.17					
The pattern and efficiency of MBSS differ from what I think they are	0.74	0.76	22.57	17.42					
Time risk					0.897	0.917	0.81	0.79	
It takes time to learn to how operate MBSS	0.71	0.80	21.65	20.16					
It takes times to learn the rules of MBSS	0.74	0.75	20.05	17.48					
It takes time to use MBSS	0.86	0.90	19.18	24.21					
Psychological risk					0.944	0.966	0.78	0.76	
Using MBSS makes me feel uncomfortable	0.70	0.80	22.67	23.17					
Using MBSS makes me feel anxiety	0.75	0.75	20.51	21.47					
Using MBSS makes me feel nervous	0.86	0.91	18.16	20.27					
Privacy risk					0.910	0.931	0.89	0.85	
The MBSS can't keep my personal data private	0.70	0.80	22.78	22.41					
Personal information when using MBSS may be stolen by others	0.74	0.73	24.51	19.64					
A hacker may hack into my private information when using MBSS	0.85	0.90	26.12	20.72					

Table IV.
Survey instruments III

	Model	χ^2/df	GFI	RMSEA	NNFI	SRMR	AGFI	CFI
Frequent users	Confirmatory factor analysis	2.45	0.88	0.032	0.98	0.045	0.85	0.99
	Sequential path model	2.58	0.81	0.041	0.99	0.055	0.79	0.98
Infrequent users	Confirmatory factor analysis	2.94	0.85	0.043	0.97	0.058	0.83	0.98
	Sequential path model	3.09	0.79	0.061	0.95	0.075	0.76	0.96
Suggested values		<3	>0.90	<0.06	>0.90	<0.08	>0.80	>0.95

Notes: $\chi^2_{(1,121)} = 3{,}127.48$, $p = 0.00$, GFI = 0.81, RMSEA = 0.041, NNFI = 0.99, SRMR = 0.055, AGFI = 0.79, CFI = 0.98 (frequent users). $\chi^2_{(1,153)} = 3{,}571.42$, $p = 0.00$, GFI = 0.79, RMSEA = 0.061, NNFI = 0.95, SRMR = 0.075, AGFI = 0.76, CFI = 0.96 (infrequent users)

Table V.
Goodness of fit statistics

4.2 Discussion

Analytic results indicate that all significant relationships between latent constructs correlate with hypothesized directions for the frequent user group. The diffusion of the innovation components positively and significantly affects the attitude towards MBS, except for *H3*, complexity → attitude, which negatively and significantly affects attitude.

According to Table VI, *H1* in which relative advantage (for both frequent and infrequent users) positively affect mobile banking adoption is supported, the adoption of MBSs for infrequent users. In addition to correlating with previous mobile commerce research (Lu *et al.*, 2003; Luarn and Lin, 2005), this finding suggests that customers tend for adopt mobile banking that they find is useful and flexible in managing their finances efficiently.

Compatibility (both frequent and infrequent users) positively affects the adoption of mobile banking practices, which is the most significant determinant in predicting mobile banking adoption for frequent users. The support for *H2* resembles the findings of previous studies (Koenig-Lewis *et al.*, 2010; Lin, 2011). Above studies demonstrate that perceived compatibility of an innovation positively influences on the adoption of mobile banking. Therefore, once MBSs correspond to how customers handle their finances, as deemed appropriate for their work and lifestyles, they tend to adopt new innovations.

Our results further indicate that observability significantly affects mobile banking adoption only for frequent users, thus partially supporting *H3*. Observability in the mobile banking context refers to the ability to view the beneficial results such as immediate access to transactions without time and location constraints. Therefore, mobile banking offers a highly flexible and effective means of managing individual financial transactions, owing to its easy accessibility without time constraints (Al-Jabri and Sohail, 2012).

The same as observability, complexity significantly affects mobile banking adoption only for frequent users, thus partially supporting *H4*. This finding resembles those of some previous studies (Jahangir and Begum, 2008; Luarn and Lin, 2005). However, this observations contradicts the findings of Wang *et al.* (2003) and Al-Jabri and Sohail's (2012), which suggested that ease of use did not significantly impact behavioral intention to use internet banking services.

Analysis results also indicate that trialability significantly affects adoption of mobile banking services for both frequent and infrequent users, supporting *H5*. This finding contradicts other research finding with respect to PC and phone banking (Kolodinsky *et al.*, 2004). Since mobile banking poses with high risk concerns for

Table VI.
Results of the
proposed model

Causal path / Subgroups	Hypothesis	Expected sign	Path coefficient Frequent	Seldom	t-value Frequent	Seldom	Assessment ($p \leqslant 0.05$) Frequent	Seldom
Relative advantage → attitude	H1	+	0.24	0.35	4.55	3.74	S	S
Compatibility → attitude	H2	+	0.33	0.23	6.25	2.51	S	S
Complexity → attitude	H3	−	−0.22	−0.16	−3.26	−1.63	S	Ns
Trialability → attitude	H4	+	0.28	0.29	5.05	3.21	S	S
Observability → attitude	H5	+	0.18	0.13	2.61	0.58	S	Ns
Attitude → intention to use	H6	+	0.88	0.67	8.91	6.61	S	S
Perceived risk → attitude	H7	−	−0.79	−0.58	−6.96	−5.81	S	S
Perceived risk → intention to use	H8	−	−0.59	−0.25	−5.50	−3.36	S	S
Brand awareness → attitude	H9	+	0.32	0.09	5.07	0.18	S	Ns
Brand awareness → intention to use	H10	+	0.28	0.29	5.76	4.23	S	S
Brand awareness → brand image	H11	+	0.48	0.54	8.72	7.94	S	S
Brand image → intention to use	H12	+	0.54	0.52	11.84	8.55	S	S
Brand image → attitude	H13	+	0.24	0.04	4.48	0.04	S	Ns
Perceived risk → financial risk	H14a	+	0.65	0.85	6.71	8.41	S	S
Perceived risk → performance risk	H14b	+	0.45	0.78	4.92	7.91	S	S
Perceived risk → time risk	H14c	+	0.38	0.48	4.06	4.96	S	S
Perceived risk → psychological risk	H14d	+	0.88	0.83	9.12	8.12	S	S
Perceived risk → privacy risk	H14e	+	0.56	0.76	5.71	7.71	S	S

Notes: $\chi^2_{(1,121)} = 3{,}127.48$, $p = 0.00$, GFI = 0.81, RMSEA = 0.041, NNFI = 0.99, SRMR = 0.055, AGFI = 0.79, CFI = 0.98 (frequent users). $\chi^2_{(1,153)} = 3{,}571.42$, $p = 0.00$, GFI = 0.79, RMSEA = 0.061, NNFI = 0.95, SRMR = 0.075, AGFI = 0.76, CFI = 0.96 (infrequent users)
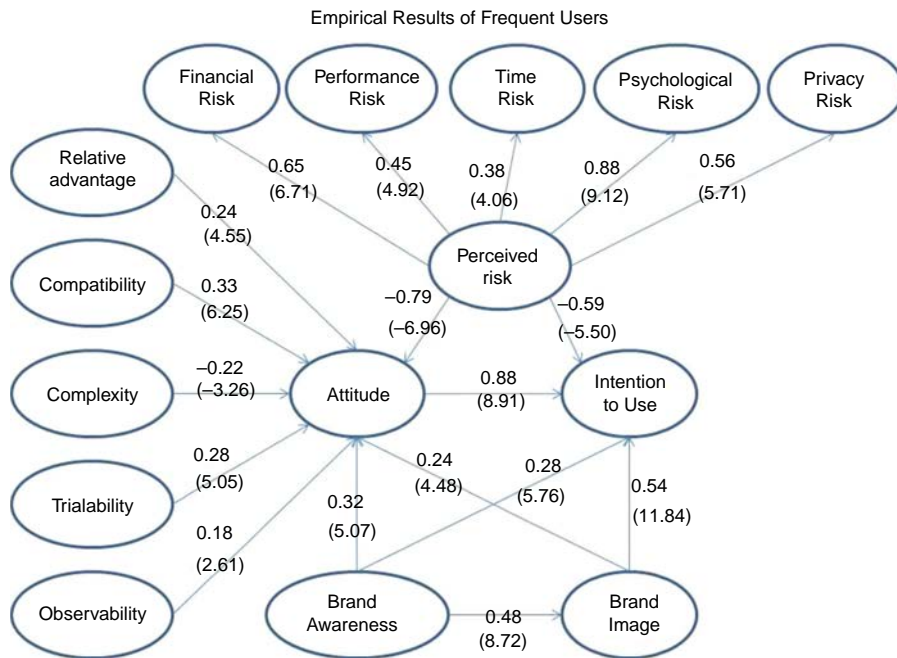
Figure 2.
Empirical results of the
conceptual framework –
frequent users
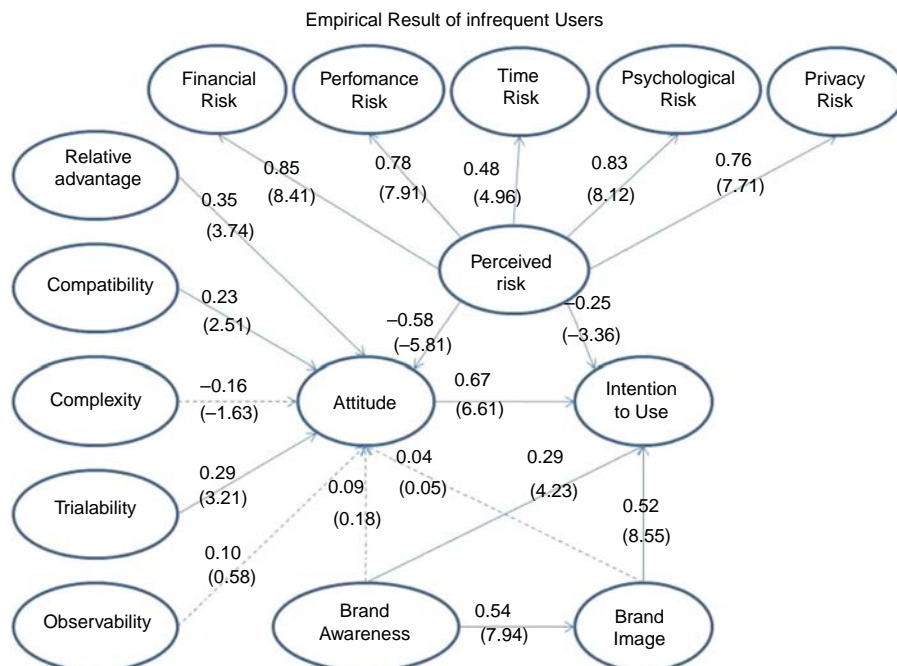
Figure 3.
Empirical results of the
conceptual framework –
infrequent users

customers, customers are expected to have full support and awareness of MBSs. Therefore, banks should more heavily emphasize to customers who are willing (or continue) to use MBSs on a trial basis. Finally, these customers are likely to be confident of MBSs, given their apparent benefits during the trial period.

Our results further demonstrate that perceived risk negatively and significantly affects attitudes towards adopting on MBSs and the intention to use (both frequent user and infrequent users, and frequent users concern more than infrequent users), thus supporting *H7* and *H8*. This finding correlates with previous research (Chen, 2008; Tan and Teo, 2000), implying that bank customers perceive risk as a major impediment to the adoption of MBSs. Banks must thus address the risk concern to ensure that their commercial transactions are safe and that the whole mobile banking system is operable.

As for discussion of the risk categories, analytical results indicate that all five-risk categories significantly affect perceived risk for both frequent and infrequent users, thus supporting *H14a*, *H14b*, *H14c*, *H14d*, and *H14e*. Frequent users are concerned more with psychological risk, as infrequent users emphasize financial, performance, time, and privacy risks. As for adoption of MBSs, users are concerned that they may lose their PIN codes and others could tamper with their transaction information. Therefore, bankers should provide more safety assurances to attract more frequent users in order to ensure continued use. In doing so, infrequent (and maybe potentially heavy users) users would be encouraged to increase mobile banking usage by upgrading their system security.

Moreover, both brand awareness and brand image significantly affect attitudes towards mobile banking and intention to use, thus supporting *H9*, *H10*, *H12*, and *H13*. Meanwhile, brand awareness significantly affect brand image, thus supporting *H11*. Therefore, both the brand awareness and brand image of mobile banking profoundly affect both users' attitude and intention to use MBSs. Compared with perceived risk, an interesting phenomenon arises in which frequent users more heavily emphasize brand image and brand awareness, yet do so to a lesser extent on perceived risk; meanwhile, infrequent users behave in a contradictory manner. This phenomenon can be explained as follows. MBS providers with good brand awareness and brand image are those with a low perceived risk. Therefore, once frequent users select a banker with a good reputation, subsequently diminishing their risk concerns.

Finally, our results demonstrate that the hypothesis of attitude towards intention to use is significant, thus supporting *H6*. Although significant for both frequent and infrequent users, the path coefficient of frequent users is larger than that of infrequent users. This finding suggests that frequent users with a positive attitude towards mobile banking are more likely to have the intention to use MBSs than infrequent users. Therefore, the analytical results partially support the volume segmentation of MBS usage frequency (*H15*).

5. Findings and implications

Mobile banking became widely popular in 2012. During the second quarter of 2011, 16 percent of all mobile users used their mobile devices to access financial data. Of this group, nearly 75 percent used their devices to interact with their banks at least once weekly. This rate resembles that for customers who use their desktop or laptop computer for online banking. Although many consumers pay bills online via their mobile devices, security is their priority concern. Banks must learn how to satisfy customer requirements on the internet, as well as make services user-friendly and secure.

As for its theoretical contribution, this study integrates several theoretical perspectives to identify factors that influence mobile banking adoption-related decisions. This study also evaluates the behavior of MBS users by drawing the traditional DOI, social behavior theory, perceived risk, and brand consideration. While moderating by usage frequency, this study contributes a more centralized user behavior for MBSs. To our knowledge, this study is the first one to theoretically specify or empirically test how innovation attributes, risk, and brand of MBSs providers affect attitudes and behavioral intentions regarding the feasibility of adopting MBSs across frequent and infrequent customers. As for mobile banking, this study fills a theoretical gap in research by developing a research model and evaluating it by using an empirical data set consisting frequent and infrequent users. Empirical analysis results demonstrate several major findings. Interpretations based on these findings and implications are discussed below.

First, results of this study support the adaptability of implying innovation attributes to predict customer attitudes towards mobile banking. According to those results, perceived compatibility significantly affects attitudes. Customers with more positive beliefs about the perceived compatibility of mobile banking have a more positive attitude towards mobile banking. Thus, customer perceptions about the compatibility of mobile banking with their values, experiences, and needs appear to be an accurate predictor of attitudes. This finding suggest that customers who enjoy using wireless banking transactions may find mobile banking conducive to their lifestyles and preferences. Therefore, the compatibility of MBSs with individual lifestyle and preferences is the only effective means of attracting customers and maintaining their loyalty. Moreover, customers who find mobile banking easy to use become more willing to use them in order to conduct banking transactions. Therefore, MBS providers should emphasize designing both useful and easy-to-use MBS interfaces.

Second, the same as with intention models, analytical results of the two subgroups show a significant and positive relationship from attitude to intention to use MBSs. This finding suggested that customer behavioral intentions to use mobile banking tend to be based on user attitudes. Moreover, attitude is predicted jointly by innovation attributes, perceived risks, and brand associations. Although previous researchers have suggested that attitude is not meaningful (Hong *et al.*, 2001) in affecting intention, results of this study suggest that attitude should continue to be incorporated in m-commerce research.

Third, this study links perceived risk and brand association (brand awareness and brand image), the interaction between these constructs based on sample subgrouping is of relevant interest. While infrequent users are concerned more in almost all risk sub-dimensions, frequent users are less concerned with the effects of both brand awareness and brand image to both attitudes towards MBSs and intention to use MBSs. This finding suggests frequent users more heavily stress the brand awareness and brand image of MBS providers; meanwhile, they may link good reputation as good risk aversion for MBS providers. Whereas, infrequent users focus more on specific risk sub-dimensions than frequent users to supplement their lack of trust in brand awareness and brand image. Therefore, we believe that consumers spend more time on web sites owned by favored organizations than on those of non-favored ones. Finally, m-commerce heavily prioritizes brand awareness and brand image to distinguish itself from other MBS providers.

Finally, as for the perceived-risk components, frequent users are more concerned with psychological risk, than with financial risk and privacy risk; time and performance risk are relatively less important risks. While perceived risk has negative and significant effects on attitude and intention, using MBSs makes frequent users feel more anxious, uncomfortable, and nervous; in addition, the attitude of frequent users' towards using MBSs and intention to use MBSs diminishes as well. Besides psychological risk, frequent users are highly concerned with compromised accounts, financial damage, and invasion of personal data.

However, infrequent users are most concerned with financial risk and psychological risk, and are relatively unconcerned with time risk. Moreover, while the effects of perceived risk on attitude and intention are negative significant, using MBSs makes frequent users feel anxious, uncomfortable, and nervous; thus, their attitudes towards using MBSs and intention to use MBSs diminish. Particularly when MBS users are aware of compromised accounts, financial damage, and personal data privacy uncertainty, user-perceived risk increase. Consequently, financial risk negatively and significantly affects the attitudes of infrequent users towards MBSs, as well as their intention to use MBSs.

Therefore, risk assurance differs among different behavioral segments. When the marketing target is frequent users, bankers should eliminate their psychological risk associated with MBSs, and decrease both psychological and financial risks to acquire infrequent users.

6. Conclusions

While MBSs are characterized by their convenience and mobility, this study starts from the diffusion pattern of MBSs, incorporating the top issues of risk perception, brand awareness, brand image and their relationships to attitudes and intention. In contrast to previous studies, this study first subgroups the sample population based on their behavioral characteristics: usage frequency. Since respondents in the frequent user group represent relatively active MBS users, this study focusses on these subjects. Notably, the infrequent-MBS users with frequent MBS users are divided into subgroups and compared because individuals who seldom or never experience a technology-based innovation can only evaluate the technology-based service based on either expectations (Liao and Cheung, 2002) or limited vicarious experience.

Given the significant mobile-phone market penetration and optimally designed marketing tactics of MBS providers, exposure to mobile technology will likely facilitate the adoption of related services (Khalifa and Cheng, 2002). However, future research should examine exactly how financial services providers disseminate information about new services, and how they allocate resources to train sales personnel or to advertising campaigns affect customer segments (i.e. frequent/infrequent users) differently. The communication style of a bank should be compatible with the MBS styles of potential users. Disseminating information via the most appropriate channel and using the best communication mode for different consumer groups will likely increase the probability of each segment adopting technological innovations.

This study examines mobile banking only in Taiwan, which focusses only on consumers and on a specific, limited number of adopter attributes. These practices prevent us from generalizing the findings of this study. Analytical results predict the future usage of MBSs after asking customers about their intentions to use MBSs. Thus, intention is assumed here to be a definite indicator of actual consumer behavior.

Despite the bright future of mobile banking, issues such as perceived risk and brand issue warrant further study, an area of research already underway in our laboratory.

References

Aaker, D.A. (1996), "Measuring brand equity across products and markets", *California Management Review*, Vol. 38 No. 3, pp. 102-120.

Agarwal, R. and Prasad, J. (1998), "A conceptual and operational definition of personal innovativeness in the domain of information technology", *Information Systems Research*, Vol. 9 No. 2, pp. 204-215.

Ajzen, I. (1985), "From intentions to actions: a theory of planned behavior", in Kuhl, J. and Beckman, J. (Eds), *Action-Control: From Cognition to Behavior*, Springer, Heidelberg, pp. 11-39.

Ajzen, I. and Fishbein, M. (1980), *Understanding, Attitudes and Predicting Social Behavior*, Prentice Hall, Englewood Cliffs, NJ.

Al-Jabri, I.M. and Sohail, M.S. (2012), "Mobile banking adoption: application of diffusion of innovation theory", *Journal of Electronic Commerce Research*, Vol. 13 No. 4, pp. 379-391.

Anderson, J. (1987), "An approach for confirmatory measurement and structural equation modeling of organizational properties", *Management Science*, Vol. 33 No. 4, pp. 525-541.

Au, Y.A. and Kauffman, R.J. (2008), "The economics of mobile payments: understanding stakeholder issues for an emerging financial technology application", *Electronic Commerce Research and Applications*, Vol. 7 No. 2, pp. 141-164.

Bagozzi, R. and Phillips, L. (1982), "Representing and testing organizational theories: a holistic construal", *Administrative Science Quarterly*, Vol. 27 No. 3, pp. 459-489.

Bagozzi, R.P. and Yi, Y. (1988), "On the evaluation of structural equation models", *Journal of the Academy of Marketing Science*, Vol. 16 No. 1, pp. 74-94.

Biel, A.L. (1992), "How brand image drives brand equity", *Journal of Advertising*, Vol. 32 No. 6, pp. 6-12.

Bogart, L. and Lehman, C. (1973), "What makes a brand name familiar?", *Journal of Marketing Research*, Vol. 10 No. 1, pp. 17-22.

Brown, I., Cajee, Z., Davies, D. and Stroebel, S. (2003), "Cell phone banking: predictors of adoption in South Africa – an exploratory study", *International Journal of Information Management*, Vol. 23 No. 5, pp. 381-394.

Chaudhuri, A. and Morris, B.H. (2001), "The chain of effects from brand trust and brand affect to brand performance: the role of brand loyalty", *Journal of Marketing*, Vol. 65 No. 2, pp. 83-93.

Chen, L. (2008), "A model of consumer acceptance of mobile payment", *International Journal of Mobile Communications*, Vol. 6 No. 1, pp. 32-52.

Chen, L., Gillenson, M. and Sherrell, D. (2004), "Consumer acceptance of virtual stores: a theoretical model and critical success factors for virtual stores", *ACM SIGMIS Database*, Vol. 35 No. 2, pp. 8-31.

Cheung, W., Chang, M.K. and Lai, V.S. (2000), "Prediction of internet and world wide web usage at work: a test of an extended Triandis model", *Decision Support Systems*, Vol. 30 No. 1, pp. 83-100.

Christodoulides, G. and de Chernatony, L. (2004), "Dimensionalising on-and offline brand's composite equity", *The Journal of Product and Brand Management*, Vol. 13 No. 3, pp. 168-179.

Corradi, A., Montanari, R. and Stefanelli, C. (2001), "Security of mobile agents on the internet", *Internet Research: Electronic Networking Applications and Policy*, Vol. 11 No. 1, pp. 84-95.

ComScore Inc (2012), "2011 state of online and mobile banking", available at: www.comscore.com/ (accessed June 2012).

Cruz, P. and Laukkanen, T. (2010), "Mobile banking rollout in emerging markets: evidence from Brazil", *International Journal of Bank Marketing*, Vol. 28 No. 5, pp. 342-371.

Da Silva, R.V. and Alwi, S.F.A. (2006), "Cognitive, affective attributes and cognitive behavioral responses in retail corporate branding", *Journal of Product and Brand Management*, Vol. 15 No. 5, pp. 293-305.

Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-339.

Doney, P.M. and Cannon, J.P. (1997), "An examination of the nature of trust in buyer-seller relationships", *Journal of Marketing*, Vol. 61 No. 2, pp. 35-51.

Featherman, M.S. and Pavlou, P.A. (2003), "Predicting e-services adoption: a perceived risk facets perspective", *International Journal of Human-Computer Studies*, Vol. 59 No. 4, pp. 451-474.

Fornell, C. and Lacrker, D.F. (1981), "Evaluating structural equation models with unobservable and measurement errors", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

FRB (2012), "Current use of mobile banking and payments", available at: www.federalreserve.gov/econresdata/mobile-devices/2012-current-use-mobile-banking-payments.htm (accessed January 28, 2013).

Gardner, C. and Amoroso, D.L. (2004), "Development of an instrument to measure the acceptance of Internet technology by consumers", paper presented at the Proceedings of the 37th Hawaii International Conference on System Sciences.

Gartner (2012), "Gartner identifies the top 10 strategic technologies for 2012", available at: www.gartner.com/newsroom/id/1826214 (accessed January 28, 2013).

Gewald, H., Wullenweber, K. and Weitzel, T. (2006), "The diffusion of internet banking among Singapore consumers", *Journal of Electronic Commerce Research*, Vol. 7 No. 2, pp. 78-96.

Gilbert, L. and Han, H. (2005), "Understanding mobile data services adoption: demography, attitudes or needs?", *Technological Forecasting and Social Change*, Vol. 72, pp. 327-337.

Goldsmith, R. (2000), "Characteristics of the heavy user of fashionable clothing", *Journal of Marketing Theory and Practice*, Vol. 8 No. 4, p. 21.

Goldsmith, R. and d'Hauteville, F. (1998), "Heavy wine consumption: Empirical and theoretical perspectives", *British Food Journal*, Vol. 100 No. 4, pp. 184-190.

Goldsmith, R. and Litvin, S. (1999), "Heavy users of travel agents: a segmentation analysis of vacation travelers", *Journal of Travel Research*, Vol. 38 No. 2, pp. 127-133.

Gravetter, F.J. and Wallnau, L.B. (2000), *Statistics for the Behavioral Sciences*, 5th ed., Wadsworth, Belmont, CA.

Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (1998), *Multivariate Data Analysis*, 5th ed., Prentice Hall International Inc, Upper Saddle River, NJ.

Hair, J.F. Jr, Black, W.C., Babin, B.J. and Anderson, R.E. (2010), *Multivariate Data Analysis: A Global Perspective*, 7th ed., Pearson Prentice Hall, Upper Saddle River, NJ.

Hernan, E., Riquelme and Rosa, E.R. (2010), "The moderating effect of gender in the adoption of mobile banking", *The International Journal of Bank Marketing*, Vol. 28 No. 5, pp. 328-341.

Hong, W., Thong, J.Y.L., Wong, W.M. and Tam, K.Y. (2001), "Determinants of user acceptance of digital libraries: an empirical examination of individual differences and system characteristics", *Journal of Management Information Systems*, Vol. 18 No. 3, pp. 97-124.

Hoyle, R.H. and Panter, A.T. (1995), "Writing about structural equation models", in Hoyle, R.H. (Ed.), *Structural Equation Modeling, Concepts, Issues, and Applications*, Sage, Thousand Oaks, CA, pp. 158-176.

Hu, L.T. and Bentler, P.M. (1995), "Evaluating model fit", in Hoyle, R.H. (Ed.), *Structural Equation Modeling: Concepts, Issues, and Applications*, Sage, Thousand Oaks, CA, pp. 76-99.

Hu, L.T. and Bentler, P.M. (1999), "Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives", *Structural Equation Modeling*, Vol. 6 No. 1, pp. 1-55.

IPSOS (2012), "Mobile internet and smartphone adoption statistics", available at: www.digitimes.com.tw/tw/dt/n/shwnws.asp?CnlID=10andCat=35andCat1=andid=310528 (accessed January 28, 2013).

Jahangir, N. and Begum, N. (2008), "The role of perceived usefulness, perceived ease of use, security and privacy, and customer attitude to engender customer adaptation in the context of electronic banking", *African Journal of Business Management*, Vol. 2 No. 1, pp. 32-40.

Joreskog, K. and Sorborn, D. (1989), *LISREL 7: User's Reference Guide*, Scientific Software, Mooresville, IN.

Joreskog, K. and Sorborn, D. (1993), *LISREL 8: Manual*, Scientific Software, Mooresville, IN.

Karayanni, D.A. (2003), "Web-shoppers and non-shoppers: compatibility, relative advantage and demographics", *European Business Review*, Vol. 15 No. 3, pp. 141-152.

Keller, K.L. (1993), "Conceptualizing, measuring, and managing customer-based brand equity", *Journal of Marketing*, Vol. 57 No. 1, pp. 1-22.

Khalifa, M. and Cheng, S.K.N. (2002), "Adoption of mobile commerce: role of exposure", paper presented at the 35th Hawaii International Conference on System Sciences, IEEE Computer Society, pp. 46-52.

Kim, B.G. and Lee, S. (2008), "Factors affecting the implementation of electronic data interchange in Korea", *Computers in Human Behavior*, Vol. 24 No. 2, pp. 263-283.

Koenig-Lewis, N., Palmer, A. and Moll, A. (2010), "Predicting young consumers' take up of mobile banking services", *International Journal of Bank Marketing*, Vol. 28 No. 5, pp. 410-432.

Kolodinsky, J.M., Hogarth, J.M. and Hilgert, M.A. (2004), "The adoption of electronic banking technologies by US consumers", *International Journal of Bank Marketing*, Vol. 22 No. 4, pp. 238-259.

Kotabe, M. and Helsen, K. (2000), *Global Marketing Management*, 2nd ed., John Wiley and Sons, New York, NY.

Kotler, P. (2000), *Marketing Management: Analysis, Planning, Implementation and Control*, Millennium ed., International Series in Marketing, Prentice Hall, Englewood Cliffs, NJ.

Laudon, K.C. and Traver, C.G. (2004), *E-commerce: Business, Technology, Society*, Addison-Wesley, New York, NY.

Lee, K.S., Lee, H.S. and Kim, S.Y. (2007), "Factors Influencing the Adoption Behavior of Mobile Banking: A South Korean perspective", *Journal of Internet Banking and Commerce*, Vol. 12 No. 2, available at: www.arraydev.com/commerce/jibc/2007-08/HyungSeokLee_Final_PDF%20Ready.pdf (accessed January 20, 2013).

Lee, M., McGoldrick, P., Keeling, K. and Doherty, J. (2003), "Using ZMET to explore barriers to the adoption of 3G mobile banking services", *International Journal of Retail and Distribution Management*, Vol. 31 No. 6, pp. 340-348.

Leung and Albert, C.K. (2003), "Providing navigation aids and online learning helps support user control: a conceptual model on computer-based learning", *Journal of Computer Information Systems*, Vol. 43 No. 3, pp. 10-16.

Li, T. and Calantone, R.J. (1998), "The impact of market knowledge competence on new product advantage: conceptualization and empirical examination", *Journal of Marketing*, Vol. 62 No. 4, pp. 13-29.

Liao, Z. and Cheung, M.T. (2002), "Internet-based e-banking and consumer attitudes: an empirical study", *Information and Management*, Vol. 39 No. 4, pp. 283-295.

Liisa, K. (2010), "Alternatives for banks to offer secure mobile payments", *International Journal of Bank Marketing*, Vol. 28 No. 5, pp. 433-444.

Lin, H. (2011), "An empirical investigation of mobile banking adoption: the effect of innovation attributes and knowledge-based trust", *International Journal of Information Management*, Vol. 31 No. 3, pp. 252-260.

Lin, M.-J.J., Hung, S.-W. and Chen, C.-J. (2009), "Fostering the determinants of knowledge sharing in professional virtual communities", *Computers in Human Behavior*, Vol. 25 No. 4, pp. 929-939.

Littler, D. and Melanthiou, D. (2006), "Consumer perceptions of risk and uncertainty and the implications for behaviour towards innovative retail services: the case of internet banking", *Journal of Retailing Consumer Service*, Vol. 13 No. 6, pp. 431-443.

Lu, J. and Yu, C.S. (2006), "Gender and age differences in individual decisions about wireless mobile data services: a report from China", paper presented at the Helsinki Mobility Roundtable, Helsinki.

Lu, J., Chun-Sheng, Chang, L. and Yao, J.E. (2003), "Technology acceptance model of wireless Internet", *Internet Research: Electronic Networks Application and Policy*, Vol. 13 No. 3, pp. 206-222.

Luarn, P. and Lin, H.-H. (2005), "Toward an understanding of the behavioral intention to use mobile banking", *Computers in Human Behavior*, Vol. 21 No. 6, pp. 873-891.

McCloskey, D.W. (2006), "The importance of ease of use, usefulness, and trust to online consumers: an examination of the technology acceptance model with older consumers", *Journal of Organizational and End User Computing*, Vol. 18 No. 3, pp. 47-65.

McDonald, R.P. and Ho, M.R. (2002), "Principles and practice in reporting structural equation analyses", *Psychological Methods*, Vol. 7 No. 1, pp. 64-82.

Mardia, K.V. (1985), "Mardia's test of multinormality", in Kotz, S. and Johnson, N.L. (Eds), *Encyclopedia of Statistical Science*, Vol. 5, Wiley, New York, NY, pp. 217-221.

Mohr, J.J. (2001), *Marketing of High-Technology Products and Innovations*, Prentice Hall, Upper Saddle River, NJ.

Moore, G.C. and Benbasat, I. (1991), "Development of an instrument to measure the perceptions of adopting an information technology innovation", *Information Systems Research*, Vol. 2 No. 3, pp. 192-222.

Moore, J.F. and Steve, B. (2000), "Brands without boundaries", *European Journal of Marketing*, Vol. 34 No. 8, pp. 919-937.

Ndubisi, N.O. and Sinti, Q. (2006), "Consumer attitudes, system's characteristics and internet banking adoption in Malaysia", *Management Research News*, Vol. 29 Nos 1/2, pp. 16-27.

Ondrus, J. and Pigneur, Y. (2006), "Towards a holistic analysis of mobile payments: a multiple perspectives approach", *Electronic Commerce Research and Applications*, Vol. 5 No. 3, pp. 246-257.

Pedhazur, E.J. and Schmelkin, L.P. (1991), *Measurement, Design, and Analysis: An Integrated Approach*, Lawrence Erlbaum Associates, Hillsdale, NJ.

Perfetto, R. and Woodside, A.G. (2009), "Extremely frequent behaviour in consumer research: theory and empirical evidence for chronic casino gambling", *Journal of Gambling Studies*, Vol. 25 No. 3, pp. 297-316.

Poon, W.C. (2008), "Users' adoption of e-banking services: the Malaysian perspective", *Journal of Business and Industrial Marketing*, Vol. 23 No. 1, pp. 59-69.

Puschel, J. and Mazzon, J.A. (2010), "Mobile banking: proposition of an integrated adoption intention framework", *International Journal of Bank Marketing*, Vol. 28 No. 5, pp. 389-409.

Rao, S. and Troshani, I. (2007), "A conceptual framework and propositions for the acceptance of mobile services", *Journal of Theoretical and Applied Electronic Commerce Research*, Vol. 2 No. 2, pp. 61-73.

Ravi, P., Pascale, G.Q. and Ray, W.C. (2005), "Consumer-based brand equity: improving the measurement-empirical evidence", *Journal of Product and Brand Management*, Vol. 14 No. 3, pp. 143-154.

Rogers, E.M. (1962), *Diffusion of Innovations*, Free Press, New York, NY.

Rogers, E.M. (1983), *Diffusions of Innovations*, 3rd ed., Free Press, New York, NY.

Rogers, E.M. (1995), *Diffusion of Innovation*, 4th ed., Free Press, New York, NY.

Rogers, E.M. (2003), *Diffusion of Innovations*, Free Press, New York, NY.

Ruyter, K.D., Wetzels, M. and Kleijnen, M. (2001), "Customer adoption of e-service: an experimental study", *International Journal of Service Industry Management*, Vol. 12 No. 2, pp. 184-207.

Sanayei, A., Shaemi, A. and Jamshidi, H. (2011), "An analysis of the factors affecting customers satisfaction and trust in mobile banking (Case Study: Branches of Bank Mellat in Isfahan)", *Interdisciplinary Journal of Contemporary Research in Business*, Vol. 3 No. 7, pp. 440-452.

Sevier, R.A. (2001), "Brand as relevance", *Journal of marketing Higher Education*, Vol. 10 No. 3, pp. 77-97.

Shankar, V., Rangaswamy, A. and Pusater, M. (1998), "The impact of Internet marketing on price sensitivity and price competition", *Proceedings of the Marketing Science Internet Conference, MIT, Boston, MA*.

Shwu-Lng, W. and Chen-Lien, L. (2009), "The influence of core brand attitude and core-brand perception on purchase intention towards extended product", *Journal of Marketing Logistics*, Vol. 21 No. 1, pp. 174-194.

Sichtmann, C. (2007), "An analysis of antecedents and consequences of trust in a corporate brand", *European Journal of Marketing*, Vol. 41 No. 9, pp. 999-1015.

Singh, S., Srivastava, V. and Srivastava, R.K. (2010), "Customer acceptance of mobile banking: a conceptual framework", *SIES Journal of Management*, Vol. 7 No. 1, pp. 55-64.

Sinha, I. (2000), "Cost transparency: the net's real threat to price and brands", *Harvard Business Review*, Vol. 78 No. 2, pp. 43-50.

Smith, M.D., Bailey, J. and Brynjolfsson, E. (1999), "Understanding digital markets: review and assessment", in Brynfolfsson, E. and Kahin, B. (Eds), *Understanding the Digital Economy*, MIT Press, Cambridge, MA.

Sylvie, L. and Xiaoyan, L. (2005), "Consumers' attitudes towards online and mobile banking in China", *International Journal of Bank Marketing*, Vol. 23 No. 5, pp. 362-380.

Spotts, D. and Mahoney, E. (1991), "Segmenting visitors to a destination region based on volume of their expenditures", *Journal of Travel Research*, Vol. 29 No. 4, pp. 24-31.

Tabachnick, B.G. and Fidell, L.S. (2007), *Using Multivariate Statistics*, 5th ed., Allyn and Bacon, Boston, MA.

Tan, M. and Teo, T.S.H. (2000), "Factors influencing the adoption of internet banking", *Journal of the Association for Information Systems*, Vol. 1 No. 5, pp. 1-44.

Twedt, D.W. (1964), "How important is the 'heavy-user'?", *Journal of Marketing*, Vol. 28 No. 1, pp. 71-72.

Vahie, A. and Paswan, A. (2006), "Private label brand image: its relationship with store image and national brand", *International Journal of Retail and Distribution Management*, Vol. 34 No. 1, pp. 67-84.

Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003), "User acceptance of information technology: Toward a unified view", *MIS Quarterly*, Vol. 27 No. 3, pp. 425-478.

Wang, Y.-S., Wang, Y.-M., Lin, H.-H. and Tang, T.-I. (2003), "Determinants of user acceptance of Internet banking: an empirical study", *International Journal of Service Industry Management*, Vol. 14 No. 5, pp. 501-519.

Wong, Y.H. and Merrilees, B. (1998), "Multiple roles for branding in international marketing", *International Marketing Review*, Vol. 3 Nos 1-2, pp. 384-401.

Woodside, A., Cook, V. and Mindak, W. (1987), "Profiling the heavy travel segment", *Journal of Travel Research*, Vol. 25 No. 4, pp. 9-14.

Wu, J.H. and Wang, S.C. (2005), "What drives mobile commerce? An empirical evaluation of the revised technology acceptance model", *Information and Management*, Vol. 42 No. 5, pp. 719-723.

Xie, B., Lin, Y. and Guo, X. (2009), "A study on adoption factors of mobile banking services", *Nankai Business Review*, Vol. 12 No. 3, pp. 12-19.

Zhao, A.L., Hanmer-Lloyd, S., Ward, P. and Goode, M.M.H. (2008), "Perceived risk and Chinese consumers' Internet banking services adoption", *International Journal of Bank Marketing*, Vol. 26 No. 7, pp. 505-525.

Zitter, I., Kinkhorst, G., Simons, R.-J. and Cate, O.T. (2009), "In search of common ground: a task conceptualization to facilitate the design of (e)learning environments with design patterns", *Computers in Human Behavior*, Vol. 25 No. 5, pp. 999-1009.

Further reading

Al Kailani, M. and Kumar, R. (2011), "Investigating uncertainty avoidance and perceived risk for impacting Internet buying: a study in three national cultures", *International Journal of Business and Management*, Vol. 6 No. 5, pp. 76-92.

Keen, P. and Macintosh, R. (2001), *The Freedom Economy – Gaining the M-commerce Edge in the Era of the Wireless Internet*, McGraw-Hill, Berkeley, CA.

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13. Hossein Mohammadi. 2015. A study of mobile banking loyalty in Iran. *Computers in Human Behavior* **44**, 35-47. [Crossref]