Assessing user experiences and usage intentions of m-banking service

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Abstract: M-banking is a channel through which banks interact with customers via mobile devices. M-banking is an emerging mobile commerce application. It is a challenging task for banks to encourage customers to continue using m-banking services, and attract new customers to the service. This study clarifies the differences in the thinking paths of users of m-banking services, and consumers who have not yet used m-banking services, in terms of their involvement. We prove that consumers equipped with more product knowledge tend to pay more attention to the information in relation to product attributes, rather than the peripheral information, which does not consider the advantages and disadvantages of products. These findings can serve as reference for banks in the formulation of different marketing strategies and promotional campaigns targeted at both existing users and consumers who have not adopted m-banking services.

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1   Introduction

Past research has indicated that the characteristics of non-geographical constraints, convenience and the interactivity of m-banking have drawn the attention of the banking industry and consumers. However, the demand from customers for such innovative services has not increased along with the rapid pace of technological advancements, which implies that it is a challenging task for banks to encourage customers to continue using m-banking services, and attract new customers to the service. Scholars also provide relevant information to help business managers, particularly those without an IT background, to understand the key elements and basic concepts of m-commerce (Hsieh et al., 2008).

With the increase of mobile users, the utilisation of mobile internet services has witnessed a dramatic growth over recent years. Mobile internet services include mobile commerce, such as mobile communications, mobile contents, entertainment services, and transactions, via mobile platforms (Hsu et al., 2007; Shim et al., 2008). Among the large variety of mobile internet terminals, e.g., PDAs, tablet computers, pocket computer, and palmtops, cellular phones are the mostly widely used tool for mobile services (Wang et al., 2006). In keeping with this trend, the banking industry has introduced an m-banking system.

M-banking is a channel through which banks interact with customers via mobile devices (Scornavacca and Barnes, 2004; Barnes and Corbitt, 2003). It is an emerging mobile commerce application (Kim et al., 2009). The characteristics of m-banking, namely, non-geographical constraints, convenience, and interactivity of m-banking, have drawn the attention of the banking industry and consumers (Gu et al., 2009). However, the demand from customers for such innovative services has not increased along with the rapid pace of technological advancements (Constantiou et al., 2006; Wei et al., 2009b), which implies that it is a challenging task for banks to encourage customers to continue using m-banking services, and attract new customers to the service (Devaraj et al., 2002; Gefen et al., 2003; Wei et al., 2009a; Gu et al., 2009). However, banks should also understand the factors that are conducive in promoting the use of m-banking services in order to formulate strategic initiatives accordingly. Studies also indicate that ease-of-use can facilitate financial transactions between banks and customers (Kleijnen et al., 2004; Mattila, 2003; Tucker, 2008). In other words, the promotion of m-banking services will benefit from innovation and growth in banking services. Laukkanen (2007) indicated that the main reasons for willingness to use m-banking services include convenience, no geographical constraints, no business hour constraints, privacy, and savings of time and energy.

Among studies on consumer acceptance of new information technological products, Constantiou (2009) suggested that most research applies Technology Acceptance Models (TAM) (Davis, 1989). The approach of TAM is to predict attitudes and behaviours of mobile service users through Perceived Ease of Use (PEOU), and Perceived Usefulness (PU). Many previous studies applied TAM to explain the acceptance of new IT products, and proved that perceived usefulness, trust, and perceived ease-of-use are the key factors for the acceptance of m-banking services (Gu et al., 2009; Agarwal and Karahanna, 2000; Doll et al., 1998; Hendrickson et al., 1993; Segars and Grover, 1993; Adams et al., 1992; Mathieson, 1991; Davis, 1989; Davis et al., 1989). The above researches explore two main issues: extrinsic factors that are important intervening variables for usage intentions (Davis et al., 1992; Straub, 1995; Venkatesh and Davis, 2000); and behaviour intentions, that are key determining variables (Wang and Benbasat, 2005; Pavlou, 2003; Gefen et al., 2003; Gefen, 2000, 2003; Suh and Han, 2002; Moon and Kim, 2001; Teo and Lim, 1999). However, these studies fail to determine any variances between influencing paths of usage intention between the existing users of m-banking services, and those consumers who are not using m-banking services. This paper applies the Elaboration Likelihood Model (ELM) developed by Petty and Cacioppo (1984) and divides the research objectives into existing users of m-banking services and consumers who have not used m-banking services. It is initially presumed that the influencing paths of these two groups are different regarding usage intentions for m-banking services.

The personal traits of consumers have an influence on the adoption of innovative products or services (e.g., Dabholkar, 1996; Dabholkar and Bagozzi, 2002; Kleijnen et al., 2004) and different bank customers do indeed have different reasons for resisting mobile banking (Laukkanen et al., 2008). The Technology Readiness Index (TRI) indicates the level of tendency to adopt and accept technologies at work or in life (Colby and Parasuraman, 2003), which are key factors for the adoption of innovative products and services. This paper suggests that the application of TRI to measure the level of consumers tendencies in technological adoption, acceptance, and usage intentions of m-banking services (i.e., the level of care for the product) (Zaichkowsky, 1985; Warrington and Shim, 2000; Varki and Wong, 2003; Khalifa and Shen 2008) cannot

differentiate the variances of the influence paths between existing users and prospective customers, since the analysis is not performed based on a rational analysis by consumers toward product characteristics.

Therefore, this paper applies the theoretic foundations of ELM, by assuming that existing users of m-banking services adopt a central-route thinking path, whereas the prospective consumers adopt a peripheral-route thinking path. Consumers who adopt a central-route thinking path form their opinions based on product characteristics. Therefore, the influence of their assessments of m-banking services on the levels of involvement will be greater than the influence of their perceived TRI levels. This is why product assessments and involvement levels are more suitable to explain influence paths regarding usage intentions of m-banking services. In contrast, the influence path for consumers who have not used m-banking services should be analysed with TRI and involvement levels.

In short, the purpose of this study is to clarify the variances of influence paths of existing users and prospective customers of m-banking services regarding the influence of TRI and perceived product characteristics on involvement levels and usage intentions. This paper makes two major contributions. First, it clarifies the differences in thinking paths of users of m-banking services and consumers who have not yet used m-banking services, in terms of their involvement. The research findings can serve as reference for banks in the formulation of different marketing strategies and promotional campaigns targeted at both existing users and consumers who have not adopted m-banking services.

The remainder of this paper is organised as follows. We firstly examine the product characteristics, technology readiness, involvements and usage intentions as constructs discussed in past studies. The following section explains research designs and methods, including sampling design, data collection, measurement development, and data analysis models. Section 4 presents the results of data analysis, such as validity, reliability analysis, interactions between individual variables, and the results of hypothesis tests. Based on the results of an empirical test, we provide an analysis of management implications, from both theoretic and practical aspects. The research limitations and future research suggestions are given in the last section.

2   Literature review

This paper applies the ELM developed by Petty and Cacioppo (1984), and divides the research objectives into the users of m-banking services and consumers who have not used m-banking services. It is initially presumed that the main thinking paths of these two groups are different regarding usage intentions for m-banking services. Two different paths determine the attitudes of consumers, and these two paths are a central route and a peripheral route. The thinking pattern of these paths determines the level of involvement by consumers; that is, how much they care about the products (Zaichkowsky, 1985; Warrington and Shim, 2000; Varki and Wong, 2003). Davis et al. (1989) suggested that highly involved consumers are more likely to be pleased by product functionality, and this results in high satisfaction and low uncertainties for the consumers. Therefore, the higher the product involvement, the stronger is the intention to use this particular technology. The research hypotheses are proposed as follows:

H_1: Involvement levels have direct and positive influence on usage intention.

H_{1-1}: Involvement levels of the consumers who have not used the product have direct and positive influence on usage intention.

H_{1-2}: Involvement levels of the consumers who have used the product have direct and positive influence on usage intention.

The consumers who follow the central route are likely to be influenced by product characteristics. They process product information in a rational and objective manner in order to determine their level of involvement. However, the consumers who adopt a peripheral route tend to be influenced by peripheral cues or subjective emotions in their decisions and judgements for the level of their involvement. As users would have more knowledge about products than non-users, users adopt the central route as their thinking path. Sujan (1985) argued that this is mainly because consumers with more product knowledge can make more assessments and think through the issues surrounding product characteristics. Therefore, this paper suggests that consumers who have not used m-banking services have a tendency for emotional processing. In other words, their attitude towards the products does not stem from real information regarding product characteristics. Rather, these consumers determine their involvement with a product based on personal feelings and perceptions and, hence, their usage intention for m-banking services. In contrast, the consumers who have already used m-banking services determine their involvement with the product based on the pros and cons of product characteristics and, hence, their usage intention for m-banking services. Presented below is an explanation of the formation of these two routes, and the process of the hypothesis establishment.

2.1 Peripheral route

When consumers are not overly concerned with relevant product information but are subject to the influence of other incentives, their attitude toward products does not stem from the actual information regarding the pros and cons of product attributes. Rather, these consumers tend to follow emotions, and think in peripheral routes (Petty et al., 1983). Consumers make simple inferences and judgements based on scenario factors, which are also known as peripheral cues or extrinsic cues (Petty et al., 1983; Petty and Cacioppo, 1984; Andrews and Shimp, 1990; Petty et al., 1993).

Parasuraman (2000) defined TRI as "the acceptance and adoption of new technologies to complete daily life tasks or achieve work targets". Colby and Parasuraman (2003) further indicated that TRI may serve as a predicator of levels of technological adoption and utilisation. This construct may be considered as a holistic psychological status. It can be viewed as a tendency for new technology adoption by individuals and is jointly determined by psychological enablers and inhibitors. Technological readiness includes optimism, innovativeness, discomfort, and insecurity as its four parameters. Optimism refers to positive feelings consumers have regarding technologies, and the belief that technologies can enhance control, flexibility, and efficiency in daily life. Innovativeness refers to the tendency of consumers to become technology pioneers or opinion leaders. Discomfort refers to the awareness by consumers that technologies cannot be controlled, and the sense of being overwhelmed by technologies. Finally, insecurity refers to the disbelief of consumers in technologies,

and the question by consumers whether technologies can actually work. Among the four constructs, optimism and innovativeness can be classified as the enablers of TRI. They can also be regarded as the positive feelings consumers have about technologies. In contrast, discomforts and insecurity belong to the inhibitors of TRI. They can also be seen as the negative feelings consumers have about technologies.

According to the above definitions, if TRI is used as the antecedent variable that influences involvement levels and usage intention, it is the measure the influence of the consumers on a peripheral route. At this point, both users with strong product knowledge and non-users with weak product knowledge can be influenced in terms of their involvement levels and usage intentions on the peripheral route. Therefore, this paper suggests that the higher the TRI, the more is the involvement with m-banking services. In addition, a high TRI has an indirect impact on consumers' usage intentions. The research hypotheses are proposed as follows:

> H_2: *TRI has direct and positive influence on the level of involvement. It also has direct and positive influence on usage intention.*

> H_{2-1}: *The TRI of non-users has direct and positive influence on the level of involvement. It also has indirect and positive influence on usage intention.*

> H_{2-2}: *The TRI of users has direct and positive influence on the level of involvement. It also has indirect and positive influence on usage intention.*

However, in terms of the characteristics of users as individuals, their considerations of the pros and cons of product attributes is a major factor influencing their perceptions. For consumers with strong product knowledge, the influence of the central route may be greater than that of a peripheral route. The following is an explanation of flows and how the central route influences involvement levels and usage intention of users, and their relevant theoretic contents.

2.2 *Central route*

The so-called central route is the process of understanding, learning, and evaluating all relevant information about the underlying subjects. The processing of information is rational and objective, and cognitive efforts are required to focus on information contents. At this point, the assessment of products, by consumers, mainly comes from the results of in-depth thoughts and cognitive processing. Consumers form their attitudes based on conclusions, e.g., the pros and cons of product characteristics. If the information content is highly persuasive, consumers form positive attitudes, and if not, they establish negative attitudes. Therefore, information contents are also known as central or intrinsic cues (Petty et al., 1983; Petty and Cacioppo, 1984; Andrews and Shimp, 1990; Petty et al., 1993). This paper suggests that consumers who have used m-banking services possess strong knowledge about product characteristics. Therefore, it is easier for them to consider the pros and cons of products in a rational and objective manner (Petty and Cacioppo, 1984; Dotson and Hyatt, 2000), i.e., to think through issues on a central route. When consumers assess product attributes, strengths, and weaknesses rationally and in-detail, the process requires in-depth thinking and cognitive processing. This is how evaluation of products occurs on a central route. Product assessment is performed with rational thinking regarding product attributes, pros, and cons.

M-banking services allow customers to complete transactions themselves, without a technological interface, which requires the participation of service personnel (Meuter et al., 2000). Therefore, m-banking services are a kind of self-help service technology, which saves time and costs for customers, and allows greater control in the service delivery process. In addition, they reduce waiting time, allow for convenience in service locations, create fun with information technologies, generate efficiency and flexibility, and eliminate the need to deal with service personnel (Kauffman and Lally, 1994; Dabholkar, 1996; Meuter et al., 2000; Curran et al., 2003). Zhu et al. (2002) proposed seven factors for customers to measure the use of self-service technologies: ease-of-use, time saving, convenience, privacy, correctness, multi-functions, and the desire to use advanced technologies. Meanwhile, Curran and Meuter (2005) suggested that innovational characteristics and individual variances are the main factors that determine whether customers use self-service technologies. Laukkanen (2007) indicated that the main reasons for willingness to use m-banking services include convenience, accessibility anytime and anywhere, privacy, time and energy saving, ease-of-use, and assistance to customers for managing their accounts (Laukkanen and Lauronen, 2005). It also increases the number of transactions and enhances the ease of transactions for customers (Mattila, 2003; Kleijnen et al., 2004; Luarn and Lin, 2005). The above summary shows that m-banking services may be entertaining, easy to use, convenient, cost competitive, suitable, and secure. An assessment of the product's advantages and disadvantages may have a direct impact on the overall evaluation of consumers on m-banking, and the bricks-and-mortars of banking branches. The research hypotheses are proposed as follows:

H_3: *Product characteristics of m-banking services have a positive influence on product assessment.*

H_{3-1}: *The entertainment of m-banking services has a positive influence on product assessment.*

H_{3-2}: *The ease of use of m-banking services has a positive influence on product assessment.*

H_{3-3}: *The convenience of m-banking services has a positive influence on product assessment.*

H_{3-4}: *The cost of m-banking services has a positive influence on product assessment.*

H_{3-5}: *The suitability of m-banking services has a positive influence on product assessment.*

H_{3-6}: *The security of m-banking services has a positive influence on product assessment.*

In summary, this paper suggests that the higher the product assessment consumers made on m-banking services, the more involved they are with the services. Such an assessment has indirect and positive influence on usage intention as consumers evaluate, in a rational manner and on a central route thinking path, the characteristics, pros, and cons of products. Therefore, the influence of product assessment on m-banking services, with regard to involvement levels, is greater than the direct and positive influence of TRI on involvement levels. This argument will prove that consumers with strong product knowledge adopt the central route as their thinking path.

H$_4$: Product assessment of users exhibits direct and positive influence on involvement levels. Meanwhile, such influence is greater than the direct and positive influence of TRI on involvement level. It also has an indirect and positive influence on usage intention.

3   Method

This paper applies a structural equation model to examine the variances of path influences, regarding the influence of TRI and perceived product assessment, on the involvement levels and usage intentions for m-banking services between users of m-banking services and consumers yet to adopt m-banking services.

In the construction of the research measurement for TRI, this paper uses the TRI measurement proposed by Parasuraman (2000) as its base. It contains four constructs, which are optimism, innovativeness, discomfort, and insecurity. Regarding involvement levels, this paper refers to the revised personal involvement inventory (RPII) developed by Zaichkowsky (1994) as the foundation, and makes modifications through the use of a Likert 5-point scale. Regarding usage intention, this paper develops its own measurement by referring to literature and relevant definitions. A total of four items is designed. The first two items concern product characteristics of comparisons between m-banking services and visits to bank branches. The remaining six items are developed to make inquiries regarding six different product characteristics, such as entertainment, ease of use, convenience, low cost, suitability and security. All constructs are measured on a 5-point Likert scale, 1~5 points, ranging from strong disagreement to strong agreement, respectively.

In the RPII, all items are measured on a semantic 7-point scale include ten positive adjective words such as important, interesting, relevant, exciting, means a lot to me, appealing, fascinating, valuable, involving, and needed. However, the RPII items all belong to reflective indicator category. It means that reflective indicators are essentially interchangeable and, therefore, the removal of an item does not change the essential nature of the underlying construct (Diamantopoulos and Winklhofer, 2001). Following this concept, we adjust the RPII to a 5-point Likert scale and select five items, including important, relevant, means a lot to me, valuable, and needed. These modifications make questionnaire simple, consistency and easy to respond.

The first part of the questionnaire consisted of five items on demographic variables, such as gender, age, educational background, occupation, and experience using m-banking services. The second part consisted of the measurements for individual constructs, including eight items on the assessment of product characteristics, four items on usage intentions, five items on involvement levels, ten items on optimism, seven items on innovativeness, ten items on level of discomfort, and nine items on insecurity. A total of 53 items was designed. The respondents with experience using m-banking services began with the section on the assessment of product characteristics; whereas, the respondents who had never used m-banking services were exempt from this section, since they could make proper evaluations of the pros and cons of m-banking services. These respondents started with the section on usage intention. A total of 1857 questionnaires was issued, on a random sampling basis, to 1/3 of the clients who had opened accounts at two medium-sized securities brokerage houses in Taiwan. The questionnaires were sent via e-mail or over the internet. A total of 384 questionnaires

were recovered; among them, 54 were invalid. The number of valid questionnaires was 330, with a valid return rate of 17.77%. Table 1 summarises the analysis of descriptive statistics.

Table 1 Demographic variables: statistics and percentage (*n* = 330)

Demographic variables		No.	Percentage	Demographic variables		No.	Percentage
Gender	Male	172	52.10%	Occupation	Finance	57	17.30%
	Female	158	47.90%		IT	46	13.90%
Age	<20	26	7.90%		Technology	53	16.10%
	21~30	114	34.50%		Others	75	22.70%
	31~40	87	26.40%		Students	54	16.40%
	41~50	77	23.30%		Housekeeping	21	6.40%
	51~60	26	7.90%		Between jobs	24	7.30%
Education	High school	24	7.30%	Experience of using m-banking services	Yes	106	32.10%
	College	87	5.20%		No	224	67.90%
	University	155	60.60%				
	Master	56	28.80%				
	PhD	8	3.00%				

4 Analysis

Table 2 summarises the analysis of Construct Reliability (CR) and Pearson correlation. The values indicating reliability of usage intention, involvement levels, optimism, innovativeness, discomforts, and insecurity range between 0.751 and 0.925, within the acceptable range. In terms of correlation between constructs, the items on discomforts and insecurity are scored in reverse ratings in order that they can be in positive correlation with other constructs.

Table 2 Reliability and correlation coefficients

	(*n* = 320)	Item	Mean	SD	1	2	3	4	5	6
1	Usage intention	4	3.59	0.767	0.884					
2	Involvement levels	5	3.43	0.749	0.672*	0.925				
3	Optimism	10	3.97	0.492	0.471*	0.449*	0.868			
4	Innovativeness	7	3.19	0.653	0.268*	0.293*	0.497*	0.821		
5	Discomforts	10	2.69	0.482	0.038	0.072	0.172*	0.322*	0.751	
6	Insecurity	9	2.44	0.621	0.201*	0.236*	0.136*	0.188*	0.435*	0.858

Diagonal lines are Cronbach's *α*.

*Indicates the 0.01 significance level. Scores are counted in reverse for the questions on discomforts and insecurity.

In order to prove that there is good consistency among all the items within the same construct, average scores are used to represent all the items concerned. Item-to-total coefficient analysis is performed on the average values of the items under individual constructs. The coefficients for usage intention are between 0.762 and 0.917; the coefficients for involvement levels are between 0.863 and 0.893; the coefficients for optimism are between 0.617 and 0.770; the coefficients for innovativeness are between 0.433 and 0.802; the coefficients for discomforts are between 0.476 and 0.648, and the coefficients for insecurity are between 0.551 and 0.774.

The above analysis shows that the average values of the items under the same construct demonstrate a medium to high degree of correlation. Therefore, the average values can represent the average outcome of the whole construct. Meanwhile, the average values of the respective construct under TRI, a total of 36 items, are 0.637 (optimism), 0.757 (innovativeness), 0.678 (discomfort), and 0.660 (insecurity). They show a high level of correlation, indicating that the values of the four constructs can represent TRI. Therefore, the value of TRI is the total average of the average values of these 4 constructs, and the overall average represents the TRI of the respondents.

In order to confirm whether there is any Common Method Variance (CMV), this paper adopts a single factor test of the Exploratory Factor Analysis (EFA) for observation. It conducts a principle component factor analysis of the 45 items under the three constructs, such as TRI, involvement levels and usage intention. According to the EFA result, the maximum factor explained variance before factor rotation is 22.16%, an indication of no serious CMV in this paper.

As the literatures suggest (Churchill, 1979; Hinkin, 1998), when factor analysis is done before the purification steps, there seems to be a tendency to produce many more dimensions than can be conceptually identified. Though this application may be satisfactory during the early stages of research on a construct, the use of factor analysis in a confirmatory fashion would seem better at later stages. In scale development, Confirmatory Factor Analysis (CFA) should be a confirmation that the prior analyses have been conducted thoroughly and appropriately (Hinkin, 1998). Our measurement scale are based on well defined well-known scales, including the RPII (Zaichkowsky, 1994) and TRI (Parasuraman, 2000) scale. The exploratory factor analysis has been tested and justified before. In our research, CFA is more suitable for the application goal and provides the information of goodness of fit of the resulting factor structure. Therefore, we test the measurement scale by CFA process rather than EFA.

Table 3 summarises the result of confirmatory factor analysis. The samples of the first group are the aggregation of users and consumers who are yet to use m-banking services ($n = 330$). The samples of the second group are the consumers who are yet to use m-banking services ($n = 224$). The samples of the final group are the users of m-banking services ($n = 106$). The final group answers an additional two items regarding product characteristics, which provide assessments of the advantages and disadvantages of m-banking services and branch visits. These two items are reflective indicators to product assessment, and thus, are added to the items regarding usage intention and involvement levels for CFA tests. However, the six items regarding entertainment, ease of use, convenience, low cost, suitability, and security are relevant to product characteristics, and are formative indicators influencing product assessment; therefore, they are not included in CFA.

Table 3 The results of CFA

	1st CFA (n = 330)		2nd CFA (n = 224)		3rd CFA (n = 106)		
	Intention	*Involvement*	*Intention*	*Involvement*	*Intention*	*Involvement*	*Product assessment*
Item	*Loading*	*Loading*	*Loading*	*Loading*	*Loading*	*Loading*	*Loading*
1	0.69	0.83	0.61	0.76	0.79	0.84	0.82
	(13.85)	(18.10)	(9.75)	(13.18)	(9.49)	(10.48)	(8.76)
2	0.82	0.82	0.78	0.78	0.86	0.77	0.67
	(17.66)	(17.72)	(13.54)	(13.50)	(10.88)	(9.12)	(7.08)
3	0.91	0.88	0.89	0.89	0.92	0.82	
	(20.71)	(19.85)	(16.50)	(16.82)	(12.11)	(10.09)	
4	0.85	0.87	0.88	0.89	0.74	0.84	
	(18.57)	(19.71)	(16.07)	(16.82)	(8.64)	(10.40)	
5		0.81		0.77		0.76	
		(17.6)		(13.24)		(9.01)	
CR	0.89	0.92	0.87	0.91	0.90	0.91	0.72
AVE	0.67	0.71	0.64	0.67	0.69	0.65	0.56
Goodness of fit							
χ^2	118.10		78.45		66.31		
df	26		26		41		
NFI	0.97		0.97		0.96		
TLI	0.97		0.97		0.98		
CFI	0.98		0.98		0.99		
GFI	0.93		0.89		0.90		
SRMR	0.046		0.045		0.043		

Values in brackets indicate *t* of factor loading.

According to Table 3, the factor loadings and t-values of the three sample groups all reach significant levels. The values for CR are between 0.72 and 0.92, and the Average Variance Extracted (AVE) is between 56% and 71%. The goodness of fit, as shown in Table 3, indicates that the fit of all three groups is within an acceptable range, indicating good convergence for all three sampling groups. The coefficient between usage intention and involvement levels of the first group is 0.71, with a standard error of 0.03. The coefficient between usage intention and involvement levels of the second group is 0.75, with a standard error of 0.04. The coefficient between product characteristics and usage intention of the third group is 0.78; that between product characteristics and involvement levels is 0.76; and that between usage intention and involvement levels is 0.75, with standard errors of 0.07, 0.07, and 0.05, respectively. These numbers indicate that the coefficients are all significantly smaller than 1.0, twice of standard errors, showing good discriminant validity of the CFA constructs of the three groups.

In order to examine whether the users of m-banking services think along the paths inferred by theoretical models, this paper designs five models to validate the results of the research hypotheses. Model 1 is the peripheral-route thinking path of users, and non-users of m-banking services in H-1. Model 2 is the peripheral-route thinking path of non-users, designed to validate H-1-1 and H-2-1. Model 3 validates the peripheral-route thinking path of users, as established in H-1-2 and H-2-2. Model 4 validates the central-route thinking path of users, as established in H-3, and includes the peripheral-route thinking path of users. The constructs, such as product assessment, product characteristics, involvement levels, and usage intention are added into the model. In this model, the influence of product characteristics, and the influence of TRI on involvement levels is not the same. Model 5 is a comparison to Model 4, given an equal level of influence by product assessment and TRI on involvement levels, in order to observe the quality of model fit. The results can serve as a comparison foundation for both the theoretical and competing models. The comparison between Model 4 and Model 5 can serve as a validation for H-4. This paper analyses and compares the results of these five models in order to gain an understanding of the variances of influence paths regarding the impact of TRI and perceived product assessment on involvement levels and usage intentions of m-banking services between users and non-users.

Table 4 lists the total coefficient of the overall structural model. The table shows that all total influence coefficients are significant ($t > 1.96$). According to Models 1 to 5, TRI is not defined as having direct influence on usage intention. Therefore, the total influence on usage intention is equal to the indirect influence (total influence = direct influence + indirect influence). According to Models 4 and 5, product characteristics are not defined as having a direct influence on the usage intentions of either. Therefore, the total influence on usage intention equals indirect influence. Table 5 is a comparison of model fit of the five models, and indicates that all five models have acceptable model fit. Figure 1 shows that the influence of ease-of-use, cost, and security on product characteristics is not significant ($t < 1.96$). Thus, H-3-1, H-3-3, and H-3-5 are accepted.

Table 4   Total coefficient of the overall structural model

	Construct	*TRI*	*Involvement*	*Product Assessment*
Model 1 ($n = 330$)	*Involvement*	0.41(7.51)		
	Intention	0.29(6.54)	0.72(10.71)	
Model 2 ($n = 224$)	*Involvement*	0.42(6.39)		
	Intention	0.32(5.85)	0.76(10.39)	
Model 3 ($n = 106$)	*Involvement*	0.42(4.02)		
	Intention	0.32(4.02)	0.76(7.13)	
Model 4 ($n = 106$)	*Involvement*	0.18(2.42)		0.76(6.80)
	Intention	0.14(2.36)	0.79(7.55)	0.60(5.74)
Model 5 ($n = 106$)	*Involvement*	0.46(7.65)		0.46(7.65)
	Intention	0.36(6.22)	0.77(7.52)	0.36(6.22)

Values in brackets indicate *t*.

Figure 1 SEM models

Note: *indicates t>1.96

Model 1/2/3

Note: *Indicates t>1.96; n.s. indicates t<1.96

Model 4 & 5
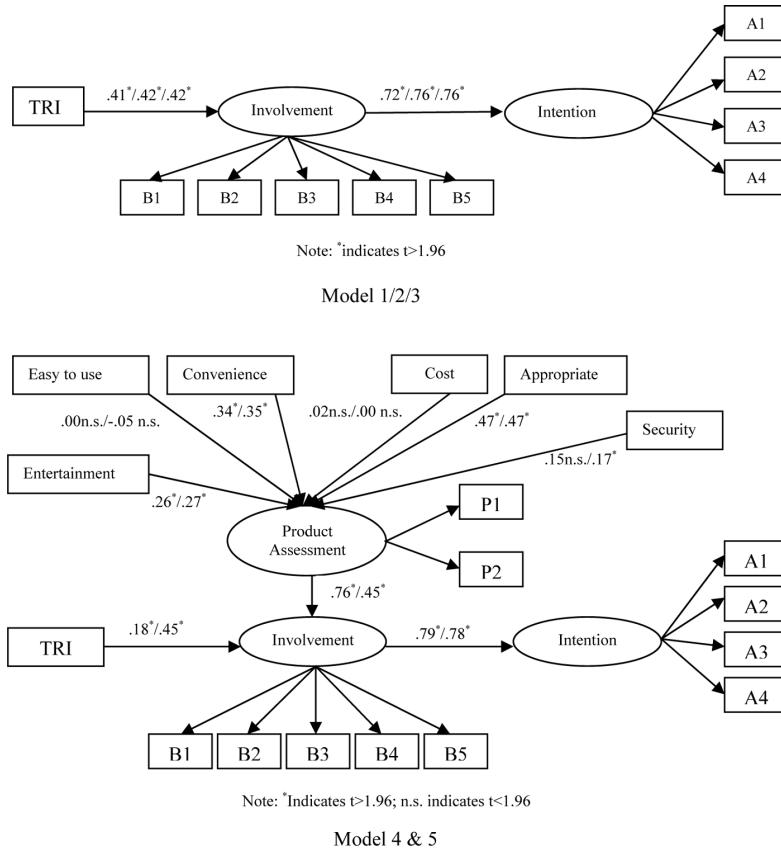
The results of Models 3 and 4, and the results of Models 4 and 5, are compared. The comparison between the results of Models 3 and 4 indicates that both models sampled users who have used m-banking services. Model 3 only examines the influence of TRI on involvement levels, and explains that the variances levels are only 18% ($\xi = 0.82$). However, Model 4 incorporates product characteristics, and finds that the explained variances for overall involvement levels are as high as 68% ($\xi = 0.32$). This proves that the addition of product assessment is a construct for Model 4, as it improves the explanatory power of involvement levels (compared to Model 3). The ratio of chi-square and degree of freedom drops from 1.83 in Model 3 to 1.45 in Model 4. It shows that the addition of product assessment, and product characteristics, as constructs, indicate improved model fit (compared to a model that only explains involvement levels with TRI).

Finally, H-4 refers to the comparison of the results of Models 4 and 5, and validates the direct and positive influence, which product assessment has on involvement levels, is greater than the direct and positive influence that TRI has on involvement levels. Model 5 defines that the influence value of TRI on involvement level is equal to that of product assessment on involvement levels. Therefore, if their influence on involvement shows no variance, the fitness of Model 5 is superior to that of Model 4. On the contrary, if the influence of these two on involvement indicates some variances, the fitness of

Model 4 is superior to that of Model 5. The results in Table 5 suggest that the chi-square of Model 4 is 162.71, and the degree of freedom is 112. The chi-square of Model 5 is 167.44, and the degree of freedom is 113. The degree of freedom of Model 5 is one unit higher than that of Model 4, but the degree of freedom increases by 4.73 higher than 3.84, which is the level suggested by theories. This shows that Model 4 is a better fit than Model 5. It also indicates that there are variances between the influence of TRI and product characteristics on involvement levels of m-banking services. The outcome of Model 4 suggests that the influence of product assessment on involvement levels is greater than that of TRI on involvement levels. Meanwhile, it has a significant and positive but indirect influence on usage intention. Therefore, H-4 is validated.

Table 5   Indicators of model fit

	χ^2	df	NFI	TLI	CFI	GFI	SRMR
Model 1 ($n = 330$)	138.14	304	0.97	0.97	0.98	0.92	0.047
Model 2 ($n = 224$)	131.87	34	0.95	0.95	0.97	0.89	0.045
Model 3 ($n = 106$)	62.09	34	0.95	0.97	0.98	0.89	0.045
Model 4 ($n = 106$)	162.71	112	0.94	0.97	0.98	0.85	0.067
Model 5 ($n = 106$)	167.44	113	0.93	0.96	0.97	0.85	0.10

5   Results

According to the test on Model 1, if the two groups are viewed together, involvement levels have a positive and direct influence on usage intentions for m-banking services. Meanwhile, TRI has positive and indirect influence on involvement levels, but indirect influence on usage intention. Therefore, H-1 and H-2 are both supported. Models 2 and 3 separate non-users from users and prove that involvement levels have a direct and positive influence on usage intentions of m-banking services. However, TRI has a positive and direct influence on involvement levels, but indirect influence on usage intentions. Therefore, H-1-1, H-1-2, H-2-1, and H-2-2 are all empirically supported.

The above conclusions indicate that the inference concerning the peripheral route in ELM can be applied to the samples of users and non-users. However, when Model 4 proves that samples are users, the addition of product assessment as a construct can enhance the explanatory power on involvement. It also has a significant, positive and direct influence on involvement levels, and indirect influence on usage intentions. Meanwhile, entertainment, convenience, and suitability, as the three characteristics among the six product characteristics have a significant and positive influence on product assessment. Therefore, H-3-1, H-3-3, and H-3-5 are all supported; whereas H-3 is partially supported. Finally, the comparison between Models 4 and 5 indicates that the model fit is better than the influence of TRI, and the influence of product assessments are not equal. Therefore, the influence of product assessment on involvement level (0.76) is greater than that of TRI on involvement levels (0.18), thus, H-4 is accepted.

The above results suggest that although the model of the peripheral route can be proven for both non-users and users, the central route model is a more suitable model design for the samples of users, as it is based on assessments of the strengths and weaknesses of product characteristics. In addition, the influence of the central route is also greater than that of a peripheral route.

6 Conclusions

Although prior literatures have thoroughly examined antecedent variables and influence paths on usage intentions or involvement levels of technological products, there are few studies focusing on the variances of the influencing variables for the consumers who have used the technologies, and for the consumers who have not used the technologies. This paper uses m-banking services as a case study to theoretically prove that users mainly refer to their judgements regarding the pros and cons of products for their thinking path, when it comes to their involvement levels and usage intentions. This means that they adopt a central route. On the other hand, the analysis on the explanatory power of the peripheral route using relevant variables finds that its influence is far inferior to that of a central route.

6.1 Academic implications

This result proves that consumers who are equipped with more product knowledge tend to pay more attention to the information in relation to product attributes, rather than the peripheral information, which does not consider the advantages and disadvantages of products. Such peripheral information includes consumers' own perceived acceptance of technologies. This conclusion implies that, in a study of the issues regarding product involvement or usage intentions for technological products, researchers should segment the consumers with different levels of product knowledge, and place an emphasis on the importance of such differences. In the analysis of the consumers with more product knowledge or those who are more familiar with the products, the relevant variables concerning the assessment of product characteristics should be included to enhance the theoretic explanatory power and model robustness.

6.2 Managerial implications

In practice, when banks promote m-banking services, they should consider that, for the consumers without the experience of using m-banking services, their acceptance of the services will influence their intentions of using m-banking services. Only consumers with high TRI for m-banking services have a strong willingness to try the services.

However, if consumers have used m-banking services, the performance of m-banking products will be the key that determines whether users will continue to use m-banking services. Therefore, regarding development of new users, banks should prioritise the consumers already equipped with high TRI. For example, banks should promote m-banking services to groups with experience in using internet banking services, or provide access to technological knowledge. However, regarding the retention of current users, banks should improve the aspects highlighted in the assessment of m-banking by users. These aspects include upgrades in entertainment, convenience, and suitability,

in order to allow users to perceive more benefits. This will encourage their involvement levels and usage intentions for m-banking services.

6.3 Limitations

Finally, this paper cannot meet the requirements of a similar percentage for users and non-users in sampling. Therefore, group comparisons may be subject to the impact of sample sizes, as the calculation of chi-squares is subject to sample sizes within the models. The samples in this paper are not suitable for group comparisons of users and non-users. Since the sample size for users is relatively small, the use of the maximum likelihood method, of the SEM test, may cause the model to be slightly unstable, and may be the one of the reasons why ease-of-use, low cost, and safety, as product characteristics, have no significant influence on product assessment. Therefore, future studies can use group comparisons to conduct more in-depth variance testing, and examine the variances between users and non-users or the variances between consumers with different levels of product knowledge. This will provide contributions in both theory and practice for m-banking services of the future.

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Appendix: Questionnaire

Product Characteristics

1 Generally speaking, there are more benefits from using m-banking services than visiting bank branches

2 Generally speaking, m-banking services provide more benefits than bank branches

3 You feel that using m-banking services is more interesting than visiting a bank branch

4 M-banking services are easier than visiting a bank branch

5 M-banking services save more time than visiting a bank branch

6 M-banking services cost less than visiting a bank branch

7 M-banking services are more specifically catering to your needs than the services provided by a bank branch.

8 You feel that m-banking services are more secure than visiting a bank branch

Usage Intention

1 When necessary, you would want to use m-banking services

2 Given the option, you prefer using m-banking services to bank branches

3 Given the same services, you tend to use m-banking services, rather than visits to bank branches

4 You try to complete tasks as much as possible by using m-banking services, rather than visits to bank branches

Involvement levels

1   M-banking services are important to you

2   M-banking services are relevant to you

3   M-banking services are meaningful to you

4   M-banking services are valuable to you

5   M-banking services are necessary to you

TRI

Optimism

1   Technologies allow people to manage daily life with more ease

2   The use of the newest technology products (or services) is easy

3   You like to conduct transactions by using your computer because it is not restricted to business hours

4   You like to use the most advanced technologies

5   You like to modify and set-up computer software based on your own preferences

6   Technology products improve your work efficiency

7   You find that new technologies lighten up your spirits

8   Technologies allow you more freedom of mobility

9   Learning how to use technologies can create many benefits

10   You are confident that technology products will complete tasks based on your instructions

Innovativeness

1   Other people ask you for suggestions regarding new technologies

2   Your friends seem to know more about new technologies than you do

3   When any new tech products or services are launched, you are usually the earliest one within your friends to obtain the products or services

4   You usually do not have to rely on others to gain an understanding of new high-tech products and servicesWithin the scope of your interest, you always keep up with the development of the newest technologies

6   You enjoy the challenges associated with the establishment of an understanding of high-tech products

7   Compared to others, you encounter fewer products in the process of using technologies

Discomforts

1 You cannot understand the professional jargons written in technical support of high-tech products and services

2 Sometimes you feel that technology products are not designed for common people

3 Manuals of high-tech products or services are usually unclear and difficult to understand

4 When seeking technical support of high-tech products and services, you sometimes feel short-changed by the people who know more than you do

5 If you want to purchase high-tech products and services, you prefer the no-frill models, rather than the models with many additional features

6 You feel embarrassed when seen making mistakes in the use of high-tech products

7 We should be careful in the replacement of personnel with technologies but new technologies may breakdown or cannot connect

8 Risks in association with health and safety are only be found only after people have used the new technologies

9 New technologies make it too easy for governments and companies to keep an eye on the public

10 Technologies always fail at the most critical moments

Insecurity

1 You do NOT believe that the key-in of credit card details on the internet is secure

2 You do NOT believe that it is secure to conduct any financial transactions online

3 You worry that the information you send out online will be seen by others

4 You have no confidence in the concept that transactions can only conducted online

5 You believe that any electronic transactions should be confirmed with written documents

6 You need to inspect and make sure that there are no errors in computers or machines for any tasks automatically completed

7 You believe that human contacts are important for transactions

8 You prefer talking with people, not dealing with machines, for any transactions

9 You cannot be sure whether information has been correctly delivered if the information is sent via machines or over the internet