Article

An investigation of users' continuance intention towards mobile banking in China

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Abstract

The long-term development of mobile banking (m-banking) relies on users' continued usage. Motivated by the need to better understand the motivations and barriers of users' continuance intention towards m-banking, this study develops a research model based on the incorporation of the technology acceptance model (TAM): task-technology fit model (TTF) and perceived risk into the expectance-confirmation model (ECM). Empirical data from 434 users who had prior experience with m-banking were tested against the proposed research model by using structural equation modeling (SEM). The results indicate that satisfaction, perceived usefulness, perceived task-technology fit, and perceived risk are the main predictors of continuance intention, satisfaction, in turn, is determined by confirmation, perceived usefulness, and perceived risk. Perceived usefulness is affected by confirmation, perceived ease of use, and perceived task-technology fit. However, the direct effect of perceived ease of use to continuance intention is not significant. The results also show that gender significantly moderates the effect of perceived risk to continuance intention. Implications of the findings and future research directions are discussed.

Keywords

mobile commerce, mobile banking, continuance intention, expectance-confirmation model, technology acceptance model, task-technology fit, China

Monitoring and improving users' satisfaction with m-banking is an appropriate approach for providers to retain users.

Introduction

Mobile banking (m-banking) means that users adopt mobile terminals such as cell phones to access payment services including account inquiry, transference and bill payment (Dahlberg et al., 2008). Compared to traditional/online banking, the main advantages of m-banking are ubiquity and immediacy. That is, m-banking can free users from temporal and spatial limitations, and enable them to conduct payment at any time from anywhere (Zhou, 2012).

Thanks to the increasingly wide spread of mobile communication technologies represented by 3G networks, m-banking has gained rapid growth worldwide. According to a report from Juniper Research, the number of m-banking users will exceed 590 million in 2013 and more than 1 billion mobile phone users will have used their phones for m-banking by the end of 2017 (Morris, 2013). In China, four state-owned banks, including the Bank of China (BOC): Industrial and Commercial Bank of China (ICBC): Agricultural Bank of China (ABC): and China Construction Bank (CCB): along with a number of private

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banks such as China Merchant Bank (CMB): China Minsheng Banking Corp., Ltd., and Industrial Bank Co., Ltd., have released their own m-banking services. The number of m-banking users of three banks (ABC, BOC, and CCB) had reached 180 million by the end of 2012 (CEBNET, 2013).

The rapid growth of m-banking has presented not only opportunities, but also challenges, to the service providers. As Bhattacherjee (2001a) argued, long-term viability of an information system (IS) and its eventual success depend on its continued use rather than first-time use. To m-banking providers, retaining their existing users is a crucial source of competitive advantage. They have invested great effort and resources on releasing m-banking services; only retaining users and facilitating users' continuance usage can recover these costs and achieve success. If users' enthusiasm over the initial adoption diminishes after gaining usage experience, the m-banking services will suffer from decreased usage and may even fall into disuse. When this happens, the service providers might need to write off their significant investments. Thus, continuance intention has become an important subject of study in the m-banking research area. However, compared to the abundant research on initial adoption, the continuance intention of m-banking has seldom been examined, which involves great uncertainty and risk that may inhibit users' continuance usage. To address this gap, conducting an investigation of the factors affecting users' continuance intention is necessary.

The main purpose of this study is to enhance our understanding of the formation of users' continuance intention towards m-banking and to offer a helpful way for m-banking service providers to improve user retention. Hence, we incorporate the technology acceptance model (TAM): the task-technology fit model (TTF) and perceived risk into the expectance-confirmation model (ECM) to hypothesize a new model and conduct an empirical study. We make this incorporation for the following four reasons. First, although the ECM has been confirmed by previous studies to be a robust model for explaining continuance intention of IS, it employs only three predictors, namely satisfaction, perceive usefulness, and confirmation, to explain continuance intention. However, users' behavior intention towards IS may be affected by other factors. Second, TAM provides an important belief, namely perceived ease of use, as the critical factor affecting perceived usefulness, which makes up the precedent factor of perceived usefulness for ECM. Third, the ECM and TAM only explain the continuance intention from the perspective of users' perceptions towards technology, while users' continuance intention is not only determined by their perceptions and attitudes, but also by task-technology fit. To fill this gap, our study combines TTF with TAM and ECM to further our understandings of the determinants of m-banking continuance intention. Fourth, adding perceived risk to the model allows us to capture the possible element of barriers to the m-banking continuance intention.

The remainder of the article proceeds as follows. The literature review and theoretical background of this study are described in the next section. The third section introduces our research model and hypotheses. Research methodology is presented in the fourth section. The results are described in the fifth Section, followed by a discussion in the sixth section. The article concludes with implications and directions for future studies.

Literature review and theoretical background

Users' adoption of m-banking

Extant research has focused on examining the factors affecting users' initial adoption of m-banking (Brown et al., 2003; Laforet and Li, 2005; Laukkanen, 2007; Yang, 2009; Puschel et al., 2010; Dasgupta et al., 2011; Zhou, 2011a; Zhou, 2012; Chen, 2013). Information technology adoption theories such as TAM (Luarn and Lin, 2005; Amin et al., 2008; Dasgupta et al., 2011): innovation diffusion theory (IDT) (Suoranta and Mattila, 2004; Riquelme and Rios, 2010; Koenig-Lewis et al., 2010; AI-Jabri and Sohail, 2012): (decomposed) theory of planned behavior (DTPB/TPB) (Brown et al., 2003; Riquelme and Rios, 2010; Puschel et al., 2010; Sripalawat et al., 2011): and unified theory of acceptance and use of technology (UTAUT) (Tan et al., 2010; Zhou et al., 2010; Yu, 2012) are often used as the theoretical bases. Perceived usefulness, perceived ease of use, relative advantage, subjective norms, self-efficacy, performance expectancy, and facilitating conditions are identified to affect users' adoption. In addition, perceived risk (Cruz et al., 2010; Chen, 2013): initial trust (Zhou, 2011a): trust (Koo and Wati, 2010): flow experience (Zhou, 2012): innovation attributes and knowledge-based trust (Lin, 2011) are also validated to have positive/negative effects.

Continuance intention of mobile services

Compared to the abundant research on initial adoption, continuance intention has received relatively less attention. Access quality, usefulness, uncertainty avoidance, perceived enjoyment and familiarity were verified to affect the continuance intention of mobile Internet services (Lee et al., 2007; Ng and Kwahk, 2010; Shin et al., 2010; Zhou, 2011b). Similarly, some researchers noted that information quality, social influence, perceived enjoyment and perceived fee have effects on continuance intention of mobile data services (Kim et al., 2008; Lee et al., 2009; Kim, 2010; Choi et al., 2011).

Chen (2012) suggested that technology readiness and service quality have indirectly significant influence on continuance intention of m-banking. Chen and Liu (2012) argued that the continuous improvement of mobile content services has a positive impact on users' expectations. Kang et al. (2012) noted that perceived usability, channel preference, and perceived value are three major determinants of sustained m-banking use. Zhao et al. (2012) explored the effects of service quality and justice on user satisfaction, which in turn, affects continuance intention of mobile value-added services. Zhou (2013) drew on the information systems success model and flow theory to examine the effects of extrinsic and intrinsic factors on continuance intention of mobile payment services. Hsiao and Chang (2013) found that perceived value, perceived usefulness, and satisfaction all directly influence the continuance intention of mobile advertising.

Expectance-Confirmation Model (ECM)

Based on expectation-confirmation theory (ECT): a theory widely used in the consumer behavior literature to study consumer satisfaction, post-purchase and service marketing in general, Bhattacherjee proposed the Expectance-Confirmation Model (ECM). Bhattacherjee suggested that satisfaction with IS use is the strongest predictor of users' continuance intention, followed by perceived usefulness as a significant but weaker predictor. Confirmation and perceived usefulness are major determinants of satisfaction (Bhattacherjee, 2001a).

As a theoretical model focusing on the continuance usage of IS, the ECM can help us to understand user behaviors that cannot be explained by the initial adoption theories. In addition, the ECM posits that users' expectations will change after adoption and perceived usefulness to be the surrogate for post-adoption expectation, which can make up for the shortcomings of ECT (Thong et al., 2006). Many studies have used the ECM to understand users' continued usage of IS such as online banking (Vatanasombut et al., 2008), e-learning (Lee, 2010), Internet-based learning technologies (Limayem and Cheung, 2008), online shopping (Lee and Kwon, 2011), and IPTV (Lin et al., 2012), which show that the ECM is effective in predicting continuance intention in the context of mobile commerce. Therefore, the ECM is employed to understand users' continuance intention towards m-banking in the current study.

Technology acceptance model (TAM)

Based on the theory of reasoned action (TRA), Davis proposed the TAM and aimed to develop a model for understanding users' acceptance of IS (Davis, 1989). As the TAM indicates, the actual use of IS is determined by users' intention. The intention, in turn, is determined by users' attitude towards using an IS and its perceived usefulness. Perceived usefulness and perceived ease of use are the determinants of attitude towards IS. In addition, perceived ease of use affects perceived usefulness, which also mediates the effects of perceived ease of use on intention (Davis, 1989; Davis et al., 1989).

TAM was originally developed to predict users' initial adoption of a new IS. Many studies have confirmed that TAM can efficiently predict and explain users' behaviors in using IS (Moon and Kim, 2001; Shin, 2007; Park et al., 2012). Meanwhile, the TAM has been implemented to investigate users' continuance intention of IS by several studies (Gefen, 2003; Chan and Lu, 2004; Kim and Malhotra, 2005; Hong et al., 2006; Chang et al., 2013). The two main constructs, namely perceived usefulness and perceived ease of use, have also been extensively validated to be the antecedent factors affecting users' continuance intention. Since TAM is a very parsimonious and generic model which can be used to study both initial and continued IS adoption (Hong et al., 2006), we incorporate perceived ease of use into the basic framework of ECM to better explain users' continuance intention.

Task-Technology Fit (TTF)

TTF is a very precise exploration of the links between work-related matters and the use of technology proposed by Goodhue and Thompson (1995). Compared with the TAM, TTF focuses more on the relationships

among task and technology characteristics, utilization and performance impact. The theory holds that the degree of fit between tasks and technology will impact work performance and technology utilization. IS are more likely to have a positive impact on individual performance and be used if the capabilities of the IS match the tasks that the user must perform. TTF is a powerful model to analyze users' adoption and behaviors of IS in a specific context, such as mobile commerce in the insurance industry (Lee et al., 2007), mobile information systems (Junglas et al., 2008): e-learning (Larsen et al., 2009; Lin, 2012), and e-books (D'Ambra et al., 2013). Since the TTF shows a good complementarity with the TAM and ECM, this study incorporates the perceived task-technology fit into the ECM's framework.

Research model and hypotheses

As the ECM employs only three predictors to explain continuance intention, while users' behavior may be affected by other factors, it is appropriate to incorporate other models into the ECM. TAM and TTF have been used by numerous studies to examine users' adoption of IS and have good complementarities to the ECM. Consequently, we develop our research model and hypotheses based on the incorporation of TAM, TTF, and perceived risk into the ECM. There are five main hypotheses in the ECM. First, continuance intention is directly affected by the users' satisfaction with IS. Satisfaction refers to an overall evaluation of an IS, which reflects an emotion-based response about the target IS (Lam et al., 2004; Kim, 2010). Numerous studies pertaining to IS continuance support that satisfaction is a major factor determining the continuance intention. It is expected that continuance intention of m-banking is positively determined by users' satisfaction.

> **H1**: Users' satisfaction with m-banking is positively related to their continuance intention of m-banking.

According to the ECM, post-adoption expectations regarding the IS and discrepancies between pre-adoption expectations and actual performance of the IS are the two determinants of users' satisfaction. When users actually use m-banking, they update their initial expectations simultaneously. If m-banking outperforms relative to their initial expectations, their post-adoption expectations are confirmed. Otherwise, their post-adoption expectations are not confirmed. The level of satisfaction is affected by the level of confirmation.

The post-adoption expectations regarding the IS, another determinant of satisfaction, are often represented by perceived usefulness. Perceived usefulness is an important predictor of behavioral intention in many contexts including the Internet, information systems, the web, and mobile commerce. The ECM posits that perceived usefulness has a positive effect on users' satisfaction and continuance intention. In addition, users' confirmation of expectations will have a positive effect on the perceived usefulness of IS (Bhattacherjee, 2001a, 2001b). Perceived usefulness of IS can be adjusted by confirmation experience, particularly when the users' initial perceived usefulness is not concrete due to the uncertainty over what to expect from using the IS (Lee, 2010). Thus, the following hypotheses are proposed:

> **H2:** Perceived usefulness is positively related to users' continuance intention of m-banking.
>
> **H3:** Perceived usefulness is positively related to users' satisfaction with m-banking.
>
> **H4:** Confirmation of expectations is positively related to users' satisfaction with m-banking.
>
> **H5:** Confirmation of expectations is positively related to perceived usefulness of m-banking.

Davis (1989) defined perceived ease of use as "the degree to which a person believes that using a particular system would be free of effort". In the TAM, perceived ease of use is assumed to indirectly affect behavioral intention by impacting perceived usefulness. The empirical evidence accumulated over two decades reveals that perceived ease of use is significantly linked to intention, both directly and indirectly, via its effect on perceived usefulness (Kim and Malhotra, 2005; Shin, 2007; Chang et al., 2013). Compared with computers, mobile terminals suffer some constraints, such as small screens and inconvenient input. If m-banking service providers cannot present a good interface, conducting m-banking transactions will not be an easy task for users, which will not be favorable to their willingness to continued use of m-banking. An ease-of-use m-banking system will reduce users' effort spent and increase their feelings of perceived usefulness. Therefore, we propose:

> **H6:** Perceived ease of use is positively related to users' continuance intention of m-banking.

H7: Perceived ease of use is positively related to perceived usefulness of m-banking.

TTF suggests that the degree of task-technology fit is a major factor affecting users' adoption of technology. Goodhue and Thompson (1995) argued that a technology will be adopted if it is " . . . a good fit with the task it supports". The extant research has also found significant correlations between task-technology fit and continuance intention (Larsen et al., 2009; Lin, 2012). In the m-banking context, a good task-technology fit will promote users' continuance intention, while a poor task-technology fit will decrease the intention. One of the most significant advantages of m-banking is that users can enjoy m-banking services with their smartphones at any time and anywhere. If users do need to conduct payment or other types of banking transactions ubiquitously, the level of satisfaction will be improved and their continuance intention will be more intensive. Otherwise, they may possibly abandon their usage and select traditional or online banking services. In addition, the correlations between perceived task-technology fit and perceived usefulness have been confirmed by previous studies (Dishaw and Strong, 1999; Zhou et al., 2010). Only when the advantages of m-banking meet the users' requirements of banking transactions will they feel that m-banking is useful. Thus, we assume:

H8: Perceived task-technology fit is positively related to users' continuance intention of m-banking.

H9: Perceived task-technology fit is positively related to users' satisfaction with m-banking.

H10: Perceived task-technology fit is positively related to perceived usefulness of m-banking.

Perceived risk is one of the important components of several IS adoption models. It reflects users' perceptions of the uncertainty and adverse consequences of engaging in an activity. Tan et al. (2010) claimed that insufficient or unreliable security technologies will increase users' perception of risk, resulting in lower level satisfaction and willingness to continued usage in an e-commerce context. Wu and Wang (2005) found that perceived risk has a significant direct effect on behavioral intentions in e-commerce. In terms of m-banking, some studies claimed that perceived risk is one of the main determinants of users' adoption (Brown et al., 2003; Luarn and Lin, 2005). While some other studies reached an opposite conclusion, Chen (2012) reported that perceived risk has no significant impact on the relationship quality of m-banking, and Kang et al. (2012) found that perceived risk shows no significant effect on perceived value of m-banking. Base on the previous discussions, we assume that perceived risk has a negative effect on continuance intention, both directly and indirectly, via satisfaction with m-banking.

H11: Perceived risk is negatively related to users' continuance intention of m-banking.

H12: Perceived risk is negatively related to users' satisfaction with m-banking.

The moderating effects of gender in online/mobile service settings have been discussed in previous studies. Garbarino and Strahilevitz (2004) found women perceive more risk than men in online purchases. Nysveen et al. (2005) found that peer opinion has a higher effect on females in mobile services. Riquelme and Rios (2010) and Yu (2012) suggested that gender plays a moderating role in the adoption of m-banking. In contrast, no research has been conducted to investigate the role of gender in the m-banking continued usage context. Therefore, we experiment to propose the hypotheses that the effects of antecedents to continuance intention are moderated by gender.

H13a: The effect of satisfaction to continuance intention is moderated by gender.

H13b: The effect of perceived usefulness to continuance intention is moderated by gender.

H13c: The effect of perceived ease of use to continuance intention is moderated by gender.

H13d: The effect of perceived task-technology fit to continuance intention is moderated by gender.

H13e: The effect of perceived risk to continuance intention is moderated by gender.

Figure 1 depicts our theoretical model of users' continuance intention towards m-banking, which includes all the hypotheses mentioned above.

Research methodology

Questionnaire development

A questionnaire survey with two parts was used to test our theoretical model. The first part comprised a set of questions measuring the constructs in the research model, and the second part concentrated on obtaining demographic information of the sample. Most items

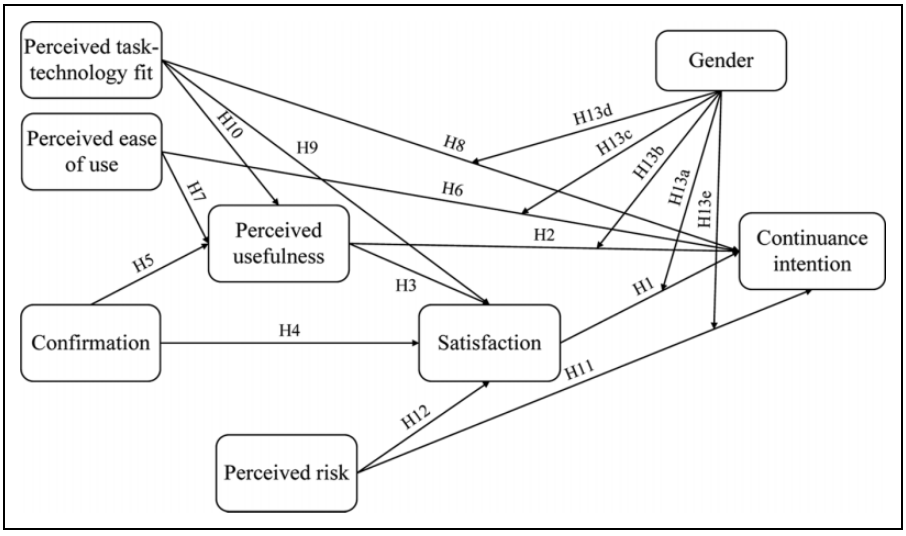

Figure 1. Research model and hypotheses.

for constructs were drawn from pre-validated studies and reworded to fit the m-banking environment. The scale items for perceived usefulness, satisfaction, confirmation, and continuance intention were drawn from Bhattacherjee (2001a, 2001b), while the scale items for perceived ease of use were adapted from Davis (1989). In addition, the items measuring perceived task-technology fit were drawn from Goodhue and Thompson (1995), and the perceived risk items were adapted from Kang et al. (2012). The final items and their sources are listed in the Appendix A. All items corresponding to the constructs were measured by using a 7-point Likert-type scales anchored from 1 (strongly disagree) to 7 (strongly agree).

Before conducting the survey, the questionnaire was first sent to six experts and users of mobile commerce to identify problems in the wording, content, clarity, and quantities of items, and was then revised according to their comments and suggestions.

Pilot test

The revised questionnaire was tested by convenience sampling. A total of 137 responses were received, of which 111 were valid, accounting for a valid response rate of 81 percent using Cronbach's reliability and Exploratory Factor Analysis (EFA). The reliability coefficients were first calculated for the items of each construct, and the standard lower bound for Cronbach's alpha was set at 0.7 (Anderson and Gerbing, 1988), with items that did not significantly contribute to reliability being eliminated. EFA was then performed to examine whether the items produced the anticipated number of factors and whether the individual items were loaded on their appropriate factors (Lee, 2010). Each item in our study has high loading (> 0.5) on its related factors and low cross-loading (< 0.4) on other factors, indicating that the questionnaire has good convergent and discriminate validities.

Data collection and sample

Our study employed a survey of m-banking users to gather data for hypotheses testing and to address research objectives. Before conducting the survey, we first considered the sample size. Stevens (2002) suggested that the sample size for social science research should be greater than 15 times the number of predictors. There are 6 predictors in our model and the sample size should therefore be larger than 90. In addition, as we needed to use Structural Equation Modeling (SEM) to test the hypotheses, a sample size of at least 200 was necessary (Hoetler, 1983). Thus, we set the minimum sample size at 200, collected from nine of the three largest telecommunication service providers in China (China Mobile, China Unicom, and China Telecom), for there are plenty of respondents at these places and we could obtain a large sample size conveniently. They are located in three cities of two Chinese eastern provinces. We think our survey method is appropriate, as eastern China is the area with more mature mobile commerce than other parts of China. We recruited respondents randomly in the mornings and afternoons during 10 weekdays and 2 weekends in August 2013, to remove potential sampling bias. The users who had m-banking experience were asked to fill out the questionnaire voluntarily based on their usage

Table 1. Demographic information of the sample.

Gender	Male	39.6%
	Female	60.4%
Age	under 20	5.8%
	20–30	24.4%
	30–40	36.2%
	40–50	19.6%
	over 50	14.0%
Occupation	Students	13.8%
	Clerical workers	69.6%
	Housewife	6.9%
	Professional	5.8%
	Etc.	3.9%
M-banking used	CCB	28.6%
	ICBC	23.7%
	CMB	20.3%
	BOC	8.5%
	ABC	7.1%
	Etc.	11.8%
Comfortable with m-banking	Extremely uncomfortable	0.0%
	Uncomfortable	2.5%
	Somewhat uncomfortable	3.2%
	Neither comfortable nor uncomfortable	20.5%
	Somewhat comfortable	29.5%
	Comfortable	33.2%
	Extremely comfortable	11.1%

experience. Each questionnaire was scrutinized and eliminated if it had too many missing values.

After a two-week survey, we obtained 434 valid responses, which fulfilled the requirements of sample size mentioned above. Among them, 39.6 percent were male and 60.4 percent were female. A majority of them (60.6 percent) were in their 20s and 30s (24.4 percent 20s; 36.2 percent 30s). In total, 75.4 percent of the respondents were employed. The m-banking services of CCB, ICBC, and CMB were three of the most frequently used services (28.6 percent CCB; 23.7 percent ICBC; 20.3 percent CMB). Most of the respondents were comfortable with m-banking. More details about the demographics of the sample are presented in Table 1.

Results

The research model was tested using AMOS 20.0. Following the two-step approach recommended by Anderson and Gerbing (1988): we conducted Confirmatory Factor Analysis (CFA) to test the measurement model and an assessment of the structural model. The maximum likelihood approach was chosen as the model estimation method.

Measurement model

The validity of the measurement model was evaluated by investigating convergent validity and discriminant validity. Convergent validity indicates the extent to which the items of a scale that are theoretically related should correlate highly. Composite Reliability (CR) and Average Variance Extracted (AVE) are the two most common indices for convergent validity of measures (Lee et al., 2007), and a CR of 0.70 or above is deemed acceptable (Fornell and Larcker, 1987). AVE reflects the overall amount of variance in the indicators accounted for by the latent construct, and an AVE of 0.50 or above is deemed acceptable (Fornell and Larcker, 1987). As shown in Table 2, the factor loading value of each item is higher than 0.63 ($0.632 \sim 0.849$) and significant at the 0.001 level, the CR values of constructs range from 0.786 to 0.836 and the AVE values range from 0.540 to 0.641, indicating a satisfactory convergent validity.

Discriminant validity is the extent to which the measure is not a reflection of other variables (Lee et al., 2007). We compared the shared variances between factors with the AVE of the individual factors to assess the discriminant validity in this study. Table 3 gives the inter-construct correlations and the square roots of the AVE values. This table shows that the square roots of the AVE values are higher than their shared variances, representing good discriminant validity.

To evaluate whether or not the measurement model can explain the actual observed data, our study assessed the measurement model in terms of eight different indices: the ratio between Chi-square and degrees of freedom (χ^2/df): standard root mean-square residual (SRMR): root mean square error of approximation (RMSEA): goodness of fit index (GFI): adjusted goodness of fit index (AGFI): normed fit index (NFI): comparative fit index (CFI): and Tucker-Lewis index (TLI). As shown in Table 4, all actual fit indices are within the recommended level. The measurement model is appropriate.

Two tests were also conducted to examine the Common Method Variance (CMV). First, we conducted a Harman's single-factor test (Podsakoff et al., 2003). The results show that the largest variance explained by individual factor is 34.79 percent (< 50 percent). Therefore, none of the factors can explain the majority of the variance. Secondly, we modeled all items as the indicators of a factor representing the method effect and re-estimated the model (Malhotra et al., 2006). The results indicate a poor fitness, for example, the RMSEA is 0.122 (>0.08): SRMR is 0.0948 (>0.05): and NFI is

Table 2. Descriptive statistics and convergent validity.

Constructs	Items	Mean	Standard deviation	Factor loading	Cronbach's alpha	CR	AVE
Perceived task-technology fit	TTF1	4.735	1.568	0.767	0.828	0.832	0.623
	TTF2	4.426	1.666	0.844			
	TTF3	4.652	1.444	0.754			
Perceived usefulness	PU1	5.316	1.398	0.783	0.825	0.826	0.544
	PU2	5.217	1.376	0.683			
	PU3	5.293	1.366	0.759			
	PU4	5.276	1.322	0.721			
Perceived ease of use	PEOU1	4.350	1.348	0.763	0.836	0.842	0.641
	PEOU2	4.263	1.169	0.837			
	PEOU3	4.247	1.080	0.800			
Perceived risk	PR1	3.613	1.593	0.704	0.794	0.802	0.577
	PR2	3.283	1.368	0.849			
	PR3	2.991	1.337	0.717			
Confirmation	EC1	4.371	1.686	0.789	0.791	0.793	0.561
	EC2	4.431	1.478	0.731			
	EC3	4.763	1.516	0.726			
Satisfaction	SAT1	4.689	1.450	0.819	0.820	0.823	0.540
	SAT2	4.578	1.373	0.783			
	SAT3	5.101	1.219	0.632			
	SAT4	4.601	1.475	0.691			
Continuance intention	CI1	4.829	1.591	0.816	0.786	0.790	0.557
	CI2	4.346	1.427	0.687			
	CI3	5.115	1.445	0.730			

Table 3. Discriminant validity.

	Perceived task-technology fit	Perceived usefulness	Perceived ease of use	Perceived risk	Confirmation	Satisfaction	Continuance intention
Perceived task-technology fit	**0.789**						
Perceived usefulness	0.554	**0.738**					
Perceived ease of use	0.228	0.485	**0.801**				
Perceived risk	−0.371	−0.572	−0.258	**0.780**			
Confirmation	0.588	0.637	0.238	−0.567	**0.749**		
Satisfaction	0.481	0.615	0.200	−0.547	0.674	**0.735**	
Continuance intention	0.537	0.586	0.209	−0.581	0.675	0.599	**0.746**

Note: All correlations significant at $p < 0.001$. Diagonal elements are the square roots of AVE.

0.638 (<0.9). The results of both tests indicate that CMV is not a significant problem in our study.

Structural model

As Table 4 shows, the goodness-of-fit of the structural model is comparable to the previous CFA measurement model: $\chi^2/df=1.758$; SRMR=0.041; RMSEA=0.042; GFI=0.932; AGFI=0.912; NFI=0.921; CFI=0.964; TLI=0.957. These fit indices provide evidence of adequate fit between the hypothesized model and the observed data.

As shown in Table 5 and Figure 2, the explained variances of perceived usefulness, satisfaction and continuance intention are 59.2 percent, 53.2 percent and 53.4 percent, respectively. The continuance

Table 4. Fit indices for measurement and structural models.

Fit indices	Recommended value	Measurement model	Structural model
χ^2		343.398	372.722
df		209	212
χ^2/df	<3	1.643	1.758
SRMR	<0.05	0.037	0.041
RMSEA	<0.08	0.039	0.042
GFI	>0.9	0.938	0.932
AGFI	>0.9	0.918	0.912
NFI	>0.9	0.927	0.921
CFI	>0.9	0.970	0.964
TLI	>0.9	0.964	0.957

Table 5. Summary of hypotheses testing.

Hypotheses	Standardized path Coefficients	T-value	P-value	Hypotheses testing
H1: Satisfaction→Continuance intention	0.237	3.311	<0.001	Supported
H2: Perceived usefulness→Continuance intention	0.208	2.613	0.009	Supported
H3: Perceived usefulness→Satisfaction	0.205	2.842	0.004	Supported
H4: Confirmation→Satisfaction	0.436	4.545	<0.001	Supported
H5: Confirmation→Perceived usefulness	0.483	7.048	<0.001	Supported
H6: Perceived ease of use→Continuance intention	−0.070	−1.252	0.210	Not supported
H7: Perceived ease of use→Perceived usefulness	0.333	6.767	<0.001	Supported
H8: Perceived task-technology fit→Continuance intention	0.225	3.601	<0.001	Supported
H9: Perceived task-technology fit→Satisfaction	0.050	0.785	0.433	Not supported
H10: Perceived task-technology fit→Perceived usefulness	0.190	3.077	0.002	Supported
H11: Perceived risk→Continuance intention	−0.287	−4.559	<0.001	Supported
H12: Perceived risk→Satisfaction	−0.153	−2.394	0.017	Supported
H13a: Satisfaction→Continuance intention moderated by gender			0.837	Not supported
H13b: Perceived usefulness→Continuance intention moderated by gender			0.274	Not supported
H13c: Perceived ease of use→Continuance intention moderated by gender			N/A	Not supported
H13d: Perceived task-technology fit→Continuance intention moderated by gender			0.207	Not supported
H13e: Perceived risk→Continuance intention moderated by gender			0.039	Supported

intention to use m-banking is jointly predicted by satisfaction ($\beta = 0.237$, $p < 0.001$), perceived usefulness ($\beta = 0.208$, $p < 0.01$), perceived task-technology fit ($\beta = 0.225$, $p < 0.001$), and perceived risk ($\beta = -0.287$, $p < 0.001$) directly, supporting H1, H2, H8, and H11, respectively. Satisfaction, in turn, is predicted by perceived usefulness ($\beta = 0.205$, $p < 0.01$), confirmation ($\beta = 0.436$, $p < 0.001$), and perceived risk ($\beta = -0.153$, $p < 0.05$). The results provide support for H3, H4, and H12, respectively. In addition, confirmation ($\beta = 0.483$, $p < 0.001$), perceived ease of use ($\beta = 0.333$, $p < 0.001$), and perceived task-technology fit ($\beta = 0.190$, $p < 0.01$) have significant effects on perceived usefulness, supporting H5, H7, and H10, respectively.

The last analysis of the data was performed to determine the effect of gender as a moderator of continuance intention. The results indicate that gender dose not significantly moderate the effects of satisfaction ($\Delta\chi^2$=0.042, $p = 0.837$), perceived usefulness ($\Delta\chi^2 = 1.197$, $p = 0.274$), and perceived task-technology fit ($\Delta\chi^2 = 1.591$, $p = 0.207$) to continuance intention, while the effect of perceived risk to continuance intention is significantly moderated by gender ($\Delta\chi^2 = 4.258$, $p = 0.039$). The detailed statistical figures reveal that the influence of perceived risk on continuance intention is stronger among males than females ($\beta = -0.453$ and $\beta = -0.159$, respectively).

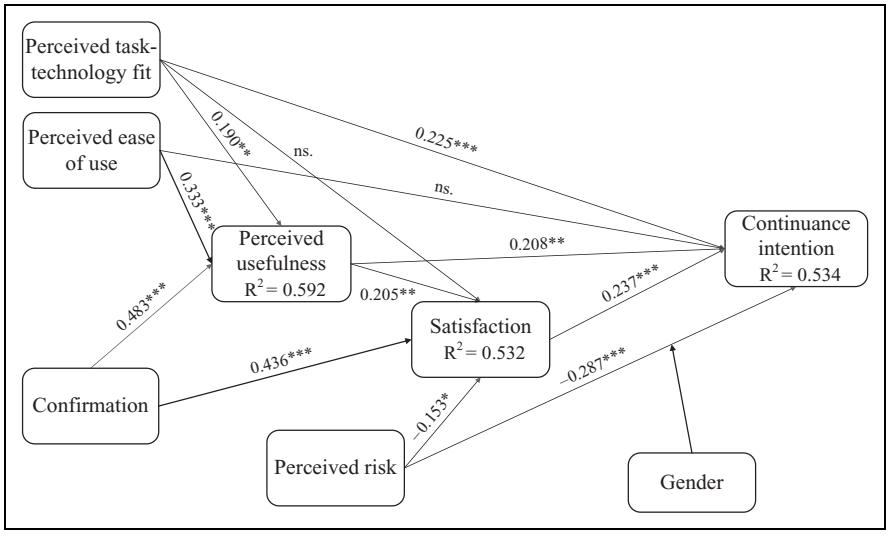

Figure 2. Hypotheses testing results.
Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ns. not significant.

Discussion

The results show that satisfaction is the important predictor of users' continuance intention. The satisfaction-intention link has previously been confirmed in consumer behavior research over a wide range of products and service contexts (Bhattacherjee, 2001a, 2001b; Chen et al., 2012; Zhou, 2013), and its reconfirmation in the m-banking context further demonstrates the robustness of this association. It means that monitoring and improving users' satisfaction with m-banking is an appropriate approach for providers to retain users.

Confirmation is validated to have significant effects on perceived usefulness and satisfaction, which is consistent with previous findings (e.g. Bhattacherjee, 2001a; Lee and Kwon, 2011). Thus, banks should comprehend users' expectations of m-banking, and improve m-banking services based on users' requirements to better meet their expectations. Similarly, perceived usefulness is validated to be the determinant of satisfaction and continuance intention. Users are willing to use m-banking if they find it useful for their work, otherwise, they will switch to traditional or online banking. Hence, banks need to provide new features of m-banking opportunely, provide services accurately and with high speed, and ensure the stability of the system.

Perceived ease of use, an important belief factor determining IS adoption in TAM, is found to have no significant direct effect on continuance intention. This result reflects that users will not continually use m-banking just because it is easy to use. Since the users become increasingly familiar with the operation of m-banking after the initial adoption, whether the m-banking platform is easy to use or not will no longer be the focus of their attention. Even if the providers upgrade the system, users will not be likely to discontinue use for this reason. Therefore, it is accepted that the direct effect of perceived ease of use to continuance intention is insignificant. However, the results in our study do not indicate that an easy-to-use m-banking system is unimportant, for perceived usefulness is affected by perceived ease of use significantly. Due to the constraints of mobile terminals, users may feel it difficult to operate m-banking (Zhou, 2012) and may spend more time and effort on m-banking transactions, which will decrease their perceptions of usefulness. Therefore, it is necessary for service providers to pay more attention to the interface and functions of m-banking. For example, banks may develop m-banking applications to replace wireless application protocol (WAP) based m-banking.

Although the complementarities between TTF and several models focusing on IS initial adoption (e.g. TAM, UTAUT, and TPB) have been confirmed in previous studies, the appropriateness of using TTF to explain continuance intention has not attracted much attention so far. In our study, the results suggest that correlations between TTF and ECM constructs do exist. Perceived task-technology fit strongly affects perceived usefulness and continuance intention. If users perceive

m-banking services are unfit for their tasks, they will perceive these services to be of low usefulness and form low intention to continued usage. Thus, banks may adhere to user-centered principles when providing m-banking services, to better meet the needs of users. For instance, travelers and businessmen who are always on a trip may pay close attention to reliability, security and convenience of m-banking, while younger users may be more concerned with functions and cost. Banks may subdivide users and provide different m-banking services to meet different subgroup's needs, achieving a good task-technology fit. Unexpectedly, the direct effect of perceived task-technology fit on satisfaction is insignificant. The possible reason may be that satisfaction comes from actual use.

Inconsistent with the previous studies focusing on the continued usage of m-banking, the results of our study show that perceived risk has strongly negative effects on satisfaction and continuance intention. The possible reason is that mobile commerce in China has been developing rapidly but is still in its early stages, the level of mobile commerce security needs to be improved, and the m-banking security issue is still the focus of users' attention. If users feel unsafe in conducting m-banking transactions, their satisfaction with and continuance intention of m-banking may be reduced. Thus, m-banking service providers need to improve information security technologies, provide statements of guarantees, help desk, and a certificate, etc., so as to decrease users' perceptions of risk towards m-banking. In addition, appropriate marketing is essential. Banks may demonstrate the safety of their m-banking services via a variety of media (e. g. print, TV, online) and provide guidance for users on how to conduct m-banking transactions properly and safely.

Moreover, our study empirically observes the moderating effects of gender. Unexpectedly, the effect of perceived risk is more salient for men. A plausible reason for this result may be that men are more rational than women. When they feel it is dangerous to conduct transactions, it may be easier for men to no longer use the m-banking services. However, no matter whether the users are male or female, satisfaction is the most important determinant of their continuance intention, and perceptions of usefulness and task-technology fit are also the focus of their concerns. Thus the results showing that gender does not significantly moderate the effects of satisfaction, perceived usefulness and perceived task-technology fit to continuance intention, seem to be acceptable.

Theoretical and practical implications

To our knowledge, this study is one of the very few that has attempted to investigate factors affecting user's continuance intention towards m-banking. The findings of the study have various implications for research. First, the extant studies on m-banking users' continued usage focus on their technology perceptions and rarely take the task-technology fit into account. By incorporating the TAM and TTF into the ECM, our study investigates the users' continuance intention from the perspectives of users' perceptions towards technology and task-technology fit. Secondly, the results which confirm that perceived task-technology fit not only affects continuance intention but also affects perceived usefulness reveal the appropriateness and importance of using TTF to explain continuance intention. Thirdly, by their incorporation in the context of m-banking, our study has broadened the boundaries of the ECM, TAM, and TTF, and has enriched the IS continued usage literature. The whole model provides high explanatory power for users' continuance intention. Future research may consider examining users' continued usage of other mobile services (e.g. mobile SNS; mobile funding) based on our research model.

This study can also articulate implications for practice. First, the results show that perceived risk is the strongest predictor of users' continuance intention, followed by satisfaction, perceived task-technology fit, and perceived usefulness. Thus, guaranteeing the safety of m-banking services is crucial for banks to improve users' satisfaction, and thus form their intention to continue usage. Secondly, we find that perceived task-technology fit has significant effects on perceived usefulness and continuance intention. This indicates that m-banking service providers need to segregate the market and provide personalized services to different user groups. Thirdly, the significant link between perceived ease of use and perceived usefulness suggests that it is necessary for banks to present a user-friendly and easy-to-use m-banking system. Fourthly, the results show that men are more concerned with perceived risk than women. Consequently, banks should adopt different strategies for male and female customers to enhance their confidences that using mobile banking is safe and protected.

Conclusions

Motivated by the need to better understand the motivations and barriers of users' continuance intention towards m-banking, our study builds upon the ECM, TAM, and TTF, and postulates satisfaction, perceived

usefulness, perceived ease of use, perceived task-technology fit, and perceived risk as key beliefs. Satisfaction, in turn, is explained by confirmation, perceived usefulness, and perceived risk. In this study, the measurement model is confirmed with adequate convergent and discriminant validity, the structural model provides a good fit, and most path coefficients in the model are found statistically significant.

Our study suffers some limitations as follows: first, we conducted this research in the eastern provinces of China. It is conceivable that users from other regions or countries may have different attitudes, perceptions, and reactions to m-banking services from those of the users included in this study. We must be cautious when generalizing the findings to users beyond eastern China. Future research across different regions or countries will be encouraged. Secondly, the theoretical model accounts for 53.4 percent of the variance in continuance intention, indicating that some important predictors may be missing. Future research may explore the possible effects of other factors (e.g. familiarity, intimacy) to users' continuance intention of m-banking services. Thirdly, the research was conducted using a short-term snapshot of users' behavior. Actually, users' behavior is dynamic. Future research can adopt a longitudinal study to examine users' behaviors in different time periods and make comparisons, thus giving a clearer picture of users' continued usage.

Appendix A. Scales and items

Perceived task-technology fit

(adapted from Goodhue and Thompson (1995): Zhou et al. (2010)).

TTF1: The functions of m-banking are enough to help manage my personal finances.
TTF2: The functions of m-banking are appropriate to help manage my personal finances.
TTF3: In general, the functions of m-banking fully meet my needs of finance management.

Perceived usefulness

(adapted from Bhattacherjee (2001a, 2001b): Zhou et al. (2010)).

PU1: M-banking improves efficiency in managing my personal finances.
PU2: M-banking improves convenience in managing my personal finances.
PU3: M-banking lets me manage my personal finances more quickly.
PU4: Overall, m-banking is useful in managing my personal finances.

Perceived ease of use

(adapted from Davis (1989): Lin (2011)).

PEOU1: Learning to operate m-banking is easy for me.
PEOU2: It is easy to use m-banking to accomplish banking transactions.
PEOU3: Interaction with m-banking does not require a lot of mental effort.

Perceived risk

(adapted from Kang et al. (2012)).

PR1: I am confidently aware of the risks associated with m-banking.
PR2: M-banking is dangerous for me to use.
PR3: There is a considerable risk involved in participating in m-banking rather than other modes of banking services (e.g. traditional banking, online banking)

Confirmation

(adapted from Bhattacherjee (2001a, 2001b)).

ECT1: My experience with using m-banking was better than what I expected.
ECT2: The functions provided by m-baking were more than what I expected.
ECT3: Overall, most of my expectations from using m-banking were confirmed.

Satisfaction

(adapted from Bhattacherjee (2001a, 2001b)).

How do you feel about your overall experience of m-banking use:
SAT1: Very dissatisfied/Very satisfied.
SAT2: Very displeased/Very pleased.
SAT3: Very frustrated/Very contented.
SAT4: Absolutely terrible/Absolutely delighted.

Continuance intention

(adapted from Bhattacherjee (2001a, 2001b)).

CI1: I intend to continue using m-banking rather than discontinue its use.
CI2: My intention is to continue using m-banking than use any alternative means (traditional banking or online banking).
CI3: If I could, I would like to discontinue my use of m-banking (reverse coded).

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