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Predicting the Intention to Use Mobile Banking in India

Introduction

Information and communication technologies, such as the Internet and wireless technologies, have revolutionised the world. Specifically, the mobile sector in both developed and developing countries is growing enormously. According to a report by the Telecom Regulatory Authority of India (TRAI, 2016), there are 936 million wireless subscribers in India. Moreover, the number of mobile Internet users in India is expected to grow to more than 300 million by the end of 2017 (KPMG, Google, 2016).

To meet customers' expectations, banks now offer a wide range of services delivered through mobile technologies. Mobile banking, which was introduced in India in the late 1990s and early 2000s, is defined as "a channel whereby the customer interacts with a bank via a mobile device, such as a mobile phone or personal digital assistant" (Barnes & Corbitt, 2003). It has considerable potential in developing countries, where customers primarily connect to the Internet through mobile phones. The major advantage of mobile banking is that financial transactions can be conducted anytime and anywhere (Kleijnen et al., 2004; Herzberg, 2003; Rivari, 2006; Laukkanen, 2007). Customers can check account balances, transfer funds between accounts, and make electronic bill payments without traveling to a traditional bank. Mobile banking thus reduces the physical distance between the bank and the customer, helping customers achieve financial inclusion.

There are 18.7 bank branches per 100,000 adults in urban areas of India, whereas this proportion is only 7.8 in semi-urban and rural areas. The number of ATMs in India is just 205,151, which indicates that mobile banking in India has great potential to deliver banking services to an untapped market (RBI, 2016). In rural India, only 5% of the adult population has access to a commercial bank branch and only 40% have bank accounts (India Brand Equity Foundation, 2016). Furthermore, Internet penetration is much less in rural areas in India compared with mobile penetration. It may thus be easier to offer banking services through mobile phones in rural areas, where bank branches are scarce, than through any other delivery channel.

Despite the advantages of mobile banking, few customers actually use these services in India ((Poddar et al., 2016). The surge in the use of mobile wallets from non-bank companies, such as Paytm, also poses competition to banks. According to a survey conducted by Poddar et al. (2016), 21% out of the 32% of customers using online banking use a mobile wallet from a non-bank instead of mobile banking from their own banks. India is presently in a demonetisation wave, with the government of India and the Reserve Bank of India (the banking regulatory authority) encouraging more and more cashless transactions. Cultural settings and economic factors also play a major role in the adoption of mobile banking (Koksal, 2016; Baptista & Oliveira, 2015; Bankole et al., 2011; Ainin et al., 2007; Amin et al, 2006). Hence, the findings of prior studies conducted in different parts of the world can be used as a guide, but they cannot solely explain the current banking climate in India. Indeed, limited research studies have examined the adoption of mobile banking in India (Dasgupta et al., 2011; Ketkar et al., 2012; Kumar et al., 2017), which indicates a need for further research to understand the motivators and inhibitors of mobile banking adoption in the country. To bridge the gap between the high penetration of mobile wallets and the low adoption of mobile banking, we must develop a model that measures the factors leading to the acceptance of mobile banking. The literature points out that the same models or theories, if tested in different economic, political and cultural settings, give different results (Baptista & Oliveira, 2015; Mortimer et al., 2015). Past empirical studies of mobile banking have adapted different theories to study adoption intentions and have showed diverse results, which makes it difficult for bankers and researchers to identify the key drivers and inhibitors of mobile banking adoption. Prior studies have identified that the success of new technology-enabled delivery channels, such as mobile banking, solely depends upon the acceptance of customers (Hanafizadeh et al., 2014; Tan & Lau, 2016; Chaouali et al., 2017). Hence, it is important to study and understand customers' adoption of mobile banking to enhance its diffusion.

Literature Review

Mobile banking is considered the most value-adding and important mobile commerce application available (Baptista & Oliveira, 2015; Malaquias & Hwang, 2016; Chaouali et al., 2017). Laukkanen and Kiviniemi (2010) defined mobile banking as "an interaction in which a customer is connected to a bank via a mobile device such as a cell

phone, smartphone, or personal digital assistant." Mobile banking services allow customers to check account balances, transfer funds between accounts, and make electronic bill payments. They thus have vast market potential because of their always-on functionality and the option for customers to bank virtually any time and anywhere.

Acceptance Models used in Mobile Banking Adoption

Technology adoption is one major areas of focus for information systems (IS) researchers. A variety of theoretical perspectives have been developed to study mobile banking adoption: innovation diffusion theory (IDT) (Rogers, 1995), the technology acceptance model (TAM) (Davis, 1989) and its extensions, unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), and UTAUT2 (Venkatesh et al., 2012). These theoretical models are derived from social psychology theories, such as the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975) and the theory of planned behaviour (TPB) (Ajzen, 1991).

TRA specifies that human behaviour is preceded by intentions, which are formed based on the individual's attitude towards behaviour and on perceived subjective norms. TPB (Ajzen, 1991) is derived from TRA, supplementing the theory with an additional construct called perceived behavioural control, which describes the resources and opportunities required to form behaviour.

IDT (Rogers, 1995) is used to study the characteristics of innovation. The core idea of innovation diffusion is the process through which an innovation is communicated by certain channels over time among the members of a social system. The TAM (Davis, 1989) describes a consumer's willingness to use technology and is derived from TRA (Fishbein & Ajzen, 1975). The TAM is tailor-made for the IS context; it is an intention-based model, relying on behavioural intention to predict usage, that was designed to predict information technology acceptance and usage in an organisation. The TAM comprises five constructs, namely perceived usefulness, perceived ease of use, attitude, intention to use, and actual use.

Venkatesh et al. (2003) integrated elements from eight prominent IS models to develop UTAUT. These eight models are TRA (Fishbein & Ajzen, 1975), TPB (Ajzen, 1991), the TAM (Davis, 1989), decomposed TPB (DTPB) (Taylor & Todd, 1995), the model

of PC utilisation (MPCU) (Thompson et al., 1991), the motivational model (Davis et al., 1992), IDT (Rogers, 1995), and social cognitive theory (SCT) (Bandura, 1986). The four core constructs determining intention and usage are performance expectancy, effort expectancy, social influence, and facilitating conditions. The four moderators used in this model are age, experience, gender, and voluntariness of use. Venkatesh et al. (2012) modified the UTAUT model by adding three constructs, namely hedonic motivation, price value, and habit, dropping the moderator of voluntariness to better suit a consumer context (UTAUT2).

Many studies have been conducted in both developed and developing countries to understand the adoption of mobile banking. These are summarised in the Appendix 1. Most of these studies implemented well-known adoption models, such as the TAM (Luarn & Lin, 2005; Lee et al., 2007; Norzaidi et al., 2011; Jeong & Yoon, 2013; Mortimer et al., 2015; Kumar et al., 2017), TPB/DTPB (Beiginia et al., 2011; Aboelmaged & Gebba, 2013), UTAUT/UTAUT2 (Luo et al., 2010; Bankole et al., 2011; Yu, 2012; Baptista & Oliveira, 2015; Alalwan et al., 2017), and IDT (Khraim et al., 2011; Lin, 2011). A small number used other theories, such as the means-end approach (Laukkanen, 2007), the Bass diffusion model (Suoranta & Mattila, 2004), and TTF (Zhou et al., 2011; Afshan & Sharif, 2016) to identify the core determinants of mobile banking adoption. The extensive review of the literature revealed diverse antecedents to the adoption of mobile banking (Luarn & Lin, 2005; Crabbe et al, 2009; Yu, 2012; Aboelmaged & Gebba, 2013). Studies were carried out in both developing and developed countries; however, a limited number have been conducted in India, specifically in metropolitan cities (Goyal et al., 2012; Rejikumar & Ravindran; 2012; Singh & Srivastava, 2014). These findings are thus insufficient to provide meaningful insights into predicting which factors influence customers' use of mobile banking in India.

Theoretical Model and Hypotheses

The proposed research model is developed based on existing theories, such as the TAM (Davis, 1989) and its extensions, SCT (Bandura, 1986), and UTAUT (Venkatesh et al., 2003). To these the study added constructs, such as trust, security, and perceived financial cost, which are considered to influence mobile banking acceptance (Luarn &

Lin, 2005; Lee et al., 2007; Zhou, 2011; Yu, 2012; Hanafizadeh et al., 2014; Afshan & Sharif, 2016). The bank customer has many alternative digital channels to use than mobile banking where these six constructs play an important role. The study proposes that if the mobile banking is easy to use, customers have the self-confidence to use, if their significant others recommend using, and it is secure, trustworthy channel, and cheaper than other digital channels, more customers will be willing to use mobile banking. These factors were integrated into a conceptual model that has more explanatory power, since these factors are not present in any one single model (Figure 1), which led to the proposed hypotheses for the study.

Perceived Ease of Use

Perceived ease of use is defined by Davis (1989) as "the degree to which a person believes that using a particular system would be free of effort". It is the extent to which a customer believes that a system is easy to learn or use. This construct is similar to the complexity construct used in IDT (Rogers, 1995). Mobile banking technology should be simple and easy for the customer to understand in order to enhance acceptance (Chitungo & Munongo, 2013; Mortimer et al., 2015; Koksal, 2016). In mobile banking, many factors can increase complexity, such as navigation problems, a small screen size, and transaction issues. If the mobile banking service is easy to learn and use, it positively influences the customer's use. Hence, the following hypothesis is proposed:

H1: Perceived ease of use has a positive effect on behavioural intentions to use mobile banking.

Social Influence

TRA and its extensions (Fishbein & Ajzen, 1975) specify that human behaviour is preceded by intentions, which are formed based on an individual's attitude towards the behaviour and perceived subjective norms. Venkatesh et al. (2003) represented subjective norms as social influence, which is derived from theories such as TRA, TPB, DTPB, TAM2, C-TAM-TPB, MPCU, and image in IDT. Social influence refers to an individual's perception of other people's opinions if he or she should perform a particular behaviour. Prior studies of mobile banking adoption have shown a relationship between social influence and intention to use mobile banking (Laukkanen et al., 2007; Amin et al., 2008; Riquelme & Rios, 2010; Puschel et al., 2010; Sripalawat

et al., 2011; Dasgupta et al., 2011; Tan & Lau, 2016). This study investigates whether social influence has any effect on customers' decision to use mobile banking, proposing the following hypothesis:

H2: Social influence has a positive effect on behavioural intentions to use mobile banking.

Computer Self-Efficacy

The origin of self-efficacy is SCT (Bandura, 1986). Self-efficacy expectation is the "conviction that one can successfully execute the behaviour required to produce the outcomes" (Bandura, 1977). Further, "expectations of self-efficacy determine whether coping behaviour will be initiated, how much effort will be expended, and how long it will be sustained in the face of obstacles and aversive experiences" (Bandura, 1977). Self-efficacy belief is extended in IS research; here, it is termed computer self-efficacy, which is defined as one's perception of his or her ability to use a computer (Compeau & Higgins, 1995). In the context of mobile banking, if the customer believes that he or she has the required knowledge, skill, or ability to operate mobile banking, there is a higher chance of attempting to use the service. Through this hypothesis, the study investigates whether a customer has the self-confidence to use mobile banking. Past studies have shown empirical evidence of a causal link between perceived ease of use and self-efficacy (Luarn & Lin, 2005; Wang et al., 2006; Sripalawat et al., 2011; Jeong & Yoon, 2013). The following hypotheses are thus proposed:

H3: Computer self-efficacy has a positive effect on behavioural intentions to use mobile banking.
H3a: Computer self-efficacy has a positive effect on the perceived ease of use of mobile banking.

Perceived Financial Cost

The cost incurred in conducting mobile banking could slow its adoption. In the mobile banking context, cost has been found to be a major barrier to adoption (Yu, 2012; Hanafizadeh et al., 2014; Alalwan et al., 2017). The cost incurred includes the initial purchase price, equipment cost, subscription charges, and transaction cost. Perceived financial cost is the extent to which a person believes that using mobile banking would

be costlier than other options (Luarn & Lin, 2005). Hence, the following hypothesis is proposed:

H4: Perceived financial cost has a significant effect on behavioural intentions to use mobile banking.

Security

Security is a serious concern when conducting financial transactions through electronic channels. Therefore, this could be one of the major barriers to the adoption of mobile banking, as personal or monetary information could be exposed and used for fraudulent activities. Kalakota and Whinston (1997) defined security as "a threat which creates circumstances, condition, or event with the potential to cause economic hardship to data or network resources in the form of destruction, disclosure, modification of data, denial of service and/or fraud, waste, and abuse". Mobile banking also involves greater uncertainty and risk to the customer. In the mobile/wireless environment, security can be categorised as mobile payment-enabling application security, network security, and device security. The security mechanism of mobile banking has a positive effect on intention to use. Through the following hypothesis, the study investigates the impact of security challenges on mobile banking adoption:

H5: Security has a positive effect on behavioural intentions to use mobile banking.

Trust

Trust can be defined as the willingness to make one vulnerable to actions taken by a trusted party based on the feeling of confidence or assurance (Gefen, 2000). Mayer et al. (1995) defined trust as the "trustor's intention to take a risk and proposed the trustor's perception about a trustee's characteristics". Masrek et al. (2012) defined trust in mobile banking as "the belief that allows individuals to willingly become vulnerable to the bank, the telecommunication provider, and the mobile technology after having the banks, and the telecommunication provider's characteristic embedded in the technology artefact". Trust thus plays a significant role in the adoption of mobile banking, helping customers overcome the fears of security/privacy risks and fraudulent activities in the mobile environment (Gu et al., 2009; Zhou, 2011; Afshan & Sharif, 2016). Trust is enhanced by the security mechanisms provided by mobile banking services. Customers

are more likely to trust the new service if adequate security is provided for their transaction data. The following hypotheses are proposed to investigate the causal link between trust and security:

H6: Trust has a significant effect on the behavioural intentions to use mobile banking.

H6a: Security has a positive effect on customer trust to use mobile banking.

Research Methodology

The theoretical constructs adopted in this study were measured by using validated multi-item scales from prior research, adapted through rewording to fit the needs of the current study. Seven-point Likert scales (1 = strongly disagree and 7 = strongly agree) were used to measure all the theoretical constructs, since such scales are widely used in marketing and social science research (Garland, 1991). Reliability and validity tests were conducted to verify the suitability of the adapted scales. Cronbach's Alpha values were used to calculate the reliability of the constructs used in this study, and only those items having a Cronbach's Alpha value of 0.7 or more were used (Hair et al., 2006). To review content validity, the questionnaire in English was then shown to a panel of experts to judge the appropriateness of the scale. The measurement constructs, sources, and Cronbach's Alpha values are listed in Table 1. The survey data were analysed by using SPSS 16.0, and the SEM analysis was conducted by using AMOS 16.0.

The sample frame used in this study was a list of bank customers who have operational bank accounts in any public, private, cooperative, or foreign bank with branches anywhere in India. Due to the unavailability of the entire banking customer list, as well as cost and time constraints related to collecting responses from each individual bank customer, this study used convenience sampling to collect responses to the survey questionnaire. Prior studies of mobile adoption in both developed and developing countries have also used convenience sampling as a method to collect data (Luo et al., 2010; Puschel et al., 2010; Sripalawat et al., 2011; Zhou, 2011).

A total of 1000 questionnaires were distributed through a combination of self-administration and sending e-mails through personal contacts that contained a Google form with the survey via a link embedded in the message. The researchers work in an

educational institution where students come from all states across India. With the help of these students, a hard copy of the questionnaire was distributed across India. The purpose of the study was mentioned in the questionnaire, and participation in the survey was a voluntary decision. Altogether, 875 questionnaires were collected from bank customers (27 were obtained through the Google form), of which 855 were used in the analysis, representing a response rate of 85.5%. The sample size can be considered robust according to the recommendations of Nunnally (1978), as cited by Hinkin (1998). Among the respondents, 68% were men.

To test construct validity, an exploratory factor analysis was conducted by using principal component analysis as the extraction method and varimax as the rotation method. The criterion used to accept items are factor loadings greater than 0.5 (Hair et al., 2006). The results of the factor analysis are presented in Table 2.

Findings

The demographic profile of respondents is presented in Table 3, including their gender, age, education, occupation, and income. The majority of respondents were aged between 20 and 29 years (62.3%). The most common educational qualification was graduate (49.9%), followed by postgraduate (33.3%). The majority of respondents' annual income fell between Rs. 1 lakh and Rs. 8 lakhs (70.9%).

Hypothesis Testing

To test the proposed model, structural equation modelling (SEM) using Amos 16.0 was used with maximum likelihood estimation. SEM tests the hypothesised causal relationships among multiple variables simultaneously and estimates the strength of the interrelationships among latent constructs. The two-step approach recommended by Anderson and Gerbing (1988) was applied in the SEM analysis. The first step is the measurement model, which was examined by using confirmatory factor analysis (CFA) to test the reliability and validity of the measured scale. The second step in the SEM analysis was the structural model, which was used to measure the interrelationships among the constructs, test the hypotheses, and test the proposed theoretical model.

CFA of the Mobile Banking Adoption Scale

The dimensionality of the mobile banking adoption scale was examined by using CFA, assessing the overall validity of the measures to check whether the constructs (i.e. perceived ease of use, computer self-efficacy, social influence, perceived financial cost, security, trust, and behavioural intention to use) fit the data set. CFA was also conducted to examine whether the measurement items of the mobile banking adoption scale loaded in accordance with the pattern revealed in the exploratory factor analysis. The seven factors of the measurement model were measured by using the 22 measurement items (indicators) derived from the exploratory factor analysis. The results of the CFA showed a statistically significant chi-square (χ^2 = 708.824, df = 183, p < 0.001, $\chi2$ /df = 3.873). The model fit indices in Table 4 exceeded the common acceptance level of the fit statistics. Hence, the measurement model adequately fitted the data collected from the mobile banking adoption scale.

After establishing the fit of the measurement model, the next step was to assess the unidimensionality of the constructs and establish the reliability and validity of the mobile banking adoption scale. The factors (constructs) having unidimensionality with the measurement items loaded significantly on the underlying constructs. All the measurement items (indicators) had significant loading onto their underlying constructs (p < 0.01) with the factor loadings varying between 0.5 and 0.922 (Table 5). The unstandardised regression weights were also significant from the critical ratio (C.R.) values above ± 1.96 (Table 5). Hence, unidimensionality was established (Byrne, 2001).

The reliability of the mobile banking adoption scale was assessed by computing the composite reliability (CR) of each of the latent constructs (factors). The value of the composite reliability coefficient is recommended to be above 0.60 (Hair et al., 2006). The composite reliability values obtained for the mobile banking adoption scale, namely computer self-efficacy, perceived ease of use, perceived financial cost, social influence, security, trust, and behavioural intention, were 0.63, 0.83, 0.75, 0.61, 0.65, 0.82, and 0.86, respectively (Table 5), which are all above the cut-off point of 0.60.

The AVE, a measure complementary to composite reliability, reflects the overall amount of variance in the indicators accounted for by the latent construct (Hair et al., 2006). The AVE value of a construct should exceed 0.50 (Hair et al., 2006). From Table

5, it is apparent that the AVE values obtained for the constructs, namely computer self-efficacy (0.68), perceived ease of use (0.81), perceived financial cost (0.74), social influence (0.55), security (0.51), trust (0.63), and behavioural intention (0.76), exceeded the cut-off point of 0.50.

The validity of the measurement model was established by estimating convergent validity and discriminant validity. Convergent validity was estimated by taking the composite reliability and AVE of each construct. Table 5 shows that the composite reliability of all the constructs was above the recommended value of 0.60 and that the AVE of all the constructs exceeded the cut-off point of 0.50 (Fornell & Larcker, 1981). Discriminant validity can be assessed by comparing the shared variance between the constructs and the AVE from the individual constructs (Fornell & Larcker, 1981). Table 6 shows that the shared variance between the factors is lower than the AVE from the individual factors. Hence, discriminant validity is established.

Testing the Theoretical Model

The theoretical model proposed for the study examines the relationship between the dependent variable (behavioural intention to use mobile banking) and the six antecedents, namely perceived ease of use, computer self-efficacy, social influence, perceived financial cost, security, and trust. The model also tests the relationship between computer self-efficacy and perceived ease of use. Another relationship incorporated into the model is between security and trust.

The proposed theoretical model and path coefficients are shown in Figure 2. The R^2 value obtained was 0.769, which means that the six independent variables (perceived ease of use, computer self-efficacy, social influence, perceived financial cost, security, and trust) together explain 76.9% of the variation in the dependent variable. Trust accounts for 11% of the variance explained by security, and perceived ease of use accounts for 35.7% of the variance explained by computer self-efficacy. The individual β values for each independent variable indicate the significance of the variable in the model. The independent variables are suitable explanatory variables if the p-values are less than 0.05, which indicates significance. Figure 1.2 shows that perceived ease of use (β = 0.066, p = 0.022), computer self-efficacy (β = 0.265, p = 0.000), perceived financial cost (β = 0.069, p = 0.004), and security (β = 0.649, p = 0.000) are statistically

significant. Security has the highest influence ($\beta = 0.649$) on behavioural intention to use mobile banking followed by computer self-efficacy ($\beta = 0.265$), perceived financial cost ($\beta = 0.069$), and perceived ease of use ($\beta = 0.066$). Trust ($\beta = -0.036$, $p = 0.135$) and social influence ($\beta = 0.024$, $p=0.586$) are not statistically significant, indicating that these variables do not influence the behavioural intention to use mobile banking.

Discussion

The objective of the present study was to determine the factors that influence the adoption of mobile banking in India. The empirical results identified four factors that influence customers' intention to use mobile banking: perceived ease of use, computer self-efficacy, perceived financial cost, and security. The relationships between these factors and the adoption of mobile banking were specified by H1, H3, H4, and H5. All these hypotheses were supported, indicating that Indian banking customers perceive these factors as most important in their intention to use mobile banking.

The factor of perceived ease of use represents the ease of learning and using mobile banking. The results obtained confirm the significant influence of this factor on customers' intention to use mobile banking. Customers place high importance on a simple, easy-to-use interface on their mobile phone to conduct banking activities.

The significant effects of computer self-efficacy on intention to use mobile banking in this study indicate that customers expect assistance and demonstrations when using mobile banking, since it is a new, technology-focused service for Indian banking customers. To accelerate the use of mobile banking, banks need to concentrate more on helping customers use these services.

One inhibitor of mobile banking adoption found in this study was perceived financial cost. Many banking channels are available to Indian banking customers, such as branch banking, ATMs, and Internet banking. Therefore, customers expect the affordability of mobile banking to match that of other channels.

Security was found to have a significant influence on the adoption of mobile banking in this study. Customers expect banks to strengthen their security mechanisms, especially

over wireless networks, where they expect to have transaction security and privacy protection.

The importance of these four factors was consistent with the findings of previous mobile banking adoption studies conducted in India, as well as in other developed and developing countries (Kleijnen et al., 2004; Laforet & Li, 2005; Luarn & Lin, 2005; Amin et al., 2008; Mallat & Tunaein, 2008; Gu et al., 2009; Koenig-Lewis et al., 2010; Dasgupta et al., 2011; Samudra & Phadtare, 2012; Hanafizadeh et al., 2014).

The research model was found to predict intention to use mobile banking to a statistically significant degree. This study showed that security, computer self-efficacy, perceived ease of use, and perceived financial cost, in that order, influence customers' intention to adopt mobile banking. The study also found that security has a stronger influence on behavioural intention than all the other variables used in the study, demonstrating that security challenges and privacy issues are significant concerns for customers using mobile banking, in line with past studies of mobile banking (Luarn & Lin, 2005; Laforet & Li, 2005; Amin et al., 2008; Crabbe et al., 2009; Norzaidi et al., 2011; Dasgupta et al., 2011; Yu, 2012).

Computer self-efficacy was identified as the second most important factor predicting consumers' adoption of mobile banking. This finding demonstrates that mobile banking remains an emerging channel for Indian banking customers, who are still apprehensive about using this computer-centric method, again in line with previous studies of mobile banking adoption in India (Dasgupta et al., 2011). Overall, the study identified that computer self-efficacy significantly influences perceived ease of use and that security significantly influences trust (see also Luarn & Lin, 2005; Sripalawat et al., 2011).

Meanwhile, the study found that trust and social influence do not play a salient role in predicting intention to adopt mobile banking. One reason for the insignificance of social influence might be that customers prefer to decide on their own financial planning rather than consult friends (Alawan et al., 2017). Additionally, the trust construct may appear insignificant because customers consider banks to be among the most trustworthy institutions. Past studies have also found that trust plays no major role in the adoption of mobile banking (Koenig-Lewis et al., 2010; Koksal, 2016).

The proposed theoretical model explained 76.9% of the variance in the intention to adopt mobile banking, which is higher than the predictive power of other well-known models used in studies of mobile banking adoption, such as UTAUT (56%) (Venkatesh et al., 2003), UTAUT2 (74%) (Venkatesh et al., 2012), the TAM (40%) (Davis, 1989), TAM2 (52%) (Venkatesh & Davis, 2000), TAM3 (53%) (Venkatesh & Bala, 2008), TPB (57%) (Ajzen, 1991), and DTPB (60%) (Taylor & Todd, 1995).

Theoretical and Managerial Implications

For researchers, this study provides a foundation for the further advancement of the acceptance and use of technology. By specifying these relationships, it addresses an important gap in adoption research.

This study helps bank managers focus on initial trust building to facilitate and accelerate the usage of mobile banking. Mobile banking service providers need to adopt technological structures, such as third party security certificates, to enhance trust. Banks should also offer customer services during and after mobile banking transactions. Banks can further encourage customers to use mobile banking by implementing adequate security mechanisms and prompt customer service through which they can engender trust.

The empirical findings of this study can provide guidelines to banks and other financial institutions regarding the key drivers that influence mobile banking usage intention, which are therefore the aspects that will increase usage. For instance, the empirical support of the hypothesis (which specifies the relationship between secure transactions and use intention) suggests that to increase the usage of these services, device manufacturers and service providers should enhance the security features of mobile devices. To enhance customer trust, efforts are required to build relevant policies, regulations, and legal frameworks. Business practitioners must improve their data transmission services and ensure privacy protection for users. Periodic analyses of managerial and technical procedures are also required to protect transaction data and user information.

To attract new customers to these services, customer awareness must rise and technical support must be offered. Indian banks should build a mobile banking system that is easy

to use, as well as one that has a clear explanation of banking services and a simple interface. To increase customers' confidence in the use mobile banking (i.e. self-efficacy beliefs), banks should increase the awareness of mobile banking by uploading online demonstrations or providing usage instructions in the mass media.

The negative impact of the financial cost incurred by using mobile banking can be eliminated by displaying charges on the bank's website. Since mobile banking is relatively new to Indian banking customers, banks should increase awareness among customers with various promotional strategies. Because no significant difference in the intention to use mobile banking exists between different age categories, banks can target all age categories and encourage them to use mobile banking. More banks should start implementing mobile banking services and encourage their customers to use them.

Limitations and Future Directions

This study has some limitations. It did not study the influence of moderating factors, such as the availability of alternative channels, technology readiness, and demographic factors. The demographic factor of gender and age were not added as constructs in the theoretical model, nor was their influence measured in the structural model. The study did not use other independent variables that might predict usage more accurately. Another limitation of this study is that a convenience sample was used that may not be an effective method of representing the entire population. Hence, the results must be interpreted cautiously, especially when generalising.

This study suggests certain directions for future research. First, future research could carry out empirical studies to test and validate the theoretical model. Further conceptual and empirical work might also aim to specify the relationships between other categories of antecedents and willingness to use mobile banking. For instance, future research could focus on antecedents such as technological readiness, mobile interface quality, perceived usefulness, and compatibility and examine their relations to customers' decision to use mobile banking.

Second, this study focused on constructs suitable for mobile banking, which involves monetary transactions. Future research could carry out further conceptual and empirical work to measure customers' perceived service quality and satisfaction level with mobile

banking services. Building trust is also important when adopting mobile banking, since the vulnerability of wireless networks is high. Hence, trust formation in the initial stage, along with continuous trust building, are important topics of future research. Similarly, future research might also investigate the different characteristics of the adopters and non-adopters of mobile services.

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Figure 1: Theoretical Model
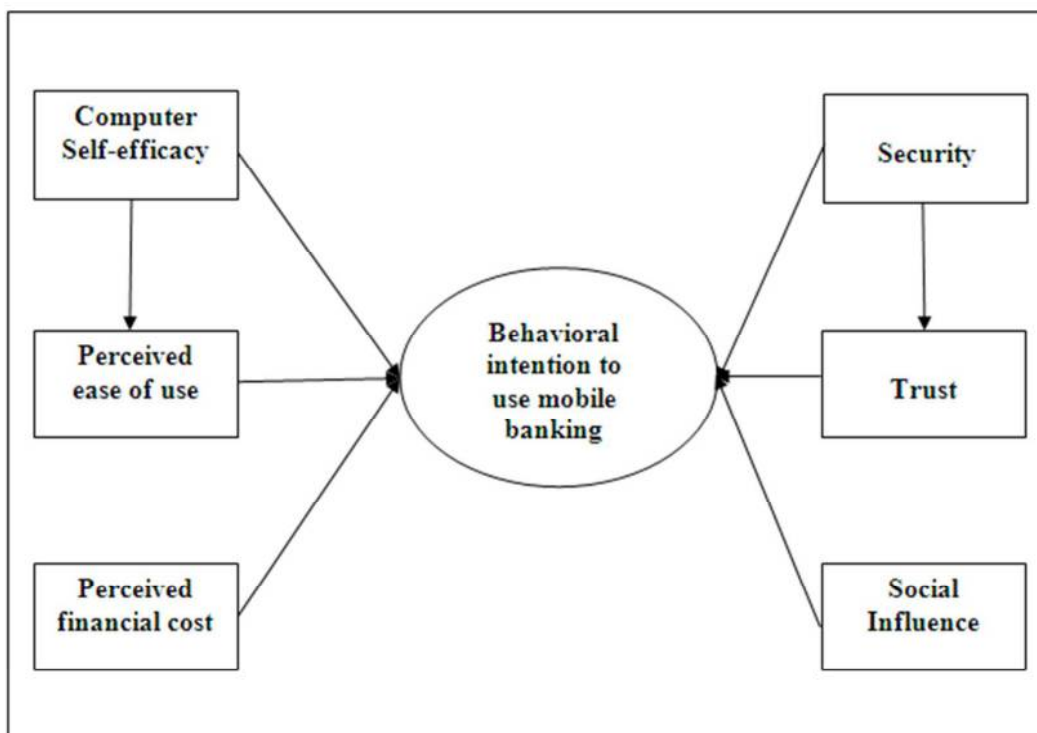
Figure 2: Results of the Mobile Banking Adoption Model

χ^2 =901.955

GFI =0.914 CFI=0.940

RMSEA=0.066

*p<0.05

**p<0.01

***p<0.001

n.s. Insignicant at the 0.05 level

BIU =76.9%

PEOU=35.6%

Trust=11%
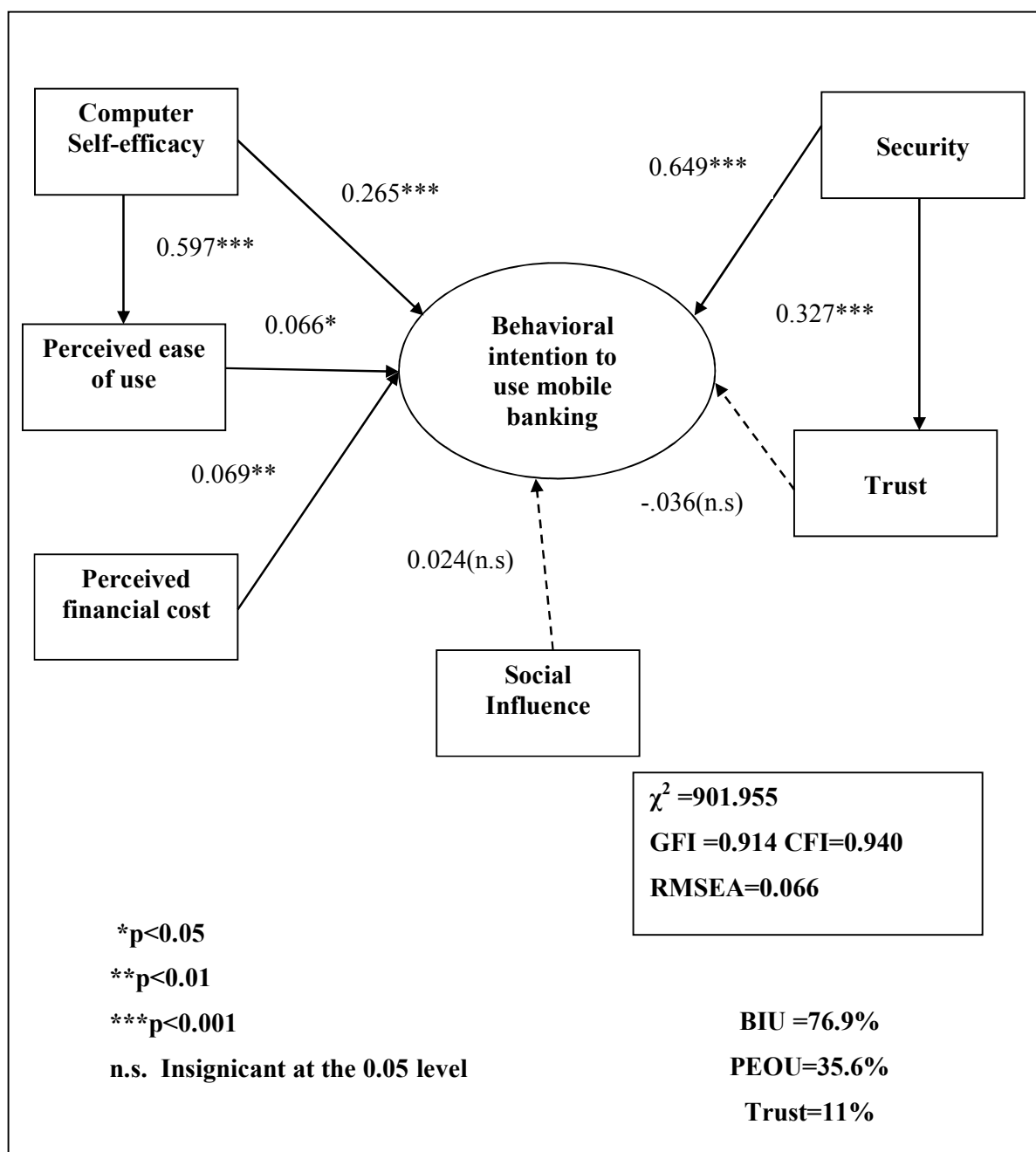
Table 1: Constructs and Their Sources

Construct	Number of items	Source	Cronbach's α
Behavioural intention (BI)	4	Davis (1989), Venkatesh & Davis (2000), Luarn & Lin (2005)	.926
Perceived ease of use (PEOU)	2	Davis (1989), Luarn & Lin (2005)	.895
Social influence(SI)	3	Venkatesh & Morris (2000), Venkatesh et al. (2003)	.780
Computer self-efficacy(CSE)	2	Compeau & Higgins (1995)	.811
Security(S)	4	Mcknight et al. (2002), Khalifa & Shen (2008)	.813
Perceived financial cost(PFC)	3	Luarn & Lin (2005)	.896
Trust(T)	4	Mcknight et al. (2002), Gefen et al. (2003)	.855

Table 2: Factor Analysis

Construct	Item	Factor loading
Perceived ease of use(PEOU)	PEOU1	.863
	PEOU2	.886
Computer self-efficacy(CSE)	CSE1	.762
	CSE2	.789
Social influence(SI)	SI1	.728
	SI2	.709
	SI3	.808

Perceived financial cost (PFC)	PFC1	.898
	PFC2	.909
	PFC3	.892
Security(SEC)	SEC1	.806
	SEC2	.770
	SEC3	.676
	SEC4	.737
Trust(T)	T1	.793
	T2	.882
	T3	.794
	T4	.811
Behavioural intention(BI)	BI1	.813
	BI2	.841
	BI3	.877
	BI4	.873

Table 3: Demographic Profile of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	579	67.7
	Female	276	32.3
Age	Below 20	34	4.0
	20–29	533	62.3
	30–39	152	17.8
	40–49	73	8.5
	50–59	43	5.0
	60 and above	20	2.3
Educational qualification	10th	8	0.9
	12th	74	8.7
	Graduate	427	49.9
	Postgraduate	285	33.3
	Professional	42	4.9
	PhD	17	2.0

	Missing	2	0.2
Profession	Self-employed	103	12.0
	Private Ltd.	311	36.4
	Public Sector	94	11.0
	Multinational Co.	70	8.2
	Any other	5	0.6
	Missing	272	31.8
Income	Up to Rs. 1 lakh	62	7.3
	Rs. 1–4 lakhs	310	36.3
	Rs. 4–8 lakhs	296	34.6
	Rs. 8–15 lakhs	143	16.7
	Rs. 15–50 lakhs	34	4.0
	Above 50 lakhs	10	1.2

Table 4: Fit Indices of the Measurement and Structural Models of Mobile Banking

Fit Index	Cut-off	Measurement model	Structural model
χ^2/df	5	3.873	4.89
Goodness-of-Fit Index (GFI)	>=0.90	0.930	0.912
Adjusted Goodness-of-Fit Index (AGFI)	>=0.90	0.904	0.884
Normed-Fit Index(NFI)	>=0.95	0.941	0.923
Non-Normed Fit Index(NNFI)	>=0.95	0.944	0.924
Comparative Fit Index(CFI)	>=0.95	0.956	0.937
Root Mean Square Error of Approximation (RMSEA)	<=0.07	0.058	0.067

Table 5: Composite Reliability and Average Variance Extracted (AVE) of Each

Factor

Factor	Indicator	Standardised Regression Weights	C.R.	P (Sig. level)	AVE	Composite Reliability
Computer self-efficacy	EOU1	0.843	22.67	***	0.68	0.63
	EOU2	0.809	-----*			
Perceived ease of use	EOU3	0.922	27.09	***	0.81	0.83
	EOU4	0.879	-----*			
Perceived financial cost	PF1	0.865	31.04	***	0.74	0.75
	PF2	0.876	-----*			
	PF3	0.845	30.24	***		
Social influence	SI1	0.777	21.78	***	0.55	0.61
	SI2	0.831	-----*			
	SI3	0.607	17.23	***		
Security	S1	0.5	13.79	***	0.51	0.65
	S2	0.626	-----*			
	S3	0.758	17.96	***		
	S4	0.895	17.77	***		
Trust	T1	0.730	-----*		0.63	0.82
	T2	0.890	23.19	***		
	T3	0.789	19.46	***		
	T4	0.745	20.51	***		
Behavioural intention	BI1	0.840	32.62	***	0.76	0.86
	BI2	0.891	37.08	***		
	BI3	0.880	-----*			
	BI4	0.873	35.97	***		
*** Significant at the $p<0.01$ level						
* Unstandardized regression weights assumed to be 1						

Table 6: Discriminant Validity of the Mobile Banking Adoption Scale

Factor	PEOU	CSE	SI	PFC	SEC	Trust	BI
PEOU	0.81						
CSE	0.33	0.68					
SI	0.25	0.51	0.55				
PFC	-0.001	-0.01	-0.03	0.74			
SEC	0.29	0.37	0.36	-0.03	0.50		
Trust	0.18	0.16	0.09	0	0.08	0.63	
BI	0.30	0.48	0.38	-0.61	0.24	0.09	0.76

Appendix 1

Summary of Studies of Mobile Banking Adoption

Author(s)	Theories adopted	Country	Major findings
Lee et al. (2003)	IDT	UK	Relative advantage, compatibility, perceived risk, and a consumer's previous experience significantly influence mobile banking adoption.
Suronta & Matila (2004)	Bass model of diffusion	Finland	Interpersonal influence, age, and income significantly influence adoption.
Kleijnen et al. (2004)	Extended TAM	Netherlands	Perceived cost, system quality with the moderating variables of age, computer skills, mobile technology readiness, and social influence all contribute to the adoption of wireless finance.
Brown & Molla (2005)	TAM and perceived characteristics of innovation	South Africa	Trialability, compatibility, complexity, relative advantage, and perceived risk significantly influence cell phone banking adoption.
Laforet & Li (2005)	Attitude, behaviour, and motivation	China	Awareness, confidentiality and security, new technology, and past technology experience are factors of mobile banking adoption.
Luarn & Lin (2005)	Extended TAM	Taiwan	Perceived self-efficacy, perceived financial cost, perceived credibility, perceived ease of use, and perceived usefulness significantly contribute to the adoption of mobile banking.

Amin et al. (2006)	Attitude, expectations, and demographics	Malaysia	Attitude is significantly influenced by race, religion, age, and field of study. Expectation is influenced by race, religion, gender, and field of study.
Ainin et al. (2007)	Diffusion of innovation model	Malaysia	Personal innovativeness and demographic factors such as age, gender, personal income, and education significantly influence the adoption of mobile banking.
Laukkanen (2007)	Means-end approach	Finland	Location-free access is the main contributor and display size of the mobile device is the major inhibitor of mobile banking.
Lee et al. (2007)	Extended TAM	South Korea	Perceived usefulness and trust significantly affect mobile banking, whereas perceived risk indirectly influences adoptive behaviour through trust.
Amin et al. (2008)	Extended TAM	Malaysia.	Perceived usefulness, perceived ease of use, perceived credibility, amount of information and normative pressure are significant determinants of mobile banking adoption.
Laukkanen & Pasanen (2008)	Diffusion of innovation model	Finland	Mobile banking innovators and early adopters of online banking are differentiated from other others by only age and gender, while education, income, occupation, and the size of the household are found to be insignificant.
Crabbe et al. (2009)	Extended TAM	Ghana	Perceived usefulness, perceived credibility, perceived elitisation, sustained usefulness, attitude, gender, and education influence intention.
Chung & Kwon (2009)	TAM with moderator variables: mobile experience and technical support	Korea	Perceived usefulness, perceived ease of use and mobile experience are found to be the important determinants of intention to use mobile banking, and technical support acts as a moderator variable between perceived usefulness and perceived ease of use.
Gu et al. (2009)	Extended TAM	Korea	Perceived usefulness, perceived ease of use, and trust influence the intention to use mobile banking.

Lee & Chung (2009)	IS success model	Korea	System quality and information quality significantly influence customers' trust in and satisfaction with mobile banking.
Kim et al. (2009)	Theory of innovation	Korea	Relative benefits and initial trust directly influence intention to use mobile banking, whereas relative benefits, propensity to trust, and structural assurances significantly affect initial trust.
Cruz et al. (2010)	TAM and diffusion of innovation	Brazil	Perception of cost, risk, low perceived relative advantage, and complexity are the main reasons for the reluctance to use mobile banking.
Mohammed-Issa & Twaissi (2010)	TAM	Jordan	Attitude and perceived usefulness have a direct effect on behavioural intention to use mobile banking.
Puschel et al. (2010)	DTPB, TAM, and IDT	Brazil	Attitude and subjective norms significantly affect the adoption intention of mobile banking.
Shen et al. (2010)	Benefit/cost framework	Taiwan	The key benefit of mobile banking is convenience, while security is the key cost.
Laukkanen & Kiviniemi (2010)	Consumer resistance theory	Finland	The effect of information and guidance offered by a bank most significantly decrease usage barriers to mobile banking, followed by image, value, and risk barriers, with the tradition barrier having no effect.
Koenig-Lewis et al. (2010)	TAM and IDT	Germany	Perceived usefulness, compatibility, and risk are significant predictors of the adoption of mobile banking, while perceived cost, perceived ease of use, credibility, and trust are not significant.
Riquelme & Rios (2010)	TAM, TPB, and IDT with gender as a moderator variable	Singapore	Usefulness, social norms, and social risk influence users the most to adopt mobile banking. Ease of use and social norms have a stronger influence on female respondents, whereas relative advantage has a stronger effect on usefulness for male respondents.
Luo et al. (2010)	UTAUT	USA	Performance expectancy and perceived risk have significant effects on the intention to use mobile banking.

Wessel & Drennan (2010)	SST attitude/intention to use model	Australia	Attitude mediated the relationships among perceived usefulness, perceived risk, cost, compatibility, and intention to use mobile banking.
Zhou et al. (2010)	Task technology fit (TTF) and UTAUT	China	Performance expectancy, social influence, task technology fit, and facilitating conditions have a significant influence on adoption of mobile banking.
Bankole et al. (2011)	UTAUT	Nigeria	Culture is the most important factor, followed by utility expectancy and effort expectancy.
Cheah et al. (2011)	TAM and IDT	Malaysia	Perceived usefulness, perceived ease of use, relative advantages, perceived risk, and personal innovativeness influence the behavioural intention to adopt mobile banking.
Zhou (2011)	TAM, IS success model	China	Perceived usefulness and initial trust predict the usage intention of mobile banking.
Beiginia et al. (2011)	TRA, TPB, and DTPB	Iran	DTPB predicts the behavioural intention to use mobile banking better than TRA and TPB.
Norzaidi et al. (2011)	Extended TAM	Malaysia	Perceived usefulness, perceived credibility, and customer awareness have significant relations with intention to use mobile banking.
Khraim et al. (2011)	IDT	Jordan	Self-efficacy, trialability, compatibility, complexity, risk, and relative advantage are significant in influencing mobile banking adoption.
Lin (2011)	IDT and knowledge-based trust	Taiwan	Perceived relative advantage, ease of use, compatibility, competence, and integrity significantly influence attitude, which in turn leads to the behavioural intention to adopt or continue to use mobile banking.
Dasgupta et al. (2011)	Extended TAM	India	Perceived usefulness, perceived ease of use, perceived image, perceived value, self-efficacy, perceived credibility, and tradition all significantly affect behavioural intention towards using mobile banking.
Sripalawat et al.	Extended TAM	Thailand	The adoption factors of mobile

(2011)			banking are subjective norms, perceived usefulness, self-efficacy, and ease of use, while barriers include device barriers, a lack of information, perceived financial cost, and perceived risk.
Yu (2012)	UTAUT	Taiwan	Intention to adopt mobile banking is affected by social influence, perceived financial cost, performance expectancy, and perceived credibility.
Ketkar et al. (2012)	Interpretive structural modelling	India	The enablers of mobile banking are quick updates, time and cost savings, reach of telecom distribution, and need for telecoms to improve customer retention. Its barriers are a lack of need for banking, quality of telecom service reach and reliability, and interoperability among banks and telecoms.
Rejikumar & Ravindran (2012)	Extended TAM	India	The study found strong links among perceived service quality, satisfaction, and continuance intentions, whereas perceived risk significantly influences service quality and continuance intention.
Samudra & Phadtare (2012)	UTAUT	India	Convenience, compatibility, perception, social influence, and information influence mobile banking adoption.
Aboelmaged & Gebba (2013)	TAM and TPB	Dubai	Attitude and subjective norms have a positive impact on mobile banking adoption.
Chen (2013)	Diffusion of innovation theory, perceived risk, brand awareness, brand image.	Taiwan	Innovation attributes, perceived risk, brand awareness, and brand image significantly influence attitude and intention to adopt mobile banking services for frequent users.
Jeong & Yoon (2013)	Extended TAM	USA	Perceived usefulness, perceived ease of use, perceived credibility, and perceived self-efficacy significantly influence behavioural intention to use mobile banking.
Chitungo & Munongo (2013)	Extended TAM	Zimbabwe	Perceived usefulness, perceived ease of use, relative advantage, personal innovativeness, and social norms all significantly influence

			intention towards using mobile banking.
Hanafizadeh et al. (2014)	Extended TAM	Iran	Perceived usefulness, perceived ease of use, compatibility, need for interaction, perceived risk, perceived cost, perceived credibility, and trust explain decisions to adopt mobile banking.
Singh & Srivastava (2014)	Extended TAM	India	Compatibility, social influence, and security influence the adoption of mobile banking.
Mortimer et al. (2015)	Extended TAM	Australia, Thailand	For Australian consumers, perceived ease of use, perceived usefulness, and perceived risk are the determinants of adoption. For Thai consumers, perceived usefulness, perceived risk, and social influence are the factors.
Baptista & Oliveira (2015)	UTAUT2 model	Africa	Performance expectancy, hedonic motivation, and habit influence the adoption of mobile banking.
Tan & Lau (2016)	UTAUT model	Malaysia	Performance expectancy, effort expectancy, perceived risk, and social influence were the factors influencing the adoption of mobile banking.
Afshan & Sharif (2016)	UTAUT, TTF, and ITM	Pakistan	The results of this study showed that TTF, initial trust, and facilitating condition have significant associations with mobile banking adoption.
Kumar et al. (2017)	Extended TAM	India	Perceived ease of use, perceived usefulness, social influence, and trust propensity influence adoption.
Chaouali et al. (2017)	Theory of trying	Tunisia	Intention to adopt mobile banking is determined by attitude, where attitude is determined by attitude towards success, attitude towards failure, and attitude towards learning to use mobile banking. All these attitudes are influenced by general confidence and cynicism.
Alalwan et al. (2017)	UTAUT2	Jordan	Performance expectancy, effort expectancy, hedonic motivation, price value, and trust significantly influence mobile banking adoption.

Appendix 2

Constructs and Measurement Items

Behavioural intention (BI)

BI1. Assuming that I have access to mobile banking systems, I intend to use them.

BI2. I intend to increase my use of mobile banking in the future.

BI3. I will frequently use mobile banking in the future.

BI4. I will strongly recommend others to use mobile banking service.

Perceived Ease of Use (PEOU)

PEOU1. Learning to use mobile banking is easy for me.

PEOU2. I can easily become skilful at using mobile banking.

Social Influence (SI)

SI1. Friends and associates may influence my decision to use mobile banking.

SI2. Mass media (e.g. TV, newspaper, articles, and radio) will influence me to use mobile banking.

SI3. I will use mobile banking if the service is widely used by people in my circle.

Computer Self-Efficacy (CSE)

CSE1. I would conduct my banking transactions using the mobile phone if I have a built-in help facility for assistance.

CSE2. I would conduct my banking transactions using the mobile phone if I had seen someone else using it before trying it myself.

Security(S)

S1. I believe my mobile banking transaction information will not be lost during an online session.

S2. I believe my mobile banking transaction information will only reach the target bank account.

S3. The mobile device has enough safeguards to make me feel comfortable using it to conduct banking operations.

S4. I am comfortable in conducting banking operations on the mobile.

Perceived Financial Cost (PFC)

PFC1. I think mobile banking services are expensive to use.

PFC2. I think mobile banking enabled handsets are expensive.

PFC3. I think mobile banking enabled handsets are expensive.

PFC4. I think the subscription fee to use mobile banking is expensive for me.

Trust (T)

T1. My bank is modern enough to conduct transactions online.

T2. My bank has access to the information needed to handle transactions appropriately.

T3. My bank is open and receptive to customer needs.

T4. My bank takes extra efforts to address most customer concerns.