The Review of Socionetwork Strategies (2020) 14:123–146
https://doi.org/10.1007/s12626-020-00060-7

ARTICLE

Customers' Continuance Intention to Use Mobile Banking: Development and Testing of an Integrated Model

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Received: 8 August 2019 / Accepted: 19 February 2020 / Published online: 4 March 2020

Abstract
Drawing upon the technology acceptance model and trust theory, the present study develops a model to examine the effects of antecedent variables in customers' continuance intention to use mobile banking service channels. Utilizing data from 202 respondents, an integrated approach of PLS-SEM analysis and mediation analysis using Hayes' PROCESS macro in SPSS was employed to test the proposed model. Results revealed that the two constructs perceived ease of use and perceived usefulness from the technology acceptance model (TAM) in conjunction explained 68.9% of the variance in attitude. Results also revealed that attitude and trust were found to jointly explain 50% of variance in continuance intention to use mobile banking. Moreover, 53.2% of the variation in trust was jointly explained by structural assurances and bank's reputation. The mediation analysis from Hayes' PROCESS macro indicated that attitude and trust mediate the relationship between continuance intention and the respective antecedent variables.

Keywords Mobile banking · Continuance intention · Trust · TAM

1 Introduction

The advent of information communication technology and its attendant revolutions has helped banks and other financial institutions provide to their customers the most convenient services. Particularly, the rapid advances in mobile technologies and devices have enabled banks to virtually connect to their clients while providing almost all types of banking services ubiquitously. Thus, mobile banking[1] has offered multiple benefits both for banks and their customers.

[1] Shaikh and Karjaluoto (2015:131) defined mobile banking as "a product or service offered by a bank or a microfinance institution for conducting financial and non-financial transactions using mobile devices".

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Mobile banking services have helped customers access their bank accounts remotely and obtain almost all types of banking services, including checking account balances and lists of latest transactions, electronic bill payments, remote check deposits, and fund transfers between a customer's or another's accounts [35, 53, 54, 58, 73].

For banks, mobile banking reduces the transaction costs of banking services and costs associated with expansions of additional physical branches [6, 24, 51, 52, 61, 91]. In general, the implementation of mobile technology has enhanced services offered by financial institutions to the customer in increasing convenience while it also brings efficiency to the banking industry [74].

Although the use of mobile technology-enhanced services provide multitude of benefits both for banks and customers, retaining initial adopters to continue using the service in this age of fierce competition is a challenge for the service providers. Usually, banks spend a great deal of effort and millions of investment in releasing new mobile banking service platforms with a pointed focus on initial adoption phase. Studies indicate that the cost of acquiring new customers is five times retaining their existing customers [66, 72]. Therefore, it is much costly for banks if customers withdraw from using the service after it has been fully commercialized. Thus, it follows that understanding customers' post-adoption behavior and particularly, the underlying factors influencing customers' intention to continue using the mobile banking service is important for the success of banks' information technology development endeavors. However, customers' continuance intention towards mobile banking services has received less attention in comparison to the plentiful researches conducted on initial adoption. A host of research [5, 8, 74, 78, 91, 92, 94] has been conducted on examining the factors affecting users' initial adoption of mobile banking services. Therefore, paying attention to customers' continuance intention and taking effective measures to retain these users is critical for banks to be successful in digital finance.

Drawing upon the technology acceptance model [25] and trust theory [17], the present study develops a model to examine the effects of antecedent variables in customers' continuance intention to use the mobile banking services. Thus, this study makes three important contributions to the extant literature.

First, most of the previous studies on mobile banking adoption have focused on predicting users' initial adoption which may not provide a guarantee of success for banks in mobile banking investment. Limited studies are available on customers' continuance intention using different models and theories as an orienting lens, and these studies fail to provide a complete picture of users' decision-making process regarding continuance intention in mobile banking.

Specifically, users' perception of trust is an important factor in customers' continuance intention in mobile banking service as the service involves monetary transaction and perception of risk. Recognizing that trust is a key factor in retaining customers in mobile banking that addresses their risk concerns [72], the present study augments TAM with trust theory. Although there have been different theories and models to explain users' intentions and behaviors, perhaps, TAM has also been used as the most powerful and widely used technology adoption model over the past 3 decades. Thus, this research extends previous findings that are mainly based on a single theoretical framework and advances the understanding of mobile

user continuance intention. In doing so, the study is able to provide a comprehensive understanding of the factors that influence customers' decision to continue or discontinue using mobile banking services.

Second, this study offers a direct test of the mediating role of attitude toward and trust of mobile banking services. While attitude is the main mediating variable in TAM, trust is the main mediating variable in trust theory to its antecedents. This study offers a direct mediation test of these variables using PROCESS macro from SPSS [42].

Third, methodologically, this study follows an integrated data analysis approach using SEM-PLS algorithm and mediation test of variables using PROCESS macro from SPSS [42].

2 Literature Review and Hypotheses Development

2.1 Continuance Intention in Mobile Banking

Customers' continuance intention to use mobile banking services has received less attention as compared to the abundant research conducted in initial adoption. Although recently, there has been a growing interest among researchers to understand customers' post-adoption behavior, to date, limited number of studies are available in this specific topic. The findings from these studies show that trust, satisfaction, security, mobility, perceived usefulness, perceived ease of use, task-technology fit and value for money affect customers' continuance intention in mobile banking services [7, 16, 45, 76, 77, 85, 90, 93]. These scholars used different theories and model either separately or by integrating different theories and models to predict users' continuance intention in mobile banking services.

For example, information system success model and flow theory [93], trust and innovation diffusion theories [77], modified technology readiness index (TRI) and extended expectation-confirmation model [45], expectation confirmation model (ECM) [82], trust transfer theory [16], task-technology fit model (TTF), perceived risk and the expectance confirmation model (ECM) [90], technology acceptance model (TAM) and expectation confirmation model (ECM) [76]. These are some of the models and theories used by previous scholars to understand factors influencing customers' continuance intention towards mobile banking services. The following table provides a summary of previous studies in customers' continuance intention towards mobile banking services (Table 1).

In this study, variables from technology acceptance model and trust theory have been integrated to provide a more comprehensive understanding of the underlying factors that affect customers' continuance intention. The TAM and trust theory have been considered in this study for the following reasons.

First, TAM was found to be one of the most influential and powerful models of technology adoption over the past 3 decades compared with other models and demonstrates ample empirical support for its predictive power across different types of technologies and users. It is a general and parsimonious model. Moreover, as its name implies, TAM is designed for IT-specific purpose. In addition, TAM has a

Table 1 Summary of previous studies in customers' continuance intention

Theory/model	Method/s	Author/s	Main findings
Information system success model and flow theory	SEM	[93]	Continuance usage intention of mobile payment is determined by trust, flow, and satisfaction
Trust and innovation diffusion theories	PLS-SEM	[77]	System security, platform reputation, mobility and customization are the antecedents of customers' trust. Customers' trust is positively associated with continuance intention
Modified technology readiness index (TRI) and Extended expectation-confirmation model	SEM	[45]	Satisfaction is the strongest predictor of continuance intentions
Expectation confirmation model (ECM)	PLS-SEM	[82]	PU significantly influences trust, user satisfaction, and continuance use intention
Trust transfer theory	PLS-SEM and CFA	[16]	Trust transfer process positively influences the continuance intention through satisfaction
Technology acceptance model (TAM), Task-technology fit model (TTF), perceived risk and the expectance confirmation model (ECM)	SEM	[90]	Satisfaction, PU, perceived task-technology fit, and perceived risk determine continuance intention
Customer satisfaction and loyalty	PLS-SEM	[85]	Mobile interface usability and service have a positive effect on customer satisfaction
TAM) and expectation confirmation model (ECM)	PLS-SEM	[76]	Satisfaction and PEOU affect different user groups
Integrated privacy and personalization into TAM	SEM	[7]	PU and PEOU affect continuance intention through satisfaction

well-validated psychometric measurement which makes it operationally suitable [20, 21, 27, 62].

In addition, trust is also an important factor, especially in mobile- and electronic-based financial services as the service involves online transaction which involves security concerns. Especially in the context of developing countries where users do not have sufficient experience and technical literacy, trust plays an important role in reducing uncertainty and users' perception of risk.

2.2 Technology Acceptance Model (TAM)

The technology acceptance model (TAM) has been used as a powerful model of technology adoption almost over the past 3 decades. It was originally developed by Fried Davis in 1986 by extending the theory of reasoned action [4] to explain the causal relationship between users' internal beliefs (usefulness and ease of use), attitude, intentions, and computer usage actual behavior [27]. In accordance with this model, attitude toward new technology is jointly influenced by two main first-order constructs: perceived usefulness (PU); the extent to which an individual believes that using a particular technology would improve job performance [26] and perceived ease of use (PEOU); the extent to which an individual believes that using a particular technology or system would be free of effort or would require limited effort [87]. Users will be interested in an information system technology and develop a favorable attitude when they find the system to be useful and easy-to-use for their transaction needs. The TAM also suggests that perceived usefulness is influenced by perceived ease of use as people will recognize its usefulness when the technology is not demanding more effort. Thus, perceived ease of use is known to influence perceived usefulness [59]. Pursuant to these explanations, the following hypotheses are established:

H1: Perceived ease of use will positively influence users' attitude towards mobile banking services.
H2: Perceived usefulness will positively influence users' attitude towards mobile banking services.
H3: Perceived ease of use will positively influence perceived usefulness.
H4. Attitude towards the use of mobile banking has a positive effect on continuance intention.

2.3 Customers' Trust in Mobile Banking Service

Originally coined from the field of social psychology, trust has been interpreted as the belief that one will react in a predictable manner towards an object a person, an event or a situation [60]. It is a faith that the other party will act following the proper behavior of generosity, integrity, and ability [33, 63, 91]. Trust plays an instrumental role in the adoption of information technology and electronic-based services. This is because mobile banking involves uncertainty and perceived risk that are associated with electronic systems and particularly, with mobile device and the telecom carrier. Previous studies in technology acceptance have examined the role of trust

in customers' decision-making process from the perspectives of e-commerce, internet banking and e-banking, and indicated that trust plays an important role in post-adoption behavior [9, 22, 28, 40, 79]. The main premise in trust building is that consumers are more likely to form social ties with their service provider (bank) if they trust them [18]. And thus, institutional trust promotes relationship building and continuous interaction [95].

2.4 Trust and Continuance Intention in Mobile Banking

The relationship between trust and continuance intention to a particular service or product has been a focus of several marketing research works [13, 30, 70]. As customers develop trust in their service provider, they have a tendency to form positive behavioral attitudes and intentions towards the service provider and to the extent that it is impossible for them to disengage from providers [16, 70]. In this regard, it is expected that users that trust their service providers or banks in this case will have favorable intentions towards continuance usage. Therefore, it can be stated that:

H5: A customer who trusts the mobile banking services offered by his/her bank is more likely to continue using the service.
H6: A customer who trusts the mobile banking services offered by his/her bank is more likely to develop a positive attitude towards the service.

In marketing literature, trust has been understood as a derivative construct in which it is affected by antecedent variables. Institutional, personal, and environmental forces were identified as contributing factors to trust building in mobile banking, e-banking and e-commerce services [19, 65].

Several characteristics such as firm's size, capability, integrity, benevolence, structural assurances, and reputation were recognized as among the institutional factors affecting customers trust, whereas trust disposition or propensity to trust has been identified as among the personal factors affecting customers trust building [64, 65]. Moreover, environmental factors, such as situational normality and facilitating conditions, have been found to affect customers' trust in mobile banking service adoption [68].

2.4.1 Reputation and Trust

A firm's reputation is interpreted as a belief, which customers hold that a firm has a good impression of ability, benevolence, and integrity [49]. A firm's reputation has been recognized as one of the antecedents of trust and there exists a strong relationship between trust and a firm's reputation [63, 64]. For example, Kim and Prabhakar [50] indicated that customers preferably rely on the reputation of a firm to assess its trustworthiness. Firms which provide reputable services are more likely to attract and retain customers [36, 84], and conversely providers with a bad reputation usually lose their online transactions from potential subscribers [12]. In the context of mobile banking services, scholars have indicated the importance of platform reputation in fostering customers' trust [77, 93]. It is, therefore, hypothesized as follows:

H7: Reputation positively influences trust of mobile banking service users.

2.4.2 Personal Propensity to Trust

Another important category of factors in trust building is the user personality or the propensity to trust. Trust propensity refers to personal disposition to trust, and reflects a general tendency or inclination in which people show trust or belief in humanity and adopt a trusting stance toward a person, an object or a situation [32]. It reflects a user's natural tendency to trust other people, object or situation [63, 64]. In this context, trust is the disposition of a customer towards the mobile banking service provided by the bank. Individuals' trust propensity has been recognized to significantly affect customers' development of trust to a particular service [56]. The users with high trust propensity tend to have positive attitudes towards new technologies. Thus, they more readily build trust in mobile banking. In contrast, users with low trust propensity may doubt the credibility of mobile banking. Thus, it can be hypothesized that:

H8: Users with high trust propensity are more likely to develop trust towards mobile banking services.

2.4.3 Structural Assurances

Finally, structural assurances that promote trustworthiness of a particular technology. Such as service guarantees and protection against online fraud, hacker attack, and information interception have a significant effect on trust and intention to use a new technology [65, 93]. Structural assurance is the belief that institutional mechanisms or structures such as customer protection policies, technological and legal guarantees, regulations and promises are available to support secured online transactions [33, 63, 64]. Structural assurance enables users to develop confidence in legal and technological structures to ensure that mobile banking is secure [91]. Structural assurance has, therefore, been found to affect users' trust [63, 64]. Users may rely much on these structural assurances to build their trust in mobile banking as there is time and space distance between the service provider (bank) and the customer. When users receive structural assurances from mobile banking service providers, trust will be increased [19, 69]. Correspondingly, Wang et al. [88] and Kim et al. [49] found that structural assurance to be the most significant predictor of trust. Pursuant to these explanations, it can be assumed that:

H9: Structural assurances will positively affect trust in mobile banking services.

2.4.4 The Mediating Role of Attitude and Trust

In the original model of TAM, attitude has been proposed as an important mediator in the relationship between antecedent variables (perceived usefulness and perceived ease of use) and users' behavioral intention. In his original conceptualization of TAM, Davis [26] suggested that when users' attitudes toward an information

system become increasingly positive, their behavioral intention to use the information system increases. Thus, users' attitudes affect their continuance intention to use information technology [2, 14, 83]. Moreover, the theory of planned behavior posits that the more favorable customers' attitudes towards a given behavior, the stronger will be their intentions to engage in the behavior [3] and thus customers' favorable attitudes towards using the mobile banking services should positively affect their intentions to use and continue using the service [55].

H10: Attitude mediates the relationship between users' continuance intention and perceived usefulness
H11: Attitude mediates the relationship between users' continuance intention and perceived ease of use

It has been indicated that trust is a derivative construct which is affected by its antecedent variables (i.e., reputation, structural assurances, and trust propensity). Thus, when we examine the role of trust on continuance intention, it will be considered as an intermediate variable in which the indirect effect of antecedent variables is reflected. As such, it can be stated that:

H12: Trust mediates the relationship between reputation and continuance usage intention.
H13: Trust mediates the relationship between structural assurances and continuance usage intention.
H14: Trust mediates the relationship between trust propensity and continuance usage intention.

Based on the relationships explained so far, it can be seen that both perceived usefulness and perceived ease of use together predict attitude towards continuance usage and both of these variables affect continuance usage intention through attitude. Moreover, trust towards mobile banking service is predicted by its antecedents (i.e., reputation, structural assurances, and personal propensity to trust) and in turn, these three antecedent variables indirectly affect continuance intention through trust. Finally, it has been indicated that attitude mediates the relationship between customers trust and continuance intention to use mobile banking services. Based on these relationships, the following conceptual model has been developed to be tested and verified in this study.

3 Methods

3.1 Research Setting and Data Collection

This study was conducted in Bahir Dar city, one of the metropolitan cities in Ethiopia and one of the twelve cities that was conferred the UNESCO Learning Cities Award 2015. Five commercial banks, which were pioneers in mobile banking services in Ethiopia, have participated in this study. The survey data were collected over a period of 2 months between February and March 2019 from customers of

Table 2 Characteristics of respondents

Variables	Category	Number	Percent
Gender	Male	155	76.7
	Female	47	23.3
Education	Secondary school	14	6.9
	Diploma	20	9.9
	First degree	128	63.4
	Master's degree and above	40	19.8
Income	< 5000ETB	72	35.6
	5000–10,000ETB	68	33.6
	10,000–20,000ETB	48	23.8
	20,000–30,000ETB	8	4.0
	> 30,000ETB	6	3.0
Occupation	Government employee	117	57.9
	Employed at private company	30	14.9
	My own business	15	7.4
	Student	33	16.3
	Unemployed	7	3.5
Mobile banking channels	CBE Birr	123	60.89
	CBE android app	26	12.87
	CBE-889	45	22.28
	Hibir mobile app	2	1.0
	Abay Bank-812	3	1.49
	United Bank-811	1	0.49
	Awash mobile wallet	1	0.49
	Unreported	1	0.49

commercial banks who used different types of mobile banking channels. Customers who were users of either USSD-based mobile banking service or android app-based channels were contacted for the survey. These customers were active users of mobile banking services who were found to use the service at least once a week. With the help of two data collectors, customers were physically approached to complete the survey questionnaire while waiting in banks' lobby area and from large shopping centers. From the dispatched 250 questionnaires, a total of 202 usable responses were successfully returned, thus indicating a response rate of 80.8%. This sample size satisfies the requirement that sample size should at least equal to ten times the maximum number of structural paths pointing at a latent variable anywhere in the PLS path model [57]. Hair et al. [38] also recommended that a sample size between 200 and 400 for structural equation modeling is ideal to produce a reliable estimate. Thirty-three responses were discarded from analysis, because 12 responses were given same values for most of the questions and the remaining 21 contained several missing values and other 15 questionnaires were not returned at all. The summary of respondents' profile is presented in the Table 2 below.

The demographic statistics presented in Table 2 below indicate that male respondents (76.7%) were more than female (23.3%) and 63.4% of the respondents were found to have completed their first degree. The level of income for most of the respondents (33.7) was between 5000 and 10,000 Ethiopian Birr followed by 23.8% with an income level of 10,000–20,000 Ethiopian Birr. Most of the survey respondents were government employees (57.9%) and 60.9% of the total respondents were users of CBE Birr mobile banking. Most of the respondents were from commercial bank of Ethiopia. This is because commercial bank of Ethiopia is the largest bank in the country with a total of 1441 physical branches.

3.2 Measurement of Variables

Initially, items to measure each construct were taken from the works of previous researchers. The items were slightly adjusted to the specific applications of mobile banking services. Accordingly, trust propensity, structural assurance, and trust were measured using a five-point Likert scale [49]. Items for measuring perceived usefulness, perceived ease of use, attitude and continuance intentions were adapted from [55] with the same five-point Likert scale.

4 Results

An integrated approach of PLS-SEM analysis and mediation analysis using Hayes' PROCESS macro in SPSS was employed to test the proposed model. The PLS-SEM algorithm was initially applied to test direct effects of independent variables in the proposed model using two-step methods: Beginning with the reflective measurement model to examine the reliability and validity of the instrument, followed by analyzing the structural model [38].

In this study, the partial least squares (PLS) method was used to analyze the study, because PLS is a better method for estimating cause and effect relationships in complex business research in comparison to covariance-based estimation like maximum likelihood method [37]. As compared to covariance-based estimation approaches, like maximum likelihood, PLS does not use a model for explaining the covariance of all indicators rather it minimizes the variance of all dependent variables, based on the parameter estimates obtained [23]. PLS is recommended as it is prediction based and can provide better prediction accuracy, in highly complex models and is more flexible [80].

Because of large number of paths and mediators in the model, PLS- SEM is considered suitable for this research. PLS-SEM is also less restrictive on the sample size and data distribution [29, 47]. PLS estimation requires ten times the largest number of structural paths directed at a particular construct in the model [86] and the sample in this study meets the necessary conditions for using PLS estimation. Furthermore, the bootstrapping method with bias-corrected confidence estimates was employed with the help of PROCESS macro integrated with SPSS to test the mediating effects of intermediate variables [42].

4.1 Assessment of the Measurement Model

Before the estimation process, the items' reliability, internal consistency, discriminant validity, and convergent validity of the measurement model were examined to make sure that they meet the requirements [89]. Indicator reliability was first checked by examining the outer loadings for all items of latent variables, and was found to satisfy the minimum threshold [39]. as indicated in Table 3 below.

Second, internal consistency reliability was assessed using Jöreskog's [48] composite reliability values. Thus, composite reliability values for all the constructs were shown to be between 0.869 and 0.956, indicating high levels of internal consistency [10].Threshold level of 0.60 or higher was indicated by previous researchers to demonstrate a satisfactory composite reliability level [57]. Third step was assessing the convergent validity to see if the construct converges to explain the variance of its items. The average variance extracted (AVE) is the recommended measure used for evaluating a construct's convergent validity for all items on each construct [31]. AVE threshold level of 0.5 was suggested as evidence of convergent validity [11]. Thus, all the study variables exceeded this level as indicated in Table 3 below.

Fourth, discriminant validity was assessed to measure the extent to which a construct is empirically distinct from other constructs in the structural model. The Fornell–Larcker criterion [31] is a recommended approach to assess discriminant validity mostly applied in PLS-SEM. It is suggested that the square root of average variance extracted (AVE) of each latent variable should be larger than the latent variable correlations (LVC) for discriminant validity satisfy the requirement. Table 4 clearly shows that discriminant validity is met for this research.

Finally, as to the measurement model, the model fit criteria proposed for partial least square structural equation models were estimated. Currently, the two most frequently implemented model fit criteria for PLS path modeling are standardized root mean square residual (SRMR) and the Bentler–Bonett index or normed fit index NFI [43]. As a result, SRMR of the path model in this study was found to be 0.064 for the saturated model and 0.075 for estimated model. Similarly, NFI was estimated to be 0.927 for the measurement model and 0.894 for the estimated model. Threshold values for SRMR < 0.08 [44] and NFI > 0.90 [15] were recommended as indicators of good model fit and the model fit for the study is acceptable as indicated in Table 5 below.

All the results above for the measurement model demonstrate that the model has good indicator reliability, internal consistency, convergent validity, and discriminant validity, good model fit and it can be assumed that the constructs from the model are statistically distinct and can be used to estimate and test the structural model.

4.2 The Structural Model

After examining the measurement model, the next step was evaluating PLS-SEM results for the structural model. Standard assessment criteria which were estimated for the structural model include the statistical significance and relevance of the path

Table 3 Reliability table

Constructs	Items	Loadings	Alpha	CR	AVE
Attitude	I think that using mobile banking is a good idea	**0.909**	**0.939**	**0.956**	**0.845**
	I think that using mobile banking would be a wise idea	**0.936**			
	I think that using mobile banking is pleasant	**0.924**			
	In my opinion, it is desirable to use mobile banking	**0.906**			
CI	I would like to use mobile banking services more often in the future	**0.887**	**0.829**	**0.898**	**0.746**
	I intend to continue using mobile banking if my banks offer the service	**0.922**			
	If I could, I would like to continue using mobile banking services	**0.775**			
Trust Prop	I do not use new Technologies(R)	**0.909**	**0.924**	**0.951**	**0.867**
	I avoid the use of new products like mobile banking (R)	**0.955**			
	I am cautious with the financial transactions I execute	**0.928**			
PEU	I have been able to easily use mobile banking services	**0.859**	**0.921**	**0.944**	**0.809**
	Mobile banking service is easy to use	**0.901**			
	I have easily learned how to use mobile banking	**0.912**			
	I found mobile banking service clear to use	**0.925**			
PU	I think that using mobile banking would enable me to accomplish my tasks more quickly	**0.864**	**0.851**	**0.910**	**0.771**
	I think mobile banking is useful	**0.871**			
	Overall, I think that using mobile banking is advantageous	**0.898**			
Reputation	My bank is known for its suitability	**0.780**	**0.833**	**0.888**	**0.666**
	The services my bank provides are of great quality	**0.797**			
	My bank is a secure institution	**0.838**			
	I trust my bank	**0.846**			

Table 3 (continued)

Constructs	Items	Loadings	Alpha	CR	AVE
SA	My banks mobile banking service has a Client Protection Policy	**0.621**	**0.796**	**0.869**	**0.627**
	My personal mobile phone information is secure when I use the Mobile banking service	**0.821**			
	I do not incur in the risk of personal information theft using mobile banking	**0.892**			
	I do not incur in the risk of financial losses using mobile banking services	**0.807**			
Trust	Trst1: Mobile banking seems dependable	**0.849**	**0.854**	**0.911**	**0.774**
	Trst2: Mobile banking seems secure	**0.875**			
	Trst3: Mobile banking seems reliable	**0.900**			
	Trst4: Mobile banking was created to help the client	**0.805**			

SA structural assurance, *PEU* perceived ease of use, *PU* perceived usefulness, *CI* continuance intention

Table 4 Fornell–Larcker criterion

Constructs	Attitude	CI	PEU	PU	Reputation	SA	Trust	Trust Prop
Attitude	**0.919**							
CI	0.696	**0.864**						
PEU	0.764	0.662	**0.900**					
PU	0.729	0.584	0.727	**0.878**				
Reputation	0.628	0.504	0.645	0.612	**0.816**			
SA	0.555	0.573	0.585	0.562	0.619	**0.792**		
Trust	0.695	0.563	0.666	0.628	0.615	0.616	**0.880**	
Trust Prop	0.101	0.135	0.040	0.130	0.142	− 0.044	0.129	**0.931**

The square root of AVE values is shown on the main diagonal; non- diagonal elements are the latent variable correlations (LVC)

SA structural assurance, *PEU* perceived ease of use, *PU* perceived usefulness, *CI* continuance intention

Table 5 Fit summary

Criteria	Saturated model	Estimated model
SRMR	0.064	0.075
d_ULS	1.668	1.837
d_G	0.838	0.955
Chi-square	985.152	1022.093
NFI	0.927	0.894
RMS_{Theta}		0.160

Table 6 Summary of hypothesis testing results for direct effects

Paths	Hypotheses	Coefficients	T-statistics	*p* values	Decision
PEU—Attitude	H1	0.376	3.600	0.000	Accepted
PU—Attitude	H2	0.271	2.875	0.004	Accepted
PEU—PU	H3	0.727	13.821	0.000	Accepted
Attitude—CI	H4	0.566	7.417	0.000	Accepted
Trust—CI	H5	0.183	2.013	0.044	Accepted
Trust—Attitude	H6	0.286	4.061	0.000	Accepted
Reputation—Trust	H7	0.386	4.514	0.000	Accepted
Trust prop.—Trust	H8	0.007	1.719	0.086	Rejected
Structural ass.—Trust	H9	0.416	5.251	0.000	Accepted

PEU perceived ease of use, *PU* perceived usefulness, *CI* continuance intention

coefficients, the coefficient of determination (R^2), and the blindfolding cross-validated redundancy measure of predictive relevance (Q^2). The results of these tests are discussed below.

Table 6 below presents the results of path analysis. As illustrated, seven out of eight structural model relationships proposed for estimating the direct effects were

significant, confirming the various proposed hypotheses. The PLS structural model results depicted in Table 6 below indicates that the strongest effect PEU on attitude ($\beta = 0.376$, $p < 0.001$) followed by PU ($\beta = 0.271$, $p < 0.001$) confirming that both hypotheses 1 and 2 were accepted. Furthermore, perceived ease of use was observed to have a significant effect on perceived usefulness ($\beta = 0.727$, $p < 0.001$) supporting that hypothesis 3 was accepted. The PLS model estimation also revealed that trust has strong relationships with structural assurance ($\beta = 0.416$, $p < 0.001$) followed by reputation ($\beta = 0.386$, $p < 0.001$) confirming that both hypotheses 7 and 9 were accepted. On the other hand, trust propensity did not show a significant relationship with trust indicating that hypothesis 8 was not accepted. Finally, the outcome variable intention to continue has strong relationship with the intermediate variables; attitude ($\beta = 0.566$, $p < 0.001$) followed by trust ($\beta = 0.183$, $p < 0.05$) indicating that both hypotheses 4 and 5 were accepted. Trust was also found to significantly affect attitude ($\beta = 0.286$, $p < 0.001$) thereby supporting hypothesis 6 (Fig. 1).

The assessment of coefficient of determination (R^2) indicated that attitude was jointly predicted by perceived usefulness and perceived ease of use. From the PLS estimation diagram (see Fig. 2), the overall R^2 is found to be a strong one.

Threshold value of 0.25, 0.5 and 0.7 are often used to describe a weak, moderate, and strong coefficient of determination [39]. In this study, it was found that the two constructs PEU and PU can jointly explain 68.9% of the variance of the endogenous construct attitude as shown inside the circle of the attitude construct in the PLS diagram (see Fig. 2). The same model estimation also revealed the R^2 for other latent construct; attitude itself and trust are found to jointly explain 50% of the variance in continuance intention. Moreover, 53.2% of the variation in trust was jointly explained by structural assurances and bank's reputation. Finally, perceived ease of use explained 52.8% of the variation in perceived usefulness.

To assess the predictive relevance of the model, Stone–Geisser Q^2 (predictive relevance) [34, 81] was examined. Q^2 reflects how well the observed values are reproduced by the model and its estimated parameters. Q^2 values were greater than 0, which is indicative of predictive relevance. In this model, Q^2 values for attitude, continuance intention, trust and perceived usefulness were found to be 0.542, 0.345, 0.361 and 0.382, respectively, indicating predictive relevance.

4.3 Mediation Analysis

In this study, the effects of each independent variable from both technology acceptance model and trust theory were examined through mediators: attitude and trust to continuance intention to use mobile banking service channels. Thus, mediation analysis was performed with the help of SPSS PROCESS macro developed by Hayes (2013) by testing the mediating role of attitude between its antecedents and continuance intention and between antecedents of trust and continuance intention. The process was tested with the help of the bootstrapping method recommended by Preacher and Hayes [71] and thus used 5000 bootstrapping samples with a 95% confidence interval (CI).

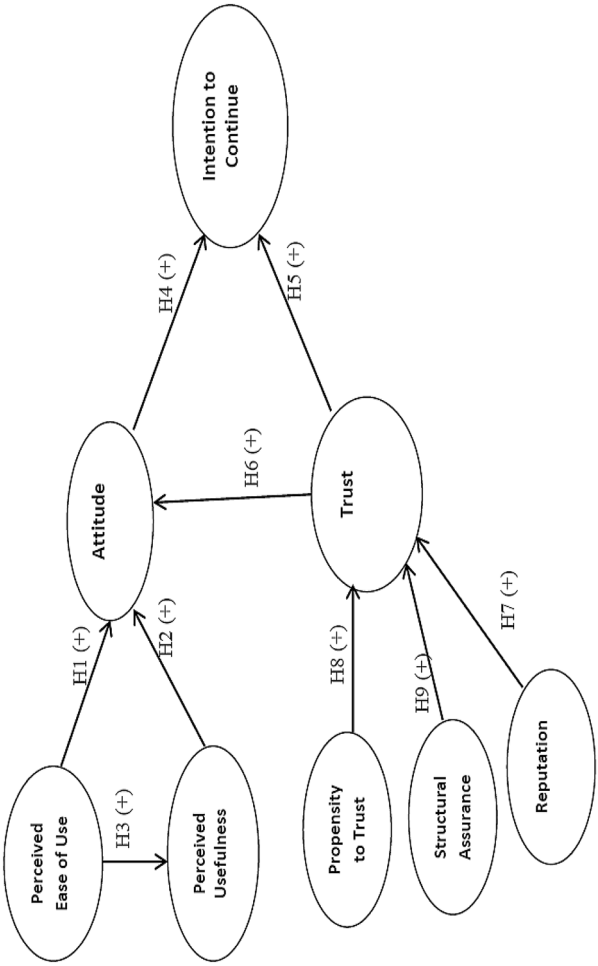

Fig. 1 Conceptual framework

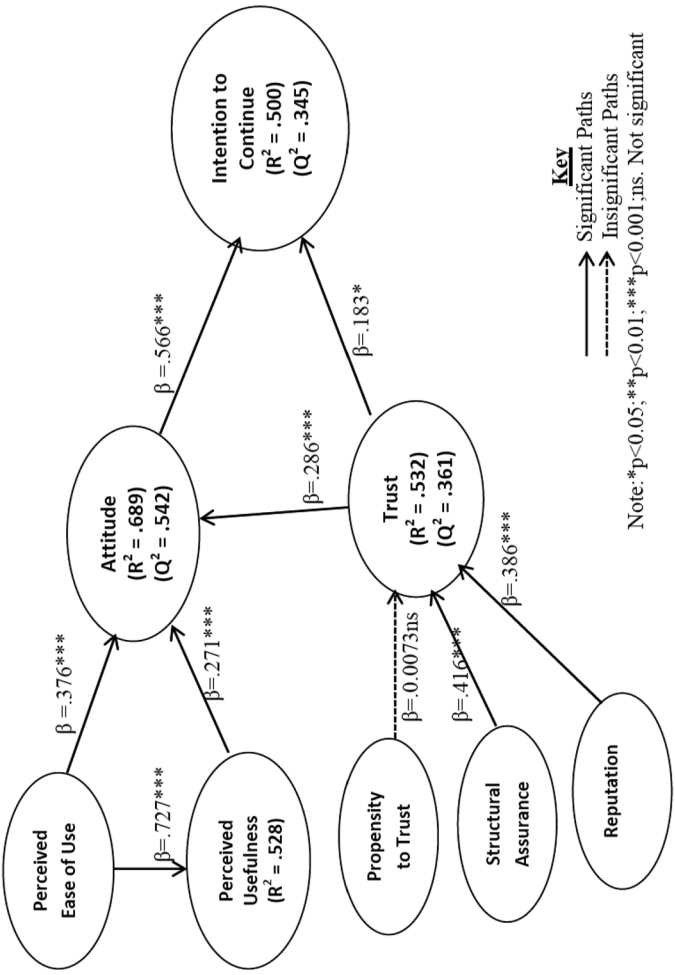

Fig. 2 Hypothesis testing result

Table 7 Result of mediation analysis

Path	Hypotheses	Indirect effect(s) of X on Y				Direct effect *p* value	Decision	Mediation
		Effect	BootSE	BootLLCI	BootULCI			
PU—Attitude—CI	H10	0.1572	0.0733	0.0393	0.3203	0.4688	Accepted	Full
PEOU—attitude—CI	H11	0.2115	0.0689	0.0824	0.3520	0.0003	Accepted	Partial
Trust—Attitude—CI	H11	0.3860	0.0743	0.2423	0.5343	0.0026	Accepted	Partial
Structural ass.—Trust—CI	H13	0.1731	0.0588	0.0749	0.3095	0.3049	Accepted	Full
Trust prop—Trust—CI	H14	0.0221	0.0144	− 0.0016	0.0548	0.0458	Rejected	–

Level of confidence for all confidence intervals in output: 95.0000. Number of bootstrap samples for percentile bootstrap confidence intervals: 5000

The results demonstrated that the effect of perceived usefulness on intention to continue through attitude was positive and significant ($\beta = 0.1572$, SE = 0.0733, $p < 0.05$) as the upper and lower bounds of the 95% CI did not include zero [upper bound CI = 0.3203; lower bound CI = 0.0393] confirming that hypothesis 10 was accepted. This result further demonstrated that the effect of perceived usefulness on continuance intention through attitude is in favor of full mediation as its direct effect on intention is not significant.

The relationship between perceived ease of use and continuance intention was also mediated by attitude as it is demonstrated in Table 7 below ($\beta = 0.215$, SE = 0.0689, $p < 0.05$) and [upper bound CI = 0.3520; lower bound CI = 0.0824]. However, this relationship demonstrates only a partial mediation as the direct effect of perceived ease of use on intention is significant ($p < 0.05$) and this also suggested the acceptance of hypothesis 11. The result further demonstrated that attitude partially mediated the relationship between trust and continuance intention ($\beta = 0.3860$, SE = 0.0743, $p < 0.05$) and [upper bound CI = 0.5343; lower bound CI = 0.2423] confirming that hypothesis 11 is accepted.

Similarly, it is confirmed that the effect of bank's reputation and structural assurance on continuance intention through trust were also positive and significant, thus demonstrating full mediation for both variables: Bank's reputation ($\beta = 0.1357$, SE = 0.0440, $p < 0.05$) and [upper bound CI = 0.2309; lower bound CI = 0.0572] and structural assurance ($\beta = 0.1731$, SE = 0.0588, $p < 0.05$) and [upper bound CI = 0.3095; lower bound CI = 0.0749]. This supported that both hypotheses 12 and 13 were accepted. The indirect effect of trust propensity on continuance intention through trust was not significant as the upper and lower bound confidence intervals include zero and thus hypothesis 14 was not supported.

5 Discussion

This study was designed to test an integrated model of customers' continuance intention to use mobile banking services. Variables from the technology acceptance model were augmented with variables from trust theory to gain a more comprehensive understanding of the underlying factors responsible for customers' continuance intention towards mobile banking services.

The study further examined the indirect relationship that exists between antecedent and outcome variables through mediation analysis. The result from PLS-SEM analysis supports supported most of the proposed hypotheses.

The result showed that perceived usefulness and perceived ease of use jointly influenced customers' attitude to continuance intention. The result from the mediation analysis indicated that attitude mediates the relationship between perceived usefulness (full mediation) and perceived ease of use (partial mediation) and continuance intention which is similar with the later research conducted on TAM that attitude may play a central mediating role for technology usage [1, 46]. Hayes [41] PROCESS macro analysis also indicated that trust has mediated the relationship between two of its antecedents (structural assurance and bank's reputation) and behavioral intention. This is in line with the study by Shao et al. [77] claiming that reputation is the second most significant antecedent of customers' trust. Consistent with this study it was confirmed that trust, in turn, is positively and significantly associated with continuance intention.

The finding in this study also revealed that structural assurance has strongest effect on users' formation of trust which could increase continuance intention in mobile banking [67]. Consistent with the findings by Shao et al. [77], the result confirmed that bank's reputation is significantly affects trust, whereas personal propensity to trust has an insignificant effect on trust. In line with the same study, trust directly affects customers' continuance intention in mobile banking.

Generally, the present findings reinforce the validity of the TAM model in explaining customers' adoption of mobile banking services. However, TAM only presents half of the picture as it does not account for the role of trust in customers' continuance intention in mobile banking services. Trust is likely to be a critical factor in a mobile banking context, where customers are required to operate their bank accounts from their mobile devices. To account for this phenomenon, the present study augmented TAM with trust theory. By incorporating trust, the study was able to explain greater portion of the variance in continuance intention in mobile banking services. For example, a study by Albashrawi and Motiwalla [7] using TAM constructs through satisfaction indicated that the model was able to explain only 45.9% of the variance in intention to continue using mobile banking services. However, the present study account for 50% of the variance in continuance intention, which represents a considerable improvement in the explanatory power of TAM.

6 Conclusion and Policy Implication

As financial institutions are at the avenue of evolving financial technology, they invest substantial amount of money in releasing alternative technologically enhanced services, including mobile banking. However, introducing mobile banking services by itself would not help banks to win the competition in this era of financial technology. Banks need to traverse the extra mile to retain initial adopters, as well as need to attract more additional users for their mobile banking services. Thus, understanding the critical factors that influence users' intention to continue using mobile banking services is critical. This study integrates two powerful models from the technology adoption literature to provide a more comprehensive view of the underlying factors that influence customers' intention to continue using mobile banking service channels. The substantive outcome of this research is that it provides a broader view of the underlying factors and their complex intersecting relationship. As indicated in the discussion, the finding revealed that perceived usefulness and perceived ease of use from the technology acceptance model (TAM) and structural assurance and bank's reputation from trust model theory were significant in affecting the intermediate variables' attitude and trust, respectively. Moreover, the finding showed that both attitude and trust independently mediate the relationship between continuance intention and the respective antecedent variables except trust propensity.

From theoretical perspective, this research has investigated the combined effect of technology acceptance model and trust theory on users' intention to continue using mobile banking services. Although technology acceptance model has been widely used in predicting users' decision-making regarding adoption of mobile banking services and other information systems, using a single framework could not provide a complete understanding of the underlying factors. Thus, this study augmented the technology acceptance model with trust theory and provided a more powerful prediction than has been found using the technology acceptance model alone. From managerial perspective, the finding gives an insight into financial institutions, especially banks, to focus on building trust on their mobile banking services to retain their customers and gain a return on their investment in technology.

7 Limitation and Future Research Implications

Although this study provided a broader conceptualization of customers' continuance intention in mobile banking, considerations have to be taken with regard to its limitations. First, future researchers may consider a larger sample size than considered in this study and examine if there exists a deviation from this finding. Second, the finding for this model might be different in other contexts. Hence, it is worth doing if future researchers extend this model to other contexts particularly in terms of location to see cross-cultural differences. Finally, most of the

studies in technology adoption have been conducted with the consideration of a single model or theoretical framework, while a plethora of models and frameworks have been developed. It is imperative to consider the different models and underlying variables from these models to provide relatively a more complete view of factors contributing for customers' continuance intention.

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