Perception and prediction of intention to use online banking systems: An empirical study using extended TAM

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ABSTRACT

Online banking has become a vital instrument for delivering quality and easily reached banking services at the lowest possible time with ensuring affordability both for customers and service providers. Although this banking has huge potentials and benefits, the successful adoption of online banking remains a significant challenge in the context of an emerging economy like Bangladesh. The purpose of this empirical study is to investigate the factors influencing the online banking services adoption in Bangladesh by using the extended Technology Acceptance Model (TAM) with government support and risk factors. A questionnaire survey method was used to collect data from 380 banking customers. To analyse the collected survey data and test the set of hypothesis, a structural equation modelling (SEM) method was used with the help of SmartPLS3 package. The results illustrate that some key factors such as,(i) perceived ease of use, (ii) perceived usefulness, (iii) attitude towards use, (iv) government support positively influence the intention to use as well as the intention to use positively impact on intention to continue to the adoption of online banking services. However, the relationship between risk and intention to use was statistically insignificant. Finally, the findings may assist banking professionals and programmers to develop and design successful policies regarding online banking services to boost this service industry in the future.

Introduction

It is not something new to the use of information technology (IT) applications by companies to develop their organizational outcomes. As stated by Saffu (2008), The decade from 1998 to 2008 was characterized by the proliferation of electronic-commerce in industry. The banking sector acquires e-commerce facilities known as e-banks and online banking. Turban, King, Lee, and Viehland (2002) highlighted the advantage of online banking including cost reductions, increased business growth, shortened lead times and more personalized customer services. Gurău (2002) reported that at present more than thousands of e-banking websites are available across the globe. Digital banking has been introduced in many advanced economies (Pikkarainen, 2004). There is also a growing trend of online banking adoption (hereafter, OBA) from developing countries. It was reported from the database of Statista statistics on the trend of penetration of online banking, 2012, more than 30% of internet users visited websites regarding online banking purposes worldwide. Regional statistics on internet banking penetration for 2014 indicate that a low penetration percentage (only 32 per cent of internet users) exist in the Asia-Pacific region. Therefore, from the context of developing and emerging economy who are out of the sphere of online banking, have the prospect to fascinate the number of internet users. By considering the significance of OBA, it has become part of an ongoing stragegic research project in Bangladesh.

"Banking is essential; banks are not" by Bill Gate (2008) which means with a view to attracting new users the traditional banking system will be replaced by the electronic banking system. Through adopting new technologies and bringing their clients nearer to the bank, the banks can provide better clients services reported by the banking industry. Banks having expensive branch networks enjoy the maximum incentive benefit to ensure quality e-banking services.

Nowadays, most of the banks in Bangladesh are using online banking and innovation related technologies to provide better financial services in daily activities. Online banking offers improved convenience and customer services such as easy access, safe transactions, and options for 24-hour banking. This provides smooth routine operations of banking transactions instead of lengthy monthly statements. This also facilitates easy banking activities and save time. Al-Somali, Gholami, and Clegg (2009) and Alsajjan and Dennis (2010) specified that banks could enhance the satisfaction level of bank clients and its overall performances by availing the potential benefit of online banking facilities.

Nevertheless, although at present modern banking systems are available around the globe, online banking remains a novel concept in Bangladesh with a low rate of customer adoption because the traditional banking system does not permit bank clients' personal communication with bank representatives to solve their problem. Therefore, customers who do not feel comfortable with this modern banking system avoid online banking. Hence, it is badly needed to understand the factors influencing OBA in the context of Bangladesh to design strategies and to ensure the successful introduction of this system and to continue its usages.

Factors affecting the acceptance of customers related to OBA have been studied by the previous researchers (Daniel, 1999; Howcroft, 2002; Kolodinsky Jane, 2004; Littler & Melanthiou, 2006; Pikkarainen, 2004). Mols Niels (1999) stated that Consumer acceptance is more influenced by the spread of electronic banking than by offerings by the seller. The interpretation and assessment by consumers of electronically provided services are not sufficiently understood. (Ibrahim Essam, 2006; Lee, 2005) have also pointed out that it is needed to do more research for assessing the impact of electronic-services on the performance of that services and behavioral intention to use. Therefore, by considering these situations more advanced analysis is required to better understanding of the behavioral intention of OBA enthusiastically.

Bangladesh has been developing IT infrastructure and undergoing a digital transformation since Digital Bangladesh's 2021 vision was proposed in 2008. As a result, the importance of OBA has become an integrated part of digital Bangladesh. According to the report of (Allen & Craig, 2016) 2019, present internet users are 93.70 million in Bangladesh, but most of them are unfamiliar with the online banking system. Thus, banking systems in Bangladesh have enormous opportunities to explore OBA. Nonetheless, for the inauguration and usage of the new system, it is urgent to accept it by the users. Consequently, this study examines the influencing factors for users' acceptance of OBA as well as continuous usage in Bangladesh.

Previous literature suggests that different researchers studied behavioral intentions (BI) to adopt the technology by using various theories and models. Besides, Bagozzi (2007) recommend that Technology Acceptance Models (TAM) is more suitable to examine the influencing factors of using new technology. Moreover, there are some other vital factors such as Government support and risk should be taken into consideration to study the OBA. Therefore, this study aims to fill this gap by extending the TAM by including the said factors.

The specific research objectives are:

- To explore whether self-efficacy, Quality of m-Apps and System Reliability have an impact on Perceived Ease of Use that attitude towards use.
- To examine whether social influence and responsiveness, have implications for Perceived usefulness that attitude towards the use
- To investigate whether Government Support and Risk have an impact on intention to use and intention to continue.

Especially in the context of a developing economy the study would enhance the existing theory-based OBA studies and reveals the key factors that influence the intention and continue to use these services. Therefore, it is one of the leading work spreading out the TAM model by incorporating two constructs, risk and government support, the model built in this study represents a substantial enhancement for TAM. The model provides a better understanding of the factors that contribute to the success of OBA, specifically for an emerging economy like Bangladesh.

In addition to the theoretical contribution, the banking experts, online banking systems developer, high officials of bank and banking service provider would be beneficial by the study. The result and findings of the survey indicate future approaches and methods to encourage the implementation of OBA in a broader way. To conduct further research related to OBA and banking services, the results and analysis can be used. Based on the study findings, managers and decision-makers of banks in Bangladesh can formulate strategies to offer better online banking services and encourage their clients for using the online banking system compared to the conventional banking system. In order to achieve the above mentioned objectives, the following specific research questions are given below:

- How do online banking service customers adopt online banking services in the context of Bangladesh?
- What are the key determinants of intention to adopt online banking services and its influence on intention to continue this service?

The remaining of the study contains more seven sections. Section 2 explores the review of the existing literature regarding information system and OBA. Section 3 portrays the theoretical framework followed by hypothesis development. Section 4 elucidates Research Methodology. Section 5 discusses the data analysis and results. Section 6 presents a discussion and conclusion. Section 7 offers the implication of the research. Finally, sections 8 highlights the limitations and scope of future research.

Literature Review

Online Banking

Nowadays, for business strategies, most of the business organizations have responded through the implementation of electronic business to a competitive situation. Through using internet technologies, banks changed the way to provide better financial services virtually (Wang, 2003). Ikram Ullah, Zahid, and Safeer Ullah (2017) reported that most of the Asian countries are involving in online banking services, and the consumers are also adopting online banking for their financial transactions. They also highlighted that throughout Asia, branch usages has been dropped by 27 % and usages of online banking has been increased by 35% during the last couple of years.

Shih (2004) stated that the online banking system is an innovative information system that uses Internet resources to carry out practical financial activities. For example, it empowers bank clients to diffuse different banking dealings using the website of the bank (Tan & Teo, 2000) Therefore, now, online banking clients can get traditional banking services. An excellent addition of online banking system is "one-stop service and information unit" that provides a massive advantage for the customers and banks as well (Tan & Teo, 2000). Therefore, consumers of Asian countries make 25% of their purchase decisions using online tools (Sengupta, Lam, & Desmet, 2014)

Alike conventional banking system, online banking works the same way. The critical difference is that customers can access their accounts and get other financial services without going to the bank physically. In the arena of e-commerce for the long-term survival of banks, Online banking platforms can be vital fundamentals. (Liao, Shao, Wang, & Chen, 1999) reported that the market of online banking is expected to propagate expressively over the following years to take competitive benefits.

Technology Adoption Models (TAM)

In terms of technology adoption, one of the most common models is the Technology Acceptance Model (TAM) specially in the context of the consumer. Bagozzi (2007) recommend that Technology Acceptance Models (TAM) is more suitable to examine the influencing factors of using new technology. He also identified that perceived usefulness and perceived ease of use are key influencing factors to consider the attitude towards using the technology.

Davis, Bagozzi, and Warshaw (1989) stated that Perceived usefulness as "the degree to which a person believes that using a specific system would improve the performance of his or her job". Therefore, bank customers will use online banking system if they feel it brings benefits and improves efficiency (Rao, Metts, & Monge, 2003). Davis et al. (1989) also define that perceived ease of use is "the degree to which the prospective adopter expects a free effort to transfer and use the new technology adopted". Therefore, bank customers will use online banking system when they feel it is easy to use and hassle-free. Jeyaraj, Rottman, and Lacity (2006) reported that TAM is extensively used since 1989. Nevertheless, various research identified that TAM itself is not adequate to enlighten the verdict of user's technology adoption. TAM is used as a basic model and extend it by adding more construct to the model based on the study. Such as Kamarulzaman (2007) in the study of internet shopping used TAM with adding personal and perceptive variables. Lavenja and Hatammimi (2015) discussed in the study of Factors Affecting the Intention to Reuse Mobile Banking Service also used TAM with adding perceived credibility, customer awareness and social influence. In addition, Amin (2007) perceived credibility and information on mobile credit card added to extend the basic TAM in the study of mobile card usage intention. In the same way, different constructs have been used with the basic TAM model in the research field of online banking.

On the other hand, many researchers also tried to associate different technology adoption model with TAM. Mauro (2007), in the online banking study in Brazil, used basic TAM with the Innovation Diffusion Model and TAM2 extension. However, in the research of technology adoption, the combination of TAM with another model known as the Innovation Diffusion model.

Why Extended TAM Model?

Our study will also use TAM as the primary model based on existing reviews and adds other two constructs that are more pertinent for the OBA studies in Bangladesh. The purpose of the model is to focus on factors unique to Bangladesh, i.e. the government support and the risk factors due to the unclear internet laws and regulations in Bangladesh.

The overall internet usage in Bangladesh is a very satisfactory level comparing to other South Asian countries except for India. Nonetheless, most of the users do not understand the laws regarding security and privacy issues which will affect the using of internet banking. The factors of government support and risk on consumer safety and privacy are to some extent dissimilar from the studies in various developed nations. For example, comparing to different developed nations, the government of Bangladesh plays a critical role in planning economic decision. Moreover, most of the area of the countryside of Bangladesh still do not have good internet connections due to lack of adequate technology in related infrastructure.

Unlike many developed nations with clear laws and policies online transactions, these issues in Bangladesh remained unclear. The authors, therefore, believe that it is essential to the study whether government support of Bangladesh can impact the OBA, as Yee-Loong Chong (2008) claimed that many other countries confirmed that IT policies of government could impact the growth of IT and adoption of new technology. It is also essential to examine, just like many internet technologies, whether risk factors related to security and privacy issues can influence OBA.

On the other hand, customers tend to seek assistance with online banking website usage to perform particular transactions and tasks regardless of their internet usage experience. Research shows that many mature bank clients try to use internet banking but then drop out due to deception. (Mattila, 2003). These deceptions primarily stem from the inadequate training given to customers by bank staff to use the Internet banking system. Adequate user-friendly presentations may decrease these user-defined constraints within the website itself. Mattila (2003) Stated that the pre-education and presentations could help users to navigate through web pages frequently cited as cryptic and perform tasks conveniently. Ege Oruç and Tatar (2017) claimed three key factors such as benefits of Internet Banking, communication and convenienc significantly impact customers' usage of Internet banking.   Finally, the last but not the least risk is also a significant influencing factor to explore the behaviour of online consumer. Cheng, Lam, and Yeung (2006) in their study, found that crime can occur without physical contact in the online arena. If an unauthorised person can access a user's online banking portfolio, a large amount of financial data may be jeopardised and significant financial losses may occur. Factors that are related to other threats, including financial, economic, system, development, political, legal, reputation, supply chain, and enforcement risk, are also influenced. Now risk has also been considered to be the most significant factor in the adoption of technology.

Thus, the study uses basic TAM considering two key variables of TAM, which are Perceived Usefulness (PU) and Perceived Ease of Use (PEU) and extends TAM by adding Government support and Risk. The authors believe that the said factors will play a significant role to influence the verdict of OBA and intention to continuous usage of it in Bangladesh.

Research gap in the Online banking adoption research in Bangladesh

Online banking is relatively new thought in Bangladesh. Previously only the foreign banks operating in Bangladesh like Standard Chartered Bank, HSBC, etc provided online banking services. These foreign banks took competitive benefit through the introduction of online banking for the first time in Bangladesh. As result the Domestic commercial banks started to loose their market to these foreign commercial banks. Therefore, they reacted very quickly. A. S. Hasan, Baten, Kamil, and Parveen (2010) addressed significant gaps in existing online banking and landscape awareness. Jahangir, Parvez, and Research (2012) suggest that banks need to develop the belief of system use among their users to attract more users to use online banking system, it won't be enough to introduce an online banking system. They focus mainly on user trust to introduce online banking services for the citizens of Bangladesh. H. Rahman, Uddin, Siddiqui, and Publications (2012) discussed in their study, the new challenges facing online banking are to build and implement the regulation, as it does government, from the view of society, banks and regulatory authorities. (H. Rahman et al., 2012); Md Nur Alam Siddik, Gang Sun, Sajal Kabiraj, Joghee Shanmugan, and Cui Yanjuan (2016b) also indicated that the Government's support is a crucial factor for the growth of online banking in Bangladesh. M. Rahman, Saha, Sarker, Sultana, and Prodhan (2017) advocated government should implement the cyber laws to ensure proper security about customer's information (i.e. Credit card number). They also added that Government should establish proper educational institution to create efficient information technology professionals to support internet banking in Bangladesh. Islam, Salma, and Engineering (2014) showed that commercial banks in Bangladesh need to be aware of the future internet banking risks and present new strategies for the battle against hacking, phishing, harming and other unethical practices. So the risk is also an important variable to adopt online banking in Bangladesh. These factors find the gap between conducting the research regarding OBA in Bangladesh.

Theoretical Framework and Hypothesis Development

Several studies found the dimensions of TAM as reliable and valid to assess OBA (Lai & Li, 2005; Sentosa, Ming, Soebyakto, Nik Mat, & Commerce, 2012). The proposed research model has been portrayed in Figure-1, and the following sub-sections provide a detailed explanation of each construct.
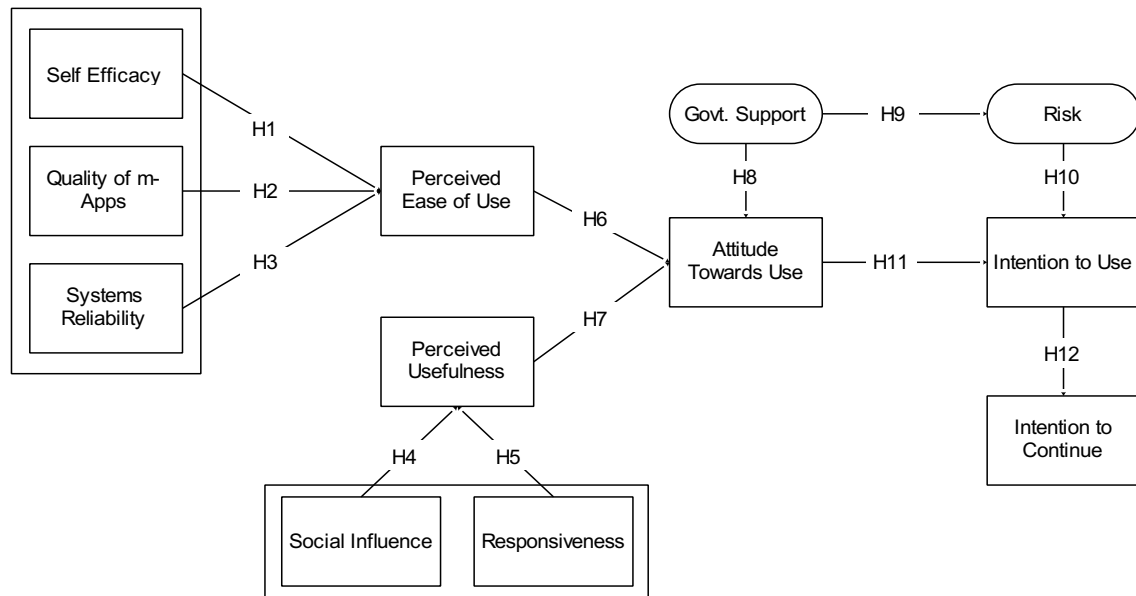
Figure 1: Conceptual Model

Perceived Ease of Use

Self-efficacy is denoted as the outcome of one's aptitude to use the technology (Compeau & Higgins, 1995). Agarwal and Prasad (1999) stated that previous studies had shown the positive relationship between knowledge with information technology, perceived outcome, and intention to use. On the other hand, (Davis et al., 1989); Ndubisi (2003) perceived ease of use refers to how simple and understandable the system interacts, how easy to make the system do what is needed, the psychological strength needed for system interaction and the competence to use the system.

And the quality of m-Apps means that it would be accurate and error-free. While the reliability of these apps affects mobile users ' operating experience, the findings have been verified (V. Venkatesh & V. J. M. q. Ramesh, 2006). Tsai, Chou, and Leu (2011) suggested that industry professionals should enhance the development of mobile websites and offer high-quality websites to improve user involvement. Fogg (2002) found that perceived ease of use is one of the key factors which enhances the perception of system credibility and performance to make the website more reliable. Therefore, based on the works of literature, we proposed the following hypotheses:

H1: There is a significant strong relationship between self-efficacy and perceived ease of use
H2: The relationship between quality of m-Apps of online banking and perceived ease of use is positively associated with the attitude towards the use of online banking.
H3: In the context of attitude towards the use of online banking, there is a significant strong relationship between systems reliability and perceived ease of use.

Perceived Usefulness

Perceived usefulness is "the degree to which a person thinks it could increase his job effectiveness using a certain program" (Davis et al., 1989). Rahi, Ghani, Alnaser, and Ngah (2018) argued that performance expectancy was one of the most significant factors amongst other variables to forecast the intention of user's internet banking adoption. Nonetheless, Early studies by Davis (1985), showed that TAM was imperfect as it did not take into account social influence to adopt and use of new information technology. Davis (1985) also denoted that the value of the construction representing the social influence of compensating the subjective norm. On the other hand, the SERVQUAL questionnaire method stated that responsiveness is the willingness to help consumers and provide prompt service timely. Responsiveness transmits the effective management of inquiries and glitches whenever consumers want the bank's assistance. So social influences and responsiveness play vital role to ensure perceived usefulness. (Gounaris, 2008; Pikkarainen, 2004) in their study claimed that perceived usefulness is one of the key factors for OBA. Based on the different studies, the following hypotheses has been proposed:

H4: There is a strong positive significant relationship between social influence and Perceived Usefulness.

H5: Responsiveness has a significant strong relationship on Perceived Usefulness of online banking systems.

Attitude Towards Use

The TAM model refers to the attitude towards adopting new technology as a building explained by two perceived variables: ease of use and usefulness. This approach is focused on evaluating how systems allow performing tasks faster, escalation productivity, better excellence, and operating competency. several studies conducted in different contexts, the effect of perceived use ease on attitude

was shown (Chau & Lai, 2003; Hernández, 2010). On the other hand, perceived usefulness has also been seen as a perceived relative benefit. Many studies found the direct relationship between perceived usefulness and attitude towards use (Munoz-Leiva, Hernández-Méndez, & Sánchez-Fernández, 2012). Besides these, Tan and Teo (2000) in their study of OBA in Singapore found that government support has a significant impact on the attitude of users adoption of online banking. Md Nur Alam Siddik, Gang Sun, Sajal Kabiraj, Joghee Shanmugan, and Cui Yanjuan (2016a) suggested that Government support in Bangladesh is so crucial for the growth of online banking. Considering these fundamentals, the following hypothesis are formulated:

H6: The relationship between perceived ease of use and attitude towards use was positively associated.

H7: Perceived usefulness has a significant strong relationship with the attitude towards the use of online banking systems.

H8: There is a significant strong relationship between Govt. Support and attitude towards use.

Risk

The risk related to the adoption of technology encompasses the effect of information systems and the environments in which they function on an enterprise and its stakeholders, due to threats and vulnerabilities. Customers will go to adopt online banking willingly when they feel the online banking system is free of risks. They choose to use online banking when they feel secured to use it. Perceived individual security is the robust forecaster of the OBA (Hua, 2009; Polasik, 2009). Namahoot Kanokkarn (2018) showed that service quality, perceived risk and trust influence behavioural intentions to use internet banking. The role of government in establishing a consistent cyber law to enhance the confidence of users in using the online banking system. The government can affect the adoption of new technologies depending on their level of support needed (Tan & Teo, 2000). Based on the above, propose the following hypothesis:

H9: Risk of intention to use of online banking is related to Govt. Support in the developing country context.

Intention to Use

Khan, Khan, and Xiang (2017) in the study of Factors Influencing Consumer Intentions to Adopt Online Banking in Malaysia found that mainly four constructs convenience, trust, perceived ease of use, and perceived usefulness significantly impact on consumer intention to use online banking. Different studies have shown that risk affects the attitudes negatively (Zhou, Lu, & Wang, 2010) and, therefore, intention to use technology (Herrero & San Martín, 2012; Herrero Crespo & Rodriguez del Bosque, 2010). In this study, the risk is a crucial factor to consider the originator of intention to use. Attitude is a significant precedent for the formation of a particular behaviour. Attitude is supposed to promote transactions and reduce obstacles to adopt technology innovation (Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014; Pavlou, 2002). According to the above, the following hypotheses are proposed:

H10: There is a strong relationship between risk and intention to use of online banking systems

H11: Attitude towards the use of online banking systems has a significant relationship to intention to use.

Intention to Continue

Expectation confirmation theory (ECT) suggests that the degree of satisfaction is a significant factor that influences to repurchase or reuse. Through empirical analysis by a combination of TAM and ECT (Bhattacherjee, Perols, & Sanford, 2008) found that the degree of happiness pointedly positively affects the willingness of the users to use. The cumulative positive experience would escalation the effect of user satisfaction on further use (Chiu, Hsu, Lai, & Chang, 2012). Hsiao, Chang, Tang, and Informatics (2016) stated that the degree of satisfaction plays a mediating function between the perceived value and the desired to be used continuously. Therefore, it can be concluded that a high level of satisfaction leads to grow the high level of intention to continue the usage of existing services. Given the above, propose the following hypothesis:

H12: A high level of intention to continue has a positive significant relationship to intention to use of online banking systems

Research and Methodology

The main objective of this study is to identify factors of intention to adopt and use online banking in Bangladesh. The population unit of this study is the banking customers of Bangladesh. The sample was selected from both the customers who are existing users of online banking services and respondents were selected as a minimum of two years' onwards experience in online banking services. We interviewed online banking services using experienced customers, especially those who are using online banking for different types of banking services. Based on the literature, we developed a structured questionnaire. We sent the questionnaire to the academician, i.e. bank risk management expert. Accordingly, the expert tested the questionnaire for justification before collecting data. In the questionnaire, twelve factors were included, in which all the items were measured using 5-point Likert Scale from 1 to 5 with anchors ranging from 'strongly disagree' (1) to 'strongly agree' (5).

The researchers distributed 1000 questionnaires to adopted online banking services experienced customers and requested them in a formal letter to complete the questionnaire within four weeks. To justify the reliability of the questionnaire, primarily 50 collected data were analyzed. The researchers found that the Cronbach's alpha values were above 0.9. Hence, the questionnaire was considered to be reliable, as suggested by (Joseph F Hair, Black, Babin, Anderson, & Tatham, 2006). The researchers collected the distributed

questionnaire into three phases. In the first phase, The researchers collected only 100 questionnaires physically by visiting individual customers. The researchers reminded the rest of them to fill up the questionnaire. In the second phase, another 150 questionnaires were collected and finally, more 150 filled questionnaires were collected. After scrutinizing 421 (40% response rate) responses, the researchers omitted 21 responses due to incomplete information and finally selected 380 questionnaires for analysis purposes. It was found that the response rate was satisfactory. Major online banking service provider's banks were requested by the researchers' to send a letter requesting the respondent to voluntary fill-up the questionnaire for a study purpose. However, to test the proposed research model along with the

developed hypothesis, the researchers used the smart PLS software package along with SPSS 23.0 package. Compared with AMOS and STATA, PLS has some advantages. For example, this package is attuned with a small sample (Chin & Newsted, 1999; Joe F. Hair, Sarstedt, Ringle, & Mena, 2012;Hasan et al., 2019). The PLS is attuned to test the reliability and validity of the theoretical constructs and also able to identify the direct effect and indirect effect (Chang, Chou, Yin, & Lin, 2011). It is easy to build a causal relationship within the factors; factor analysis along with regression analysis can be calculated simultaneously. Hence, the package is appropriate in a research situation where the sample size is limited (Goodhue, Lewis, & Thompson, 2006; Ha, Ahn, & Technology, 2014).

Data analysis and results

Descriptive statistics

Table 1 illustrates the descriptive statistics of the study. About 40% of the total participants were from the age group of (18 to 28) following 29-39 (20%) and one-fourth of the total was under the age group 40-49. Exactly 35% of respondents were participated whose monthly income group within the range from 50000 to 1,00000 in which the number of lowest (200001-Above) and highest (150001-200000) monthly income were both 10% and 45% respectively. It is observed that few respondents from female (30%) and bigger portion were male respondents (70%) also part of the study. In this study, we found graduate respondents were highest (60%) with below graduation (25%) following post-graduation (20%). Most of the respondents were experienced more than 10 years (35%) and the next highest respondents held the experience in online banking of more or less 6 years of were (30%) where the smallest figure fell in the group of online banking in use for 2–4 years.

Table 1: Descriptive statistics of the participants (N=380)

Dimensions	Percentages
Age	
18-28	40
29-39	20
40-49	25
50-Above	15
Income per month	
50000-100000	35
100001-150000	20
150001-200000	45
200001-Above	10
Gender	
Male	70
Female	30
Academic qualification	
Below graduation	25
Graduation	60
Post-graduation	20
Others	5
Experience of M-banking (Years)	
2-4	10
5-7	30
8-9	25
10 and Above	35

Source: Authors' calculation

Control of common method bias

The pitfalls of common method variance may arise due to the self-reported questionnaire and the same respondent of the data sources. Collinearity test is applied to identify the common method bias (hereafter CMB) resulting in variance inflation factors (VIFs). When the VIFs' result is higher than 3.3, it indicates that the model is adulterated by this bias whereas full collinearity tests are equal to or lower than 3.3, the model can be thought free of common. From the following Appendix A, this study point outs that all the values of VIFs are less than 3.3 and indicates the model free of common method bias(Hasan et al., 2019) .

Measurement model

In this study, to validate the measurement model, three types of validity approaches (e.g. content validity, convergent validity, and discriminant validity) were considered (Chou & Chang, 2008). In the first step to test contingency the measurement of the items to the constructs that were assessed by expert's evaluation was used to confirm content validity (Hair et al., 2011) which has been completed this in the pilot study stage. The second step is to evaluate the convergent validity by examining composite reliability (CR) and average variance extracted (AVE)(Chou & Chang, 2008; Hair et al., 2011). Cronbach's Alpha values were used to test internal consistency. All the Cronbach's Alpha values are above 0.70 which indicates the satisfactory level (Nunnally & Bernstein, 1994). If all the outer loading is above 0.70 and average variance extracted (AVE) is higher 0.50 then convergent validity support is found confirmed (Joe F. Hair et al., 2011). In this study, all the outer loadings were higher than 0.70 (Table 2) and values of AVE above 0.50 (find in Appendix A) which satisfy the requirement. Finally, we evaluated the discriminant validity recommended by (Fornell & Larcker, 1981) measuring the square root of AVE. We found satisfactory values of the discriminant validity (Table 3). The square root of all construct was greater than the values of correlation with the involving other constructs. After that, the Heterotrait-Monotraiti Ratio (hereafter HTMT) (Table 4) criteria for each pair of constructs was computed. Nevertheless, considering HTMT0.90 or HTMT inference, the factors confirmed discriminant validity (Henseler, Ringle, & Sarstedt, 2015).

Table 2: Construct Reliability and Validity

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	R Square
ATU	0.811	0.888	0.726	0.560
GS	0.699	0.869	0.768	
IC	0.688	0.865	0.762	0.467
IU	0.672	0.819	0.606	0.556
PEU	0.729	0.847	0.649	0.403
PU	0.731	0.848	0.651	0.380
QMA	0.735	0.883	0.790	
RES	0.650	0.846	0.735	
RIS	0.652	0.851	0.741	0.386
SE	0.646	0.810	0.588	
SI	0.683	0.862	0.757	
SR	0.800	0.909	0.833	

Source: Authors' calculation

Acronyms of the constructs are given in Appendix A

Table 3: Discriminant Validity (Fornell-Larcker Criterion)

	ATU	GS	IC	IU	PEU	PU	QMA	RES	RIS	SE	SI	SR
ATU	**0.852**											
GS	0.559	**0.877**										
IC	0.507	0.515	**0.873**									
IU	0.624	0.610	0.683	**0.778**								
PEU	0.584	0.526	0.465	0.583	**0.806**							
PU	0.729	0.636	0.580	0.635	0.663	**0.807**						
QMA	0.473	0.491	0.430	0.452	0.512	0.469	**0.889**					
RES	0.440	0.400	0.403	0.445	0.538	0.501	0.392	**0.857**				
RIS	0.520	0.621	0.526	0.673	0.507	0.553	0.423	0.401	**0.861**			
SE	0.524	0.386	0.475	0.492	0.490	0.480	0.641	0.406	0.422	**0.767**		
SI	0.543	0.491	0.474	0.517	0.573	0.572	0.541	0.535	0.456	0.509	**0.870**	
SR	0.454	0.430	0.449	0.475	0.574	0.479	0.566	0.334	0.465	0.481	0.624	**0.913**

Source: Authors' calculation

Acronyms of the constructs are given in Appendix A

Table 4: Discriminant Validity (Heterotrait-Monotrait Ratio (HTMT)

	ATU	GS	IC	IU	PEU	PU	QMA	RES	RIS	SE	SI	SR
ATU												
GS	0.741											
IC	0.678	0.743										
IU	0.837	0.879	0.880									
PEU	0.759	0.737	0.657	0.833								
PU	0.845	0.885	0.821	0.807	0.806							
QMA	0.612	0.686	0.604	0.642	0.700	0.639						
RES	0.584	0.570	0.584	0.641	0.753	0.703	0.557					
RIS	0.709	0.812	0.785	0.897	0.735	0.794	0.608	0.603				
SE	0.721	0.575	0.711	0.744	0.714	0.700	0.834	0.633	0.652			
SI	0.729	0.706	0.690	0.756	0.803	0.797	0.764	0.735	0.681	0.768		
SR	0.565	0.575	0.605	0.648	0.749	0.625	0.736	0.432	0.643	0.674	0.852	

Source: Authors' calculation

Acronyms of the constructs are given in Appendix A

The PLS analysis results

The bootstrap method was used to test both the hypotheses and prescribed research model of this study by applying SmartPLS-3. The complete outcomes of the examination are illustrated in Figure 2 and Table 5. Nevertheless, all the dependent variables have noteworthy variances with the value of $R^2 > 0.40$ except for attitude towards use ($R^2 > 0.38$). Hence, since this result provides a good clarification of the complete research objectives, the model is considered to be suitable. All hypotheses related to PEU (H1, H2, and H3) are accepted. Since it is showed in Figure 2, it is true that the influence of PEU on attitude towards use (40.3% variance) is positive and significant. At the same time, perceived usefulness has a significant positive effect on attitude towards use. Perceived usefulness has a lower variance (38.0%) whereas government support towards attitudes towards use (56%). Moreover, attitude towards use has a significant positive effect on the intention to use and intention to use has a positive effect on the intention to continue. While intention use has a greater (56%) variance, a relatively lower percentage of variance (47.0%) was the intention to continue of this adoption. All hypotheses regarding perceived usefulness (H4 and H5) are accepted due to the significant value of β coefficient 0.426*** and 0.273***. In terms of PEU and PU towards attitude to use are revealed as significant. Hence, H6 and H7 are accepted. However, H8 and H9 were accepted illustrating the direct effect of on government support on attitudes towards use is significant with β = 0.132***) and also has a significant effect on risk factor with (β = 0.621***) while H10 (relationship between risk and intention to use) was rejected with (β = 0.478). Finally, on the other hand, H11 and H12 were accepted indicating attitude to use has a positive significant effect on the intention to use and intention to use has a positive effect on the intention to continue with both (β = 0.376***) and (β = 0.683***) respectively.

Table 5: Hypothesis Testing

Serial No.	Relationship Patterns	Path Coefficients	T Statistics	P Values	Remarks
H1	Self-Efficacy -> Perceived Ease of Use	0.198	3.844	0.000	*Accepted*
H2	Quality of m-Apps -> Perceived Ease of Use	0.168	3.057	0.002	*Accepted*
H3	Systems Reliability -> Perceived Ease of Use	0.383	7.276	0.000	*Accepted*
H4	Social Influence -> Perceived usefulness	0.426	8.525	0.000	*Accepted*
H5	Responsiveness -> Perceived usefulness	0.273	4.920	0.000	*Accepted*
H6	Perceived Ease of Use -> Attitude Towards Use	0.155	2.630	0.009	*Accepted*
H7	Perceived usefulness -> Attitude Towards Use	0.542	9.733	0.000	*Accepted*
H8	Govt. Support -> Attitude Towards Use	0.132	2.089	0.037	*Accepted*
H9	Govt. Support -> Risk	0.621	16.309	0.000	*Accepted*
H10	Risk -> Intention to Use	0.478	1.024	0.615	***Rejected***
H11	Attitude Towards Use -> Intention to Use	0.376	7.907	0.000	*Accepted*
H12	Intention to Use -> Intention to Continue	0.683	21.257	0.000	*Accepted*

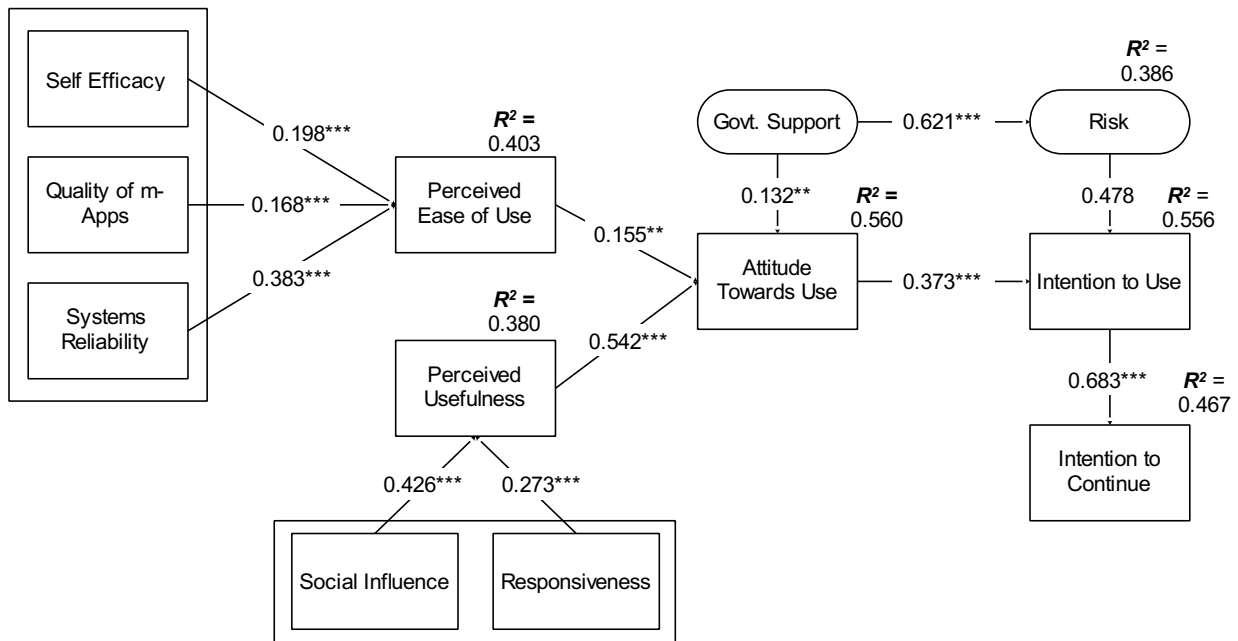**Source:** Authors' calculation

Figure 2: Path Diagram

Conclusions

It is observed from the table 5 that PEU related hypotheses (H1, H2, and H3), PU (H4, H5), PEU to ATU (H6), PU towards ATU(H7), GS to ATU (H8), GS to risk (H9), ATU to IU(H11) and IU to IC (H12) were both statistically significant which were matched with the results of the studies of (Bhattacherjee et al., 2008; Fogg, 2002; Muñoz-Leiva, Climent-Climent, & Liébana-Cabanillas, 2017; Tan & Teo, 2000; V. Venkatesh & V. Ramesh, 2006).

On the other hand, the relationship between risk and intention to (H10) were found to be insignificant and negative relationship which contradict with the results of (Sathye, 1999; Siddik et al., 2016a) The main cause of this negative relationship may be due to the low security system of the banking arena with low monitoring and high security measures taken by the authority. In the context of mobile banking adoption in Bangladesh, the ICT policy is favorably positioned to execute the financial services of m-banking to all banking customers to ensure healthy services for all. Present mobile users are about a hundred million, which is roughly more than 60% of the total population. Moreover, Since The development of ICT in the country getting improved, The adoption of m-banking has become a significant issue in the banking segment of Bangladesh which will continue to increase in manifolds (Bhuiyan & Rahman, 2013). Therefore, the number of mobile banking users are rising day by day which lead to great potentials for them to facilitate m-banking adoption in Bangladesh. It is possible that the large size of these m-banking customers will generate a wave of change in the use of m-banking in Bangladesh in the coming days. In order to make best use of the opportunity offered by mobile phone technology in middle-income countries such as Bangladesh, its potential and challenges should be better comprehended.

The government of Bangladesh has made numerous initiatives and allocated an enormous budget to enlarge on a priority basis the use of ICT to fulfill the vision 2021 of Digital Bangladesh. digitalized banking section is one of the top sectors on the government's priority list to accomplish the goals of sustainable development. In this current empirical research, a combined model is proposed that integrates extra constructs into the widely accepted and expanded TAM theory. An effective roadmap needs to be recognized by different service providers to attain greater adoption and use of m-banking services. The applications of mobile technologies are widely available in the banking industry. This availability can play an imperative role to boost this sector. The outcomes offer an overview of m-banking services to the customers in Bangladesh and redefine the significance of this new technological application in refining this promising area. This survey-based empirical study represents both theoretical and practical contributions in the arena of OBA. This study will augment the present theory-based OBA studies and reveals the key determinants that impact the intention and continue to adopt these services in the context of emerging nations. Thus, the study is one of the leading works spreading out the TAM model by incorporating two constructs, risk and government support. The model built in this study represents a substantial enhancement for TAM. Specifically, for an emerging country, the risk to security and privacy is a dynamic factor to influence the intention of consumers' OBA. Similarly, the model will illustrate the significance of government support in growing customers OBA in many emerging countries where government play a major role in economic planning. This model can be used for forthcoming online banking studies, where Bangladesh is a fast-growing economy. The authors tested the model empirically to elucidate the intention of using the online banking system in Bangladesh. It provides a better understanding of the factors that contribute to the success of online banking, especially for an emerging nation like Bangladesh. Past studies based on developed countries vary in terms of analysis since most of the users have been using the internet and e-commerce since the late 1990s. But the Internet in Bangladesh is till now new phenomena. Moreover, most of the internet users are not familiar with the online banking system.

Conversely, as Bangladeshi online banking users may have cultures different from developed country users, it is significant to consider the effect on their choice of OBA from the government's support and the risk of it.

In addition to the theoretical contribution, the banking experts, online banking systems developer, high officials of bank and banking service provider would be beneficial by the study. The result and findings of the study indicate future approaches and methods to embolden the implementation of OBA in a broader way. With a view to conducting further research related to OBA and banking services, the results and analysis can be used. On the basis of the study findings, managers and decision-makers of banks in Bangladesh can formulate strategies to offer better online banking services and encourage their clients for using the online banking system compared to the conventional banking system (Bhuiyan & Rahman, 2013). As Eriksson (2005) stated that banks may be focused on refining the user interface of online banking websites to be more user-friendly and attractive, but the perceived benefits of online banking are more significant than ease of use. Banks should also analyze what additional features Bangladeshi customers find more convenient and develop and actively stimulate their online banking systems. Therefore, Bank decision-makers will invest to provide a more useful online banking system so that the customers are encouraged to use it willingly. The risk related to online banking security and privacy is one of the key issues that play a vital role to determine the OBA in Bangladesh. Grabner-Kräuter and Faullant (2008) recommended that since online security is one of the key attractions, banks must confirm that their strategies regarding online banking systems are fully secured. This research also shows that customers in Bangladesh are more interested in security and privacy issues than in ease of use.

The Government of Bangladesh is able to help ensure clear Internet transaction rules and laws. With a clear and solid law, customers can be surer that online banking is taken care of with security and privacy issues. The government of Bangladesh can also support the banking industry by providing better internet infrastructure to encourage people to use online banking. This will improve the efficiency of the banks and support the progress of Bangladeshi banks. Bank decision-makers should also work along with the government to introduce user oriented online regulation and legislation to assist enhance customers ' confidence regarding online banking security and privacy issues. The current literature primarily focuses on the intention of use formed from derived rates of satisfaction, while we argue that a series of initial experiences with the facility that result from such behavioral intention. When a customer uses the facility for a long time based on behavioral intention, they are better able to illuminate the overall satisfaction resulting from the strength of long-term use. Bankers should exploit these early positive intentions and make these users happy with the core benefit by providing online banking services which are error-free and without restriction.

In terms of customer interface and internal navigation, banks can follow the existing results of the study and provide their online banking websites user-friendly. All possible phishing, malware, and non-authorized data encryption solutions that might seriously affect consumer security and confidence in a bank's online banking facility should also be well established. The banks can conduct customer feedback frequently through the uploaded questionnaire on their banking portals. Individual banks can then also common work to alleviate customer anxieties and certify a secure online banking system.

There are some key limitations to the present study. First of all, the main focus of this study was online banking customers from the standpoint of developing nations, Bangladesh. The proposed model used in this study can be applied in other emerging nations having diverse cultural locations and firms' requirements. The study was conducted in the context of the developing country, Bangladesh, a moderately matured in terms of the infrastructural information technology having big market size. Secondly, as the previous studies related to the OBA, the determinants designated may not cover all the reasons that could affect the adoption of the online banking situation in Bangladesh. Thus, socio-cultural factors can be considered for further forthcoming research can to examine the acceptance of the service of online banking with a new dimension. Lastly, the sample size is relatively small with only a single cross-sectional research design. Future research may be conducted on similar studies in the context of other countries with a larger sample size to generalize the results of this study.

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Appendices

Appendix A:

Constructs	Items	Factor Loading	T Statistics	P Values	VIF	Skewness	Kurtosis
Attitude Towards Use	ATU1	0.858	61.557	0.000	1.774	-.685	-.002
	ATU2	0.861	54.003	0.000	1.841	-.626	.338
Govt. Support	ATU3	0.837	38.146	0.000	1.719	-.427	-.090
	GS1	0.873	58.652	0.000	1.405	-.740	.235
	GS2	0.881	49.760	0.000	1.405	-.828	.371
Intention to Continue	IC1	0.876	57.299	0.000	1.380	-.508	-.341
	IC2	0.870	50.908	0.000	1.380	-.453	-.294
Intention to use	IU1	0.826	38.152	0.000	1.475	-.703	.158
	IU2	0.856	61.028	0.000	1.481	-.727	-.173
	IU3	0.634	12.087	0.000	1.172	-.736	-.145
Perceived Ease of Use	PEU1	0.787	30.504	0.000	1.378	-.601	-.346
	PEU2	0.827	41.295	0.000	1.522	-.655	-.410
	PEU3	0.803	34.955	0.000	1.445	-.624	-.044
Perceived usefulness	PU1	0.825	45.979	0.000	1.528	-.594	-.275
	PU2	0.835	46.287	0.000	1.532	-.601	-.141
	PU3	0.757	25.424	0.000	1.336	-.680	.047
Quality of m-Apps	QMA1	0.883	48.239	0.000	1.509	-.492	-.200
	QMA2	0.895	66.883	0.000	1.509	-.642	.219
Responsiveness	RES1	0.913	58.840	0.000	1.302	-.588	-.010
	RES2	0.797	22.232	0.000	1.302	-.769	.262
Risk	RIS1	0.880	70.338	0.000	1.306	-.695	-.178
	RIS2	0.842	40.665	0.000	1.306	-.674	-.061
Self-Efficacy	SE1	0.698	15.981	0.000	1.204	-.655	.077
	SE2	0.823	35.521	0.000	1.452	-.707	-.152
	SE3	0.773	20.912	0.000	1.299	-.600	-.138
	SI1	0.839	29.649	0.000	1.368	-.702	-.017
	SI2	0.900	60.295	0.000	1.368	-.457	-.211
Systems Reliability	SR1	0.923	88.111	0.000	1.800	-.714	.120
	SR2	0.902	62.387	0.000	1.800	-.598	-.202