Ethiopian Journal of Science and Sustainable Development

e-ISSN 2663-3205 *Volume 6 (2), 2019*

Journal Home Page: www.ejssd.astu.edu.et

Research Paper

Mobile Banking Technology in Ethiopia: Adoption and implication for Financial Service Inclusion

Birku Reta Entele

Adama Science and Technology University (ASTU), School of Humanities and Social Sciences, Economics Program, Adama, Ethiopia, e-mail: birku200@gmail.com

Abstract

The purpose of this study is to investigate the perceived factors that hinder mobile banking adoption by using a survey data and forecast its adoption rate using a secondary data from the National Bank of Ethiopia. The survey data was collected randomly from 100 respondents who have bank account and visits the bank in March 2018 and the secondary data time span was from 2010 to 2018. To realize the objective, the study adopts innovation diffusion theory and structural equation modelling for adoption. The study result reveals that, the perceived relative advantage of mobile banking, the perceived complexity of mobile banking usage, observability, trialability, perceived analog complement and trust on provider of mobile banking services, are found to be significant in influencing the decision to adopt mobile banking technology in Ethiopia. In addition, the forecasted cumulative mobile banking users for the coming seven years i.e. by 2025 will be 2.3 million users with 1.27% penetration rate. Some of the policy implications are that; banks (both public plus private) has to promote and create awareness via explaining relative advantage of mobile banking adoption compared to other banking channels, create trust building campaign on mobile banking providers, improves analog complement such as mobile phone service language, and other regulations. Lastly, the concerned body such as banking industry shall provide some incentive which favor mobile banking adoption, at least up to some minimum threshold level, which can sustain adoption rate and increase banking service inclusion for those who are traditionally banked and unbanked.

Keywords: *Mobile Banking; Adoption; Financial Service Inclusion; Ethiopia.*

1. Introduction

The evolution of information technology is changing the future of banking services, marketing and business tactics (Muche Beza, 2010). Now a days, the adoption of electronic banking become common as a channel of banking services because of the quick advancement in information technology (IT) and strong competition of banking market. However, of the current estimated over seven billion global population, 2.5 billion do not have access to bank services, whereas five billion have a mobile phone subscription[1]. Thus, mobile banking technology is expected to fill the gaps, particularly, in developing market where an estimated 1.7 billion people have access to mobile phones but have no bank account globally (World Bank Group, 2013). This is a window of opportunities for mobile network operators (MNO) for bridging the banking services with mobile phone users according to each countries interest and policies. Furthermore, this technology contributes for increasing efficiency, bringing inclusions, which are the current agendas of digital dividends.

Nevertheless, in developing markets still the dominant transaction such as cash transfer, public utility payments, microloans and savings, insurance and cash deposit and withdrawal takes place by the traditional

[1] https://www.ericsson.com › mobility-report.

means via agents/bank branches. To overcome the inefficiency and accessibility of banking services, adopting mobile banking technology could reduce the extent of the problem. Mobile banking refers to using mobile devices to provide financial information, communication and transactions to customers such as checking account balances, transferring funds and accessing other banking products and services from anywhere, at any time (Ensor et al., 2012). Mobile banking reduces cost of banking services, including trip cost, time, and all opportunity cost of going to banking. In addition, its convenience, boundless in time and location as long as mobile network services are available, customers can make mobile banking which is potentially fit to solve the rural community's banking problem in developing countries (Mlitwa and Tshetsha, 2012). For instance, in Kenya, according to world development report (2016), in 2013, transaction of 21.9 billion USA dollars, which is small less than half of Kenya's Gross Domestic Product (GDP), were conducted on mobile devices (World Bank Group, 2016). Many articles has been published on the issues regard to mobile banking adoption in different countries, but not in Ethiopia as far as the researcher knowledge is concerned. Because of the fact that technology adoption is typical to the societal perspectives, norms and cultures and economic factors, it would be insightful to conduct this study in Ethiopia context.

Study by Donovan (2012) shows that mobile payment has fully transformed the economic activities since all sectors including health care institutions, whole sellers, agriculture and other sectors have already adopted and using it in Kenya. In 2014, in Kenya about more than 110 mobile money systems have been working, with more than 40 million users. One of the most well-known is M-PESA, which is now operational in more than five countries in east Africa.

The study by Orotin et.al. (2014) reveled the contributions of mobile money towards the developments of market system in Uganda and they investigated that the interoperability of telecom and banking sector has significant potential for inclusiveness to banking services. The main result of this study was that mobile money has important contributions for the users and for market modernization. The main services used through mobile banking are money transfer and more than two million customers who were previously unbanked are now accessing banking services using their mobile phones.

Study by Mlitwa and Tshetsha (2012) focused on adoption of Cell-Phone Banking among low-Income Communities in Rural Areas of South Africa emphasizing mobile banking may require more than access. This is because of the fact that many rural community in developing country needs to have awareness and willingness about the technology before decision to use them. Furthermore, issues of trust of the provider were also one important factor for not using mobile phone banking in South Africa.

Study by Al-Jabri and Sohail (2012) has investigated mobile banking adoption in Saudi Arabia focusing on measuring mobile banking users' satisfaction. According to this study, factors such as relative advantage, compatibility, and observability have positive impact on adoption whereas perceived risk has a negative impact on adoption.

Study by Yu (2012) investigated factors affecting individual decision to adopt mobile banking in Taiwan and according to his survey result social influence, perceived financial cost, performance expectancy, and perceived credibility are main significant factors influencing individual to adopt mobile banking services.

Study by Yee-Loong Chong et al. (2010) focused on online banking adoption in Vietnam using technology acceptance model. According to his study factors such as perceived usefulness, subsidy and trust on providers have positive impact on intention to use online banking in Vietnam. In contrary to the concept of technology acceptance model, the perceived ease of use factor was not as such important according to the result of this study.

Another study by Aboelmaged and Gebba (2013) has investigated on mobile banking adoption using the technology adoption model and investigates that the perceived usefulness, value of the technology, easy-of-use, image towards the technology, self-efficacy, and credibility are found to be important in affecting intentions to mobile banking usage.

However, in the case of Ethiopia even, the traditional banking service penetration is very low and the rural community near to 80 percent of the total inhabitants has

no good access to banking services. The bank penetration ratio according to 2017 financial access data tabulated in Table 1.

Table 1: Bank penetration rate (Source: Demirguc-Kunt et al., 2017)

Country	Branches per 100,000 adults	Ratio of 1 bank to adults
Kenya	4.38	1: 22,831
Ethiopia	1.39	1:37,500
South Africa	8.0	1:12,500
Korea	12.27	1:8,150

With the ratio of one bank to 37,500 populations, Ethiopia has the least bank penetration and because of this fact, citizens are using traditional way of exchange activities with high opportunity cost. The status of mobile banking at Africa level has been increasing and by the year 2017, it was around 12%. However, the share of Ethiopia is extremely low as the country is lately established regulation of mobile banking in 2013. Since, then onwards the banks and micro finance institutions (MFIs) has been promoting to offer financial services through mobile phones and agents[2] (Villasenor et al., 2015). After a year in 2014/15, there were only two mobile money deployment in Ethiopia those are M. Birr and Hello Cash mobile money. Based on the data from National bank of Ethiopia (NBE) in 2017[3], the mobile penetration rate reached 51.2%. However, of this mobile subscriber, only 0.9% are mobile banking service users. The percentage of mobile banking users to total mobile subscribers and total population is 0.9% and 0.4% respectively implying that mobile banking service is at infant stage. On the other hand, the total bank to population ratio shows that large number of populations mainly in the rural areas are deprived of access to banking. Hence, with the help of ICT convergence, mobile banking could able to increase banking penetration with more access to financial services particularly for rural communities.

Therefore, in order to update banking service inclusion, there is a need to study mobile banking adoption behavior of service users in Ethiopia. Therefore, the general objective of this study is to explore perceived factors that prohibit the mobile banking adoption rate and limits its digital dividends in Ethiopia[4].The specific objectives are (1) to identify perceived factors prohibiting mobile banking adoption, (2) to estimate and forecast adoption rate of mobile banking in Ethiopia, (3) to draw relevant policy input and implication.

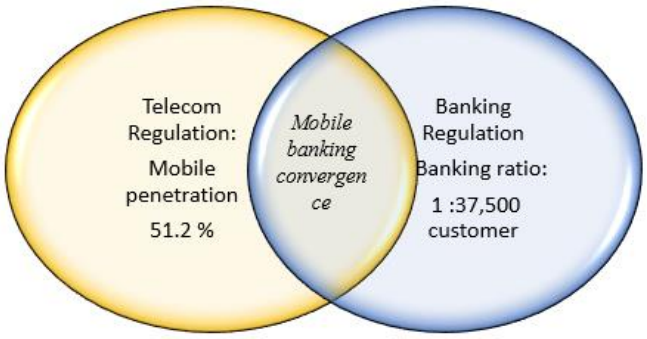

Figure 1: Mobile convergence with banking services

2. 2. Methodology

2.1. Source of the data

The study uses both mini survey and secondary data in order to reinforce and strengthen the finding of this work. With regard to the primary mini survey data, the study used both self-administered and structured survey questionnaires exclusively focuses on those who have bank account but not using mobile banking services yet by the time of survey in Adama and Addis Ababa cities. Two banks i.e. commercial bank of Ethiopia and Awash international Bank, was purposively identified and their customers who were voluntarily to respond to the survey were made to fill the questionnaires. The intention was that the commercial bank of Ethiopia shall represent the public banks with all its attributes and the Awash international Bank was assumed to represent the private banks along with its attributes. The data was collected for one-month duration in March 2017, from customers who were randomly visiting the banks during that specific month. Out of 160 total responses, finally only 100 respondents data were used for analysis purposes, while the remaining 60% were voided due to missing element and incomplete response. With regard to the secondary data, it is an aggregate country level mobile

[2] In 2013, the government has approved a mobile and agent banking regulatory framework to permit banks and MFIs to offer financial services through mobile phones and agents

[3] https://www.nbe.gov.et pdf › annual bulletin.

[4] Internet adoption lags behind considerably: only 31 percent of the population in developing countries had access in 2014, against 80 percent in high-income countries. In Ethiopia, internet penetration is 11.5% but mobile banking services can be offered with mobile network technology services without internet for the users.

banking subscription data obtained from the National bank of Ethiopia. The data was from 2010 to 2018 (a nine-year consecutive series data).

The data from the survey is used to estimate factor analysis for mobile banking service adoption whereas data from NBE used to forecast the diffusion of mobile banking service technology in Ethiopia.

2.2. Method of analysis

The study adopts innovation diffusion model of Rogers (2003) and then conduct factor analysis using structural equation modelling (SEM) for identifying perceived factors that hinder mobile banking service adoption rate. To explore the diffusion of mobile banking adoption rate, the study uses Bass diffusion model and lastly compare its result with the Gompertz and logistic diffusion model.

2.2.1. Models for technology adoption

Among many theories and models for innovation adoptions such as Innovations Diffusion Theory (IDT) by Rogers (2003), Theory of Reasoned Action (TRA) by Ajzen and Fish bein, (2007), Theory of Planned Behavior (TPB) by Ajzen, (2011) and many more, this study adopts the innovation diffusion theory of Rogers 2003. According to Rogers's model, the new technology adoption is influenced by perceived innovation characteristics such as relative advantage, compatibility, complexity, observability, and trialability. Except from the complexity, all others have positive impact on technology adoption. Apart from Rogers, all the others theory of technology adoption is based on social psychology theories.

However in this study, the Rogers (2003) innovation adoption theory, which is defined adoption as a decision to make full use of an innovation, is used. Because mobile banking services particularly from the consumer perspective is, an extension of new service technology use, which is directly leads to benefit cost evaluation (Relative advantage as Rogers call) compared to other alternatives. Therefore, this study aims to investigate the perceived factors that prohibit the adoption of mobile banking services in Ethiopia.

2.2.2. Structural Equation Modeling (SEM) Method

This model is a multivariate statistical analysis, which includes both factors analysis and multiple regression analysis together. It is mainly used to analyze the structural relationship between measured variables and latent constructs (Blunch, 2015). Hence, this study uses structural equation modelling to estimate mobile banking adoption rate. To check the reliability and validity of the measurement of the instrument this study employed KMO test and Cronbach alpha respectively (Krishnan, 2011).

Accordingly, the conceptual framework of the model is as shown in Figure 2[5].

This model have 7 component (latent) variables and 25 manifest item variables which measures each of these components. Then, to conduct factor analysis, this study uses principal Components (PCA) extraction method, which is superior over the other extraction methods in terms of identifying uncorrelated linear combinations[6].

Furthermore, PCA extract components based on their variances according to descending order and also used when the correlation matrix is singular[7]. To check reliability of the items for each factors the study uses Cronbach's coefficient of reliability i.e. >=0.7(from different literature) and to check for validity, the Kaiser-Meyer-Olkin (KMO) test should be greater than 0.50 (Hair et al. 1998). The factor analysis is conducted using SPSS and AMOS statistical software packages. The following hypothesis is tested by factor analysis.

H1: Perceived relative advantage of mobile banking has significant positive effect on intention to adopt mobile banking technology

H2: Perceived complexity to use mobile banking has significant negative effect on intention to adopt mobile banking technology

H3: Perceived compatibility of mobile banking has significant positive effect on intention to adopt mobile banking technology

[5]Varimax is an orthogonal rotation method (that produces independent factors which means no multicollinearity) that minimizes the number of variables that have high loadings on each factor.

[6] The other method is principal axis factoring, also called common factor analysis, or principal factor analysis. Although mathematically very similar to principal components, it is interpreted as that principal axis that identifies the latent constructs behind the observations, whereas principal component identifies similar groups of variables.

[7] http://www.statisticssolutions.com/factor-analysis-2/

H4: Perceived observability of mobile banking has significant positive effect on intention to adopt mobile banking technology

H5: Perceived analog complement for mobile banking has significant positive effect on intention to adopt mobile banking technology

H6: Perceived trust on provider of mobile banking has significant positive effect on intention to adopt mobile banking technology

H7: Trialability of mobile banking has significant positive effect on intention to adopt mobile banking services.

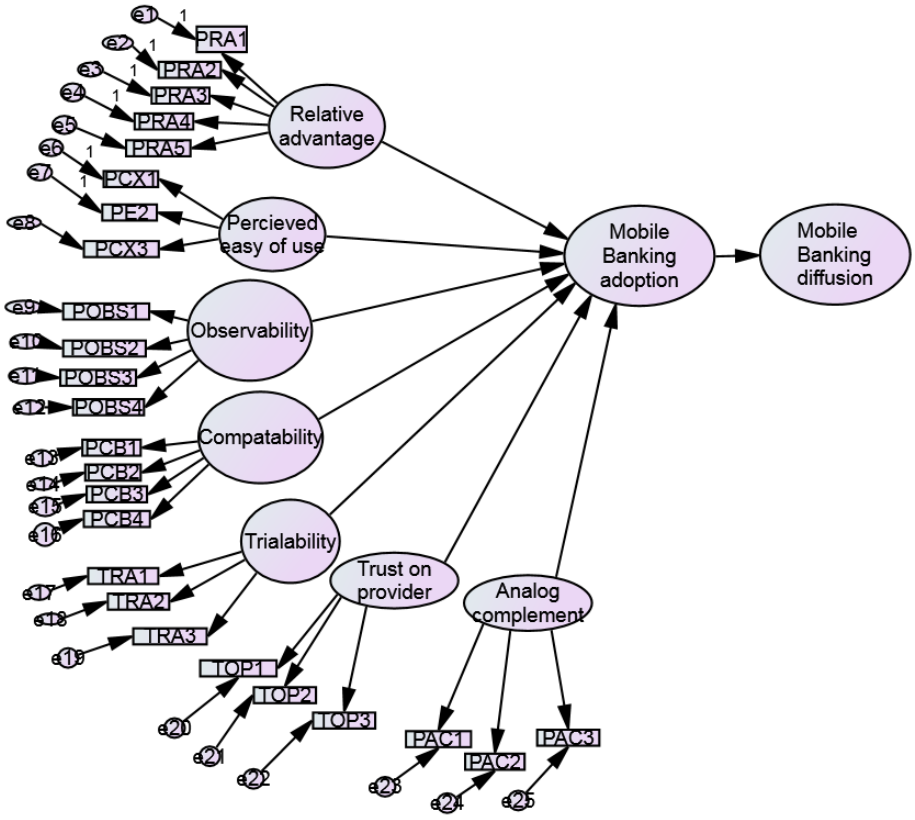

Figure 2: Framework adopted from the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)

2.2.3. Bass Diffusion model

To forecast the mobile banking adoption rate in Ethiopia, the study uses Bass diffusion model that is widely applied on new-product diffusion model. The bass model is derived from the hazard function concept that "*The portion of the potential market that adopts at **t** given that they have not yet adopted is equal to a linear function of previous adopters*" (Bass, 1969). Mathematically, using hazard function

$$\frac{f(t)}{1-F(t)} = p + \frac{q}{M}[A(t)] \qquad (1)$$

In the above equation, **t** represents the time at which technology is introduced and is assumed to be non-negative.

Hence the technology diffusion bass model is framed as a fraction of adoption rate is:

$$F_{(t)} = \frac{1-e^{-(p+q)t}}{1+(q/p)\mathrm{e}^{-(p+q)t}} \qquad (2)$$

After rearranging the above equation the study estimate the bass model using data fit statistical software as below equation.

$$Y_{(t)} = m * \frac{1-e^{-(p+q)t}}{1+(q/p)\mathrm{e}^{-(p+q)t}} \qquad (3)$$

Where,

- m - potential market (the ultimate number of adopters)
- p – innovation coefficient

- q – Imitation coefficient.
- A (t)-shows adopters at time t.
- Y-adoption rate

3. Results and Discussion

3.1. Descriptive statistics

Of the total respondents majorities are male which accounts about 82 % and the remaining 18 % respondents are female. Majority of the respondents are between 31- 40 years old age, majority of respondents income is less than 500$ per month and other descriptive statistics are as below Table 2.

3.2. Factor Analysis

Before conducting factor analysis validity and reliability, tests should be examined and accordingly validity of the samples is tested by KMO and Bartlett's test as below Table 3.

To identify the maximum length of components in the factor analysis, the study used Eigen values and the results are shown by descending order of their variance. The cut point is at the point for which Eigen value is greater or equal to one. The cumulative total variance explained by the components up to the seventh is 80.085% (Table 4).

Table 2: Descriptive statistics

Variable	Frequency	Percentage
Gender		
Female	18	18.0
Male	82	82.0
Age of respondent in years		
Less than 20	6	6.0
21-30	23	23.0
31-40	58	58.0
41-50	11	11.0
Greater than 50	2	2.0
Highest level of education		
Less /equal to high school	17	17.0
Bachelor	9	9.0
Diploma	7	7.0
Master	51	51.0
PhD or above	16	16.0
Job of respondents		
Gov't employee	74	74.0
No job	8	8.0
Private company employee	2	2.0
Self-employee	16	16.0
Monthly income level of respondents($)		
3001 on wards	2	2.0
2001-3000	2	2.0
1001-2000	6	6.0
501-1000	16	15.0
less than 500	74	74.0

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.515
Bartlett's Test of Sphericity	Approx. Chi-Square	1020.929
	Df	300
	Sig.	.000

To confirm the validity and reliability of each variable for each component is summarized standardized loading factor and Cronbach alpha for reliability test (Table 5).

Table 4: Total Variance Explained (Extraction Method: Principal Component Analysis)

Component	Initial Eigen values			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.933	27.731	27.731	3.439	13.755	13.755
2	3.252	13.006	40.737	3.066	12.263	26.018
3	2.817	11.268	52.005	2.903	11.612	37.629
4	2.639	10.558	62.563	2.880	11.521	49.150
5	1.511	6.044	68.607	2.518	10.072	59.222
6	1.184	4.737	73.344	2.252	9.009	68.231
7	1.005	3.741	80.085	2.213	8.854	80.085

Table 5. Validity and Reliability test

Latent constructs	Indicators	Standardized loading	Reliability(AVE,SC)
Relative advantage (PRA)	PRA1	.724	N items =5
	PRA2	.669	Cronbach's = .818
	PRA3	.776	AVE= 1.330
	PRA4	.844	SCR=-.867
	PRA5	.834	
Perceived complexity(PCX)	PCX1	.828	N items: 3
	PCX2	.784	Cronbach's = .876
	PCX3	.679	AVE=71.424
			SCR=0.621
Trialability	TRA1	.889	N items: 3
	TRA2	.752	Cronbach's = .916
	TRA3	.776	AVE=1.063
			SCR=0.616
Perceived Compatibility(PCB)	PCB1	.696	N items: 4
	PCB2	.870	Cronbach's = .842
	PCB3	.702	AVE=0.535
	PCB4	.808	SCR=0.846
Perceived Observability (POBS)	POBS1	.841	N items: 4
	POBS2	.722	Cronbach's = .704
	POBS3	.819	AVE=143.970
	POBS4	.697	SCR=-0.754
Trust on provider(TOP)	TOP1	.721	N items: 3
	TOP2	.686	Cronbach's = .798
	TOP3	.780	AVE=125.453
			SCR=0.765
Perceived analog complement(PAC)	PAC1	.706	N items: 3
	PAC2	.804	Cronbach's = .742
	PAC3	.754	AVE=33.952
			SCR=-0.765

3.3. Estimation Results

The regression coefficient of each component on intention for adoption of mobile banking is run by AMOS and its result is as below Figure 3. According to the below estimation six components are found to be significant in influencing the intention of mobile banking adoption except the compatibility component.

To check the fitness of the model and other criteria, here below (Table 6) are some of the indicators.

To check the fitness of the estimated model the result of RMR and GFI indexes are used. Hence, accordingly the GFI (fitness index) shows that 80.1% of the model is explained by these components, which implies that the model is relatively fitted well.

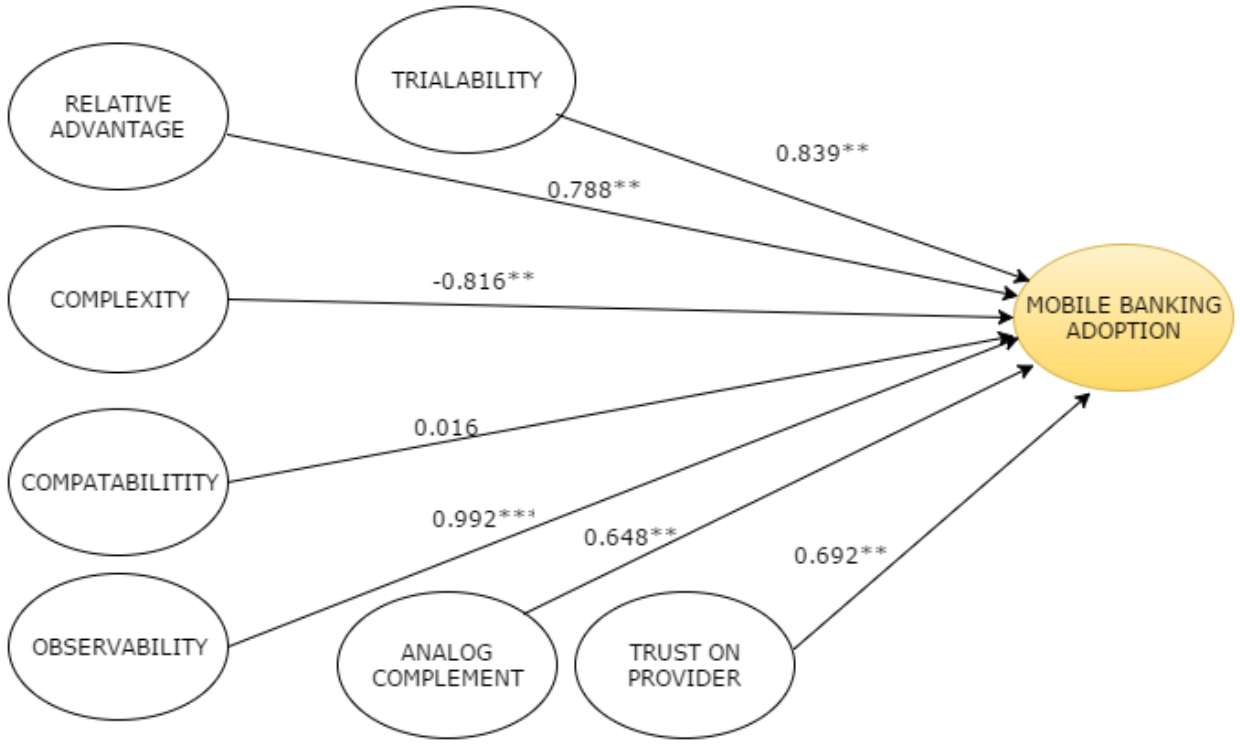

Figure 3: Estimation result of mobile banking adoption

Table 6: Regression Weights: (Mobile banking adoption model), RMAR and GFI index

Attributes	**Estimate**	**C.R.**	**P**	**RMR,**	**GFI**
Compatibility	0.016	3.752	.004	Default model=**0.679** Saturated model=**0.000** Independence model **0.325**	Default model=**0.801** Saturated model=**0.900** Independence model=**0.307**
Relative advantage	0.788	3.590	***		
Complexity	-0.816	3.752	***		
Trust on provider	0.692	6.103	***		
Observability	0.997	7.701	***		
Trialability	0.839	5.319	***		
Perceived analog complement	0.648	3.365	***		

3.4. Discussion

As per the research objective, perceived factors influencing mobile banking adoption are identified with limited information (small sample size). Accordingly all the research hypothesis is tested where some are confirmed as per hypothesized above and others are rejected. The discussion and analysis for each of the hypotheses is made with the understandings of all other things are assumed constant.

H1: The more perceived relative advantage of Mobile banking the more intention to adopt mobile banking technology

The first hypothesis is, perceived relative advantage of mobile banking, expected to have positively

influencing mobile banking adoption. The result confirms this hypothesis and even significant at 5% significance level. The more they perceive relative advantage compared to others alternatives, the more they have intention to adopt mobile banking technology. This result is similar with other research finding such as study on online banking in Vietnam by Yee-Loong Chong et al. (2010). Hence, the main point is that consumers are willing to adopt mobile banking when they realize the advantages of it compared to other channel of banking. Therefore banks and other concerned body should further investigates the types of feature which current bank users find useful or they will find useful and promote such features to encourage more customers to adopt mobile banking.

H2: The more perceived complexity to use mobile banking, the less intention to adopt mobile banking technology.

This hypothesis is confirmed by the estimated result. The result shows negative significant value, which implies that, the more perceived complexity of mobile banking, the less intention to adopt this technology particularly for those who are illiterate, assuming other things are constant.

H3: The more perceived compatibility of mobile banking, the more intention to adopt mobile banking technology.

The result of this hypothesis is insignificant which, perhaps, implies compatibility is not significantly influencing a decision to adopt mobile banking technology. For the respondents the compatibility is not a big deal to influence the decision to adopt mobile banking service technology or not.

H4: The more perceived observability of mobile banking, the more intention to adopt mobile banking technology

According to the survey result, the value for component observability is positive and significant. This implies people adopt mobile banking technology when observe real impact of it than otherwise. This result is consistent with many other studies such as (Yee-Loong Chong et al. 2010; Tan et al. 2010).

H5: The more perceived presence of analog complement for mobile banking the more intention to adopt mobile banking

This hypothesis is confirmed according to the finding of this study. That means the more people perceive presence of analog complement, the more they have intention to adopt mobile banking, assuming other things are constant. This implies that even in less developed countries people worry the problem of analog complement, legality issues to make decision to adopt technology. The more diversified mobile banking language services, the more people intendeds to adopt the services.

H6: The more perceived trust on provider of mobile banking the more intention to adopt mobile banking technology

This latent component has also positive and significant influence on intention to adopt mobile banking. That means the more trust on mobile banking service provider the more intention to adopt this services, assuming other things are constant. This result is consistent with the finding of study in Vietnam on 'online banking' by Yee-Loong Chong et al. (2010). According to Wang and Barnes (2007), it is possible to build trust strategies through advertising campaign, privacy guarantee, company guarantee policy and different statement. Therefore, banking in Ethiopia is also required to use these types of trust building campaign if they want to promote mobile banking adoption.

H7: The more Trialability of mobile banking, the more intention to adopt mobile banking services

The study result confirms this hypothesis. The result shows that as more perceived Trialability of mobile banking, the more intention to adopt mobile banking service.

Therefore, to increase penetration of mobile banking service in the country, banking sectors and the governments need to do a lot on awareness creation on advantage of using mobile banking, easiness of using mobile banking, trust and security of mobile banking providers, interoperability of banking and telecom sector, compatibility of mobile banking and other more issues.

3.5. Diffusion of mobile banking technology

The study forecasted the diffusion of mobile banking adoption rate using the Bass nonlinear regression (NLS)

model. The numerical value of diffusion parameters and performance test results are listed in Table 7.

Table 7: NLS diffusion of mobile banking adoption in Ethiopia by 2025

Parameter estimation	**Bass model**	**Gompertz model**	**Logistic model**
P	0.02	3.21	3.51
Q	0.36	0.88	-0.46
$\boldsymbol{R^2}$	0.974	0.965	0.968
Adj.$\boldsymbol{R^2}$	0.9702	0.963	0.964
Forecasted potential subscriptions- m (thousand) by 2025	2268.22	1206.12	1217.20
Forecasted penetration rates considering populations growth rate 2.6%, CSA (2015)	1.27%	1.21%	1.22%

The estimated results show that the Bass estimated model is relatively better than the other two models. The coefficient of innovation for mobile banking service is 0.02 whereas the imitation coefficient is 0.36, which implies that the diffusion rate is occurring more because of internal influence and word of mouth. That means the more people talking about a service, the more other people in the social system will adopt. The overall goodness of model is 97.02% as explained by adjusted R2. The forecasted subscription of mobile banking by 2025 is about 2.3 million users and the penetration rate is 1.27% considering the population growth rate, which is 2.6%, according to the central statistical agency of Ethiopia (2015) assuming other things are constant.

4. Conclusion and Implication

The study has identified the perceived factors that hinder mobile banking adoption with their level of extent using econometrics estimation. Those are the perceived relative advantage of mobile banking compared to other alternatives, the perceived complexity of mobile banking usage, observability, Trialability, perceived analog complement and trust on provider of mobile banking services. Except compatibility construct, all the other components are found to be significant in influencing the decision to make mobile banking adoption. Concerning the diffusion of mobile banking adoption the Bass model is used to forecast the diffusion until 2025. Accordingly, the estimated mobile banking adopters for the coming seven years i.e. by 2025 in Ethiopia will be about 2.3 million users with 1.27% penetration rate. This shows that Ethiopia will have the lowest mobile banking penetration by 2025 if not take any other measures such as more awareness creation and different incentives that favor mobile banking adoption. Based up on the findings of the study, some of the policy input and implications are as follows. The banking industry or government has a lot to do with regard to awareness creation, explaining relative advantage of mobile banking technology relatively to other banking channels, on trust building on mobile banking providers, on improving analog complement such as mobile phone service language, and other regulations. Furthermore, the concerned body such as banking industry shall provide some incentive which favor mobile banking adoption, at least up to some minimum threshold level, which can sustain adoption rate and increase banking service inclusion for those who are unbanked yet.

Finally, a few limitations in our approach that can be a future work for other researcher is that the study is limited to mini survey data during specific month in a year from two banks. However, the frequency and intensity of banking service usage might fluctuates and vary across months or seasons and vary across banks to some extent. Hence, having knowing this, the study suggest future research work that consider and relax this limitation.

Acknowledgement

The study was supported by International IT Policy program (ITPP) of Seoul National University and Adama Science and Technology University (ASTU). Therefore, I would like to thank ITPP (SNU) and ASTU for the invaluable support.

Reference

Aboelmaged, M. and Gebba, T. R. (2013). Mobile banking adoption: An examination of technology acceptance model and theory of planned behavior. *International Journal of Business Research and Development, 2*(1).

Ajzen, I. (2011). *The theory of planned behavior: Reactions and Reflections*, 1113-1127

Ajzen, I. and Fish bein, M. (2007). *Theory of reasoned action-Theory of planned behavior*. University of South Florida, 2007, 67-98.

Al-Jabri, I. M. and Sohail, M. S. (2012). Mobile banking adoption: Application of diffusion of innovation theory. *Journal of Electronic Commerce Research, 13*(4), 379-391.

Bass, F. M. (1969). A new product growth for model consumer durables. *Management Science*, *15*(5), 215-227.

Muche Beza. (2010). Assessment of the Opportunities and Challenges for the Adoption of E-Banking Service in Ethiopia: A study with reference to selected commercial Banks. Unpublished Doctoral dissertation, Mekelle University.

Blunch, N. J. (2015). *Introduction to structural equation modeling using IBM SPSS statistics and EQS*. Sage.

Demirguc-Kunt, A., Klapper, L., & Singer, D. (2017). *Financial inclusion and inclusive growth: A review of recent empirical evidence*. The World Bank.

Donovan, K. (2012). Mobile money for financial inclusion. *Information and Communications for Development*, *61*(1), 61-73.

Ensor, B., Montez, T., & Wannemacher, P. (2012). The state of mobile banking 2012. *Forrester Research*, *6*(1), 83-94.

Hair, J. F., Anderson, R. E., Tatham, R. L., & William, C. (1998). Black (1998). *Multivariate data analysis*, *5*, 87-135.

Krishnan, V. (2011). A comparison of principal components analysis and factor analysis for uncovering the early development instrument (EDI) domains. *Community-University Partnership (CUP)*, Faculty of Extension, University of Alberta, Edmonton, Alberta, Canada.

Mlitwa, N. B. W. and Tshetsha, N. (2012). Adoption of cell-phone banking among low-income communities in rural areas of South Africa.

Orotin, P., Quisenbery, W., & Sun, T. (2014). Reaching beyond the banked: The impact of mobile phone money transfer on market development in Uganda. *Journal Issues.* ISSN, 2350, 157X.

Rogers, E. (2003). *Diffusion of innovations*, 5th Edition. Simon and Schuster Publisher, USA.

Tan, H., Chong, K., Ooi, B., & Chong, L. (2010). The adoption of online banking in Malaysia: An empirical analysis. *International Journal of Business and Management Science*, *3*(2), 169.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478.

Villasenor, J., West, D., & Lewis, R. (2015). *The 2015 Brookings financial and digital inclusion project report: Measuring progress on financial access and usage*. Brookings Institution Press.

Wang, S. and Barnes, S. (2007, July). Exploring the acceptance of mobile auctions in China. *In International Conference on the Management of Mobile Business (ICMB2007)* (pp. 27-27). IEEE.

World Bank Group. (2013). *Global financial development report 2014: Financial Inclusion* (Vol. 2). World Bank Publications.

World Bank Group. (2016). *World development report 2016: Digital Dividends*. World Bank Publications.

Yee-Loong Chong, A., Ooi, K. B., Lin, B., & Tan, B. I. (2010). Online banking adoption: an empirical analysis. *International Journal of Bank Marketing*, *28*(4), 267-287.

Yu, C. S. (2012). Factors affecting individuals to adopt mobile banking: Empirical evidence from the UTAUT model. *Journal of Electronic Commerce Research*, *13*(2), 104.