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Influence of Attitude on Mobile Banking Acceptance and Factors Determining Attitude of End-Users in Ethiopia

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Abstract

As observed in many countries, mobile banking can revolutionize the practice of payment transactions. This is especially true for developing countries, where mobile banking has the potential to open non-cash banking services to the unbanked. However, unlike in countries like Kenya and Ghana, in Ethiopia, people still seem to be reluctant to use mobile banking, despite existing platforms availed by Ethiopian commercial banks like Dashen Bank and United Bank. In this paper, we explore the reasons for such reluctance with the help of the technology acceptance model (TAM) and modifications proposed by the literature that are particularly adequate for developing countries and mobile banking: the theory of trying (TT) and the concept of attitude strengths. In our sample of 394 mobile banking subscribers of Dashen Bank and United Bank, we find that a person's attitude is key for the acceptance of mobile banking and that attitude can be best explained by combining the elements of TT with the TAM. As a consequence, to foster mobile banking in Ethiopia, banks are advised to improve potential users' attitude, especially, taking into account the users' learning process and the systems' ease of use.

Keywords:

Mobile banking, Technology acceptance model, User acceptance, Theory of trying, Attitude strength, Ethiopia, Structural equation model

1 Introduction

The novelty of the internet, computers, and subsequent innovations have had profound impacts on the world economy by making access to information and information processing cheaper and faster (Gorham and Singh, 2009). New industries came up, others disappeared, and many business models radically changed. In the banking industry, electronic banking was one of the answers to this technical revolution. Electronic banking is the process of delivering traditional banking products without visiting conventional bank branches, for example through ATMs (Automatic Teller Machines), Internet Banking, Credit and Debit Cards, or other electronic devices (Kaleem and Ahmad, 2008; Keivani et al., 2012).

In developing countries many technologies of electronic banking that were successful in the industrialized world did not seem to work out, probably because a large proportion of the population is unbanked and/or does not possess a personal computer. This, however, has changed fundamentally with the innovation of mobile banking. Mobile banking is a subset of electronic banking (Porteous, 2006): It is a type of self-service technology initiated by financial and/or non-financial organizations to provide access to an existing bank account or to provide financial services to the unbanked (see Porteous, 2006; Keivani et al., 2012; Ivatury and Mas 2008; McKay and Pickens, 2010; Wambari, 2009; Etim, 2014; Curran and Meuter, 2005; Gorham and Singh, 2009). One may find several definitions for the concept of mobile banking from different perspectives (see, for example, Barnes and Corbitt, 2003; Anderson, 2010 for definitions from the service providers' perspective or Donner and Tellez, 2008, from the consumers' perspective). Since this study is about mobile banking in Ethiopia, we will take the perspective of the governing body in the Ethiopian banking sector, which is the National Bank of Ethiopia (NBE). According to NBE, mobile banking is "performing banking activities which primarily consist of opening and maintaining mobile/regular accounts and accepting deposits; furthermore, it includes performing fund transfer or cash in and cash out services using mobile devices" (National Bank of Ethiopia, 2012). The directive further clarifies that only financial institutions are allowed to provide mobile banking services.

The significance of mobile banking in the developing world does not only emanate from what a user can do using mobile banking platforms. Infrastructural impediments also favor the use of mobile banking over card payment which is popular in the developed world. For instance, a small business owner may not have the necessary infrastructure to accept card payment, but he/she is highly likely to have a mobile phone with a network access. According to Ha et al. (2012) mobile banking platforms/Fintechs have a considerable advantage in comparison to other platforms, particularly in developing countries, which mainly arise from their distinctive characteristics. These are; ubiquity (users can access the service anywhere in different situations), immediacy (users can access the service anytime and get updates), localization (services can be offered and communicated to specific users' based on their location), instant connectivity (users can access services without much effort to connect to network), and proactive functionality (users can access tailored information without considerable effort). Furthermore, the use of mobile banking in developing countries has the potential to provide banking services to the unbanked as well as the under-banked (those who have access, but services fail to meet their needs) and are forced to use informal financial instruments (McKay and Pickens, 2010).

For these reasons, mobile banking had overwhelming success in many developing economies. For example, in Kenya, 146 million mobile payments amounting to $3.2 billion were transacted in September 2018 alone; between 203,359 agents and 44.3 million mobile banking accounts (Central Bank of Kenya, 2018). In the same month, 18 million card payments were made through different forms of cards. Similarly, in Ghana, by the end of December 2018, the number of registered mobile money accounts increased by 36% from the previous year while the number of active accounts increased by 17% with about 397,000 agents and a transaction value of $38.3 billion (Bank of Ghana, 2018).

In Ethiopia, however, up to now, a similar revolution could not be observed. Electronic banking in Ethiopia started in 2001 when the Commercial Bank of Ethiopia first introduced an electronic banking platform, the ATM. Soon after that, Dashen Bank took the leading role in advancing electronic banking by acquiring the license to conduct electronic commerce and mobile merchant transactions as the first Ethiopian bank (Worku, 2010). Today, however, despite the nearly two decades of presence in the country, mobile banking seems still in an efflorescent stage (Addisfortune.net, 2017): According to The Global Findex Database (2017), although 44% of all adults and 70% of account owners in developing economies use digital payment, in Ethiopia, it is only about 30% of the account holders. Reports from 2018 also indicate that, on average, a single subscriber transacts only much less than 1 (0.32) transactions per year on the United Bank's platform (Hibir)[1], while on Dashen Bank's platform (Amole) the number amounts to 1.2 transactions per year. Thus, payment in Ethiopia is still enormously cash-based (Addisfortune.net, 2017).

As a consequence from costumers' reluctance to shift toward electronic banking, the majority of Ethiopian banks' traditional banking revenue still contributes a significant percentage of the total income; more than 80% of their revenue is generated from the same services since their inauguration (Addisfortune.net, 2017) and conventional branch expansion is still an influential factor (Adem 2015). But the looming prospect of disintermediation by Financial Technologies (Fintech) will make it harder for Ethiopian banks to earn fees, and conventional bank branches will have a limited influence as Ekekwe (2016) pointed out for African banks in general.

The impact of Fintech is that it crafts a new ecosystem and disrupts the market, which pushes incumbent banks to rethink their business model (PwC South Africa, 2016). Moreover, for African banks who managed to control the rules of engagement in the past, they may not be able to preserve the existing circumstances for long, as consumers get further fragmented and have innovative alternatives (Ekekwe, 2016). Consequently, the rivalry will no longer be bounded within banks as long as entities like Fintech entrepreneurs and telecom operators are threatening the banking business without necessarily having a banking license (Ekekwe, 2016).

Facing these opportunities and challenges, Ethiopian banks seek to seize competitive advantages by investments in information technology (Ethiopianbusinessreview.net, 2018). Also, several businesses cooperate with banks to promote the use of mobile banking on their platforms to capitalize on the major benefits poised from the presence of mobile banking. Currently, Amole and Hibir mainly provide access to fund transfer, checking account balances, bill payments, cash in and cash out at

[1] Amole and Hibir are mobile banking platforms having a combination of basic features from M-Pesa and PayPal seeking to have the proper attention to be a success story.

agent locations, pay merchants, bulk disbursements, supply chain automation, and downloading account statements. Investments in information technology, however, will only be successful when the new technology is widely-spread and used by many (Oliveira and Martins, 2011). A good example in this regard would be the success stories of M-Pesa and PayPal, the greater the number of users the more acceptances they would get. Thus, it is essential to understand the rationale behind consumers' reluctance to use mobile banking in Ethiopia to realize the level of success attained by M-Pesa and PayPal.

This study intends to shed more light on the acceptance of mobile banking in Ethiopia from the banking industry's perspective. To this end, we identify models used in the literature for explaining acceptance and fit them to a sample of Ethiopian bank customers. Our sample does not include non-banked individuals, because our main intention is to help banks understanding why their platforms are not used as desired. The remainder of this paper is structured as follows: In the following chapter, we will discuss theoretical models proposed by the literature for explaining acceptance and their suitability for mobile banking in Ethiopia. In chapter 3, we will present our own conceptual framework before describing the data in chapter 4. Chapter 5 is dedicated to the methods that we use for the estimation. In chapter 6 estimation results are presented and discussed. Implications of our findings and concluding remarks are given in the final chapter 7.

2 Acceptance models for mobile banking: a short review of the literature

Numerous scholars explored the rationale behind the adoption of mobile banking with different theoretical models. Most of the concepts used in these studies build on the Technology Acceptance Model (TAM) developed by Davis et al. (1989) for explaining the determinants for computer acceptance in general. The TAM seems to be the most widely used model in mobile banking acceptance studies worldwide (Kim et al., 2009; Ha et al., 2012; Shaikh and Karjaluoto, 2015).

The TAM can be considered as an adapted version of the more general Theory of Reasoned Action (TRA, Fishbein and Ajzen, 1975) to digital technologies. Like in the TRA, the best predictor for explaining behavior ("actual system use" in the TAM) is the intention to use the new system, which is shaped by attitude. A stylized version of the TAM is given in figure 1.

Attitude is an internal state or tendency which biases individuals' evaluative response to some degree of favorability and unfavorability (Eagly, 1992). According to Petty and Cacioppo (1986, p. 127), attitude is "general evaluations people hold about themselves, other people, objects, and issues". Moreover, attitude creates specific motives to act toward an object/behavior (Bagozzi et al., 1992) and its strength determines the mediating role it plays on behavioral intention (Petty et al., 1997). Consequently, individuals' attitude is a fundamental factor in the two steps involved in decision making (Chaouali et al., 2017); first, perception and appraisal of situations followed by generation, evaluation, and selection of choice options (Sanbonmatsu et al., 2005). According to Sanbonmatsu et al. (2005), attitude guides both the assessment and appraisal through stored evaluation or feeling. Moreover, attitude is specifically essential for decisions under uncertainty (Yager, 1999) because people do not hesitate to conceive an attitude toward products they have never experienced (Solomon et al., 2006).

The TAM postulates that apart from attitude, the perceived usefulness of new technology is building the intention to use it. Davis et al. (1989) define perceived usefulness as the subjective probability of a specific system to increase performance. Perceived usefulness is also central for explaining the attitude itself together with a second factor which is the perceived ease of use. Perceived ease of use is the users' expectation of a specific system to be effort-free (Davis et al. 1989) and in the TAM it explains attitude and perceived usefulness. Perceived usefulness and perceived ease of use can be modeled as subject to external variables (Davis et al., 1989), see figure 1.

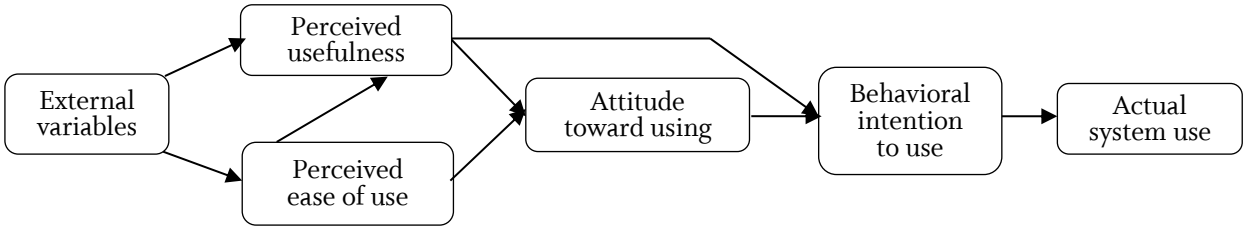


Figure 1: Technology Acceptance Model (Davis et al., 1989)

The TAM argues that users of computer technologies do not hesitate to form intentions toward behaviors regardless of their attitude as long as it is believed to boost performance; attitude would not completely capture the intention to use (Davis et al. 1989).

After conducting a study on university students in the USA, Davis et al. (1989) demonstrated that the TAM predicts acceptance and rejection of computer-based technology better than the TRA, intention can predict usage convincingly, and perceived usefulness and perceived ease of use are determinants of intention. These arguments were supported by studies from different countries (see Wu and Wang, 2005; Luarn and Lin, 2005; Curran and Meuter, 2005; Gu et al., 2009; Chitungo and Munongo, 2013; Arif et al., 2016). Davis et al. (1989) further argued that the influence of attitude on intention and beliefs is not as significant as indicated by the TAM and has a partial mediating effect. On the contrary, other studies stress the significance of attitude on intention (see Curran and Meuter, 2005; Porter and Donthu, 2006; Kim et al., 2009; Lule et al., 2012; Arif et al., 2016; Chaouali et al., 2017). Therefore, the evidence on the importance of attitude is mixed, whereas the role of perceived usefulness and perceived ease of use is similar in most empirical papers.

For Ethiopia, results from recent studies on the adoption of mobile banking are inconsistent concerning the influence of perceived usefulness and perceived ease of use, although they all used an adapted version of the TAM. Alemayehu (2017), Mulualem (2015), and Nesibu (2017) found that both variables have a significant and positive influence on mobile banking adoption while Gezahegn (2016) and Yusuf (2017) found that only one of the two has significant influence, perceived usefulness and perceived ease of use respectively. These outcomes corroborate the argument that the parsimony of TAM is inadequate in the context of a developing economy (Bagozzi, 2007; Chaoulali et al., 2017) where large parts of the focus group are less familiar with learning new electronic banking technologies. Thus, when applied to developing economies, additional moderators determining decision-making shall be included. Bagozzi et al. (1992) further point out that a model as simple as the TAM cannot be expected to fully explain a wide range of acceptance situations and advocate adoptions to the different decision makers and types of decisions. In this paper, we try to modify the

TAM in a way that better suits our purpose to explain the acceptance of mobile banking in Ethiopia. Our modifications are inspired by two strands of the literature proposing adoptions of the TAM: the theory of trying (TT) and the literature on the strength of an attitude.

The TT was developed and laid out in Bagozzi et al. (1992). It starts from the idea that the one-dimensional conceptualization of attitude in the TAM is appropriate only for determining behaviors which are non-problematic with a high level of volitional control, i.e., actions that are likely to succeed, and easily evaluated by potential users as favorable or unfavorable (see Taylor et al., 2001; Xie et al., 2008). For more complex situations that are characterized by a high degree of uncertainty for the target group, the learning process can constitute an impediment to adopting a new technology; taking explicitly into account the possibility of people trying to learn the system, but failing (Bagozzi et al. 1992). When the consequence of failure is salient for an individual, it affects his/her intention to try (Bagozzi et al., 1992). As a consequence, attitude in the TT is considered as a three-dimensional concept when explaining the acceptance of new technology with the dimensions being attitude toward success, attitude toward failure, and attitude toward learning to use new technology (Bagozzi and Warshaw, 1990). Attitude toward success (or "attitude toward trying and succeeding") refers to the foreseen expectation of success and importance of succeeding, attitude toward failing (or "attitude toward trying and failing") is an expectation of failure and an anticipated consequence of not achieving, and attitude toward learning addresses the opinion toward efforts to achieve the goal/acceptance of behavior (Bagozzi and Warshaw, 1990). The TT is considered particularly suitable in the context of developing or emerging markets characterized by the presence of external and internal environmental impediments (Chaouali et al., 2017; Xie et al., 2008). Typically, in developing countries, many potential users tend to be unfamiliar with new technologies, so that the learning process could constitute a barrier in the decision to use them. In addition, the decision to switch to mobile banking is far from "non-problematic" given the sensitivity of using a new payment system. Chaouali et al. (2017), for example, studying mobile banking adoption in Tunisia, argue that in developing countries perceived usefulness and perceived ease of use have weaker and/or insignificant influences on attitude compared to developed countries and that attitude toward success, failure, and learning are more fundamental for building the overall attitude.

The concept of attitude strength, on the other hand, provides a broader conception of attitude as a whole, and its mediating role on behavioral intention and judgment (Petty et al., 1997). Attitude strength implies the degree to which an individual's attitude can resist counter-persuasion, persist over time, and predict a behavior (Petty and Cacioppo, 1986). Attitude strength renders the process of forming decisions easy and better in quality when related to preferences (Petty et al. 1997). According to Kim et al. (2009), users with a robust favorable attitude toward technology will persistently stand to their beliefs, while users with weaker attitudes are responsive to counter-persuasion. Consequently, attitude strength postulates the link between attitude and behavior in two ways (Kim et al. 2009); first, it may moderate the influence of attitude on behavioral intention; second, it justifies the mode of mediation (i.e., full, partial, or no mediation).

In their study, Kim et al. (2009) assessed the mediating role of attitude to predict technology acceptance behavior in South Korea using the concept of attitude strength on TAM. The finding of the study postulates that in the case of strong attitude, attitude thoroughly explains valence in behavioral intention and thoroughly mediates behavioral intention, but the direct mediating role of

perceived usefulness on behavioral intention is insignificant under strong attitude. In the case of weaker attitude, the mediating role of attitude on behavioral intention declines, while the direct influence of perceived usefulness on behavioral intention improves. Nevertheless, according to Kim et al. (2009), attitude has the single most significant influence on intention, regardless of its strength.

3 Conceptual framework: Combining the TAM with TT and strength of attitude

With our aim to better understand the reluctance of mobile banking acceptance in Ethiopia, we fit a model for explaining mobile banking acceptance to a sample of Ethiopian bank account holders. Our sample excludes individuals without bank account, mainly for two reasons: First, taking the banking industry's perspective, our study tries to explain why the efforts of creating mobile banking platforms have not brought satisfactory results. Second, our conceptual framework is the TAM whose estimation requires samples of individuals having access to mobile banking and using it with different intensities.

We focus on the TAM, because of its dominance in the academic literature for analyzing acceptance of mobile banking and the broad empirical evidence available. However, as pointed out in the previous chapter, with its simple structure, the TAM seems to be limited for our goals. Particularly, the one-dimensional concept of attitude might be restrictive, considering the sensitivity of financial decisions and the complexity of learning new technologies in developing countries. Thus, it will be replaced by the three-dimensional concept from TT. Additionally, we will take into account the concept of strength of attitude, given the mixed evidence on the importance of attitude in studies applying the TAM. Therefore, we will combine the TAM with the TT and strength of attitude.

Particularly, we will proceed as follows: In the first stage, we will estimate the TAM. This will help us to answer the question whether the TAM is an adequate model to explain the acceptance of mobile banking in Ethiopia and in particular if the simple one-dimensional approach concept of attitude is useful for explaining acceptance. Second, we will estimate the three-dimensional approach of attitude as proposed by TT and evaluate whether it gives a better explanation for acceptance than the TAM. As a third step, we will combine the TAM and the TT and evaluate the explanatory power of such a model compared to the TAM. Finally, we will analyze the impact of the strength of attitude in the combined model.

4 Data collection and questionnaire

The data was collected through structured questionnaires. Since the sample was taken in Ethiopia where more than 40 million mobile telephone users are residing, and all except one commercial bank offer mobile banking service at the time of the study, it was necessary to assure that respondents have the least impediment to use mobile banking. In doing so, the capital city, Addis Ababa, where more than 35% of bank branches are located, is selected. Moreover, the key to responding to attitude related questions is availability and activation of relevant information (Tourangeau, 1987). Petty and Cacioppo (1986) also support the argument that past experience to a focal act is a better predictor to behavior than passive exposure, since it is based on self-generated information. Besides, this study focuses on the acceptance of mobile banking rather than adoption; although adoption and acceptance

often are used interchangeably, adoption is potential users' decision to subscribe on platforms for the first time, while acceptance is when a subscriber decides to use platforms frequently (Hernandez et al., 2008). Moreover, in Ethiopia, the adoption rate is relatively promising and the problem identified in chapter 1 is related to acceptance. Consequently, consumers who subscribed for mobile banking were the respondents of the questionnaires, but they use mobile banking with different levels of frequency.

To include the influence of experience and previous service provision attempts which failed to prevail, the two pioneering banks in mobile banking, Dashen Bank and United Bank, were the banks where the sample was taken (two purposively selected private commercial banks in Ethiopia). Therefore, consumers subscribed for Amole or Hibir were the target population where a total of 394 usable questionnaires were collected. The number of male respondents was around five percent bigger than female respondents. More than half of the respondents (65.2%) were undergraduate degree holders followed by postgraduate degree and diploma holders (16% and 15% respectively). An insignificant number of respondents completed high school (2.8%) and 1% of the respondents were PhD holders. This implies that the majority of the subscribers have acquired a minimum of diploma level education (97.2%).

The questionnaire had four sections; general information, perceptions of mobile banking, attitude toward mobile banking, and intention to accept mobile banking. A translated version of the originally Amharic questionnaire is given in the appendix. The most important parts of the questionnaire for this research are the items measuring the constructs from the TAM (perceived usefulness, perceived ease of use, attitude and acceptance), from the TT (attitude towards success, attitude towards failure, attitude towards learning), and attitude strength. In defining the items and formulating the questions, we followed the empirical literature. All answers were measured on a 5-point Likert scale. An overview of the questions and the sources is given in table 1.

5 Estimation method and preliminary steps

We estimate the TAM and its extensions with covariance based structural equation models (SEM) using the maximum likelihood (ML) estimator implemented in Stata. Since our data is from Likert scales, we use the Satorra-Bentler correction to account for non-normality. Conceptually, the weighted least squares estimator ("asymptotic distribution free, ADF" in Stata) is preferred for ordinally scaled data (Brown, 2015), but it did not converge in the model combining TAM and TT. We attribute this to the weak performance that the ADF revealed in simulation studies where the sample size was much lower than 1,000 (see Brown, 2015).[2]

[2] For checking the robustness of the ML estimation, we compared our results with those of the ADF estimation whenever the ADF estimator converged. We found that the differences between the parameter estimations and standard errors were neglectable. The goodness of fit values used in this study were also similar for both estimators, with exception of the relative measure CFI which was much lower for the ADF estimator. In the following, we will only report the results of the Satorra-Bentler ML estimator.

Concept and question (abbreviation in brackets)	Source
Perceived usefulness	
Using mobile banking enhances your access to banking services (pu1)	Gu et al. (2009)
Using mobile banking enables you to complete banking activities quickly (pu2)	Kim et al. (2009)
Using mobile banking helps you use your time effectively (pu3)	Kim et al. (2009)
Mobile banking is useful (pu4)	Kim et al. (2009)
Perceived ease of use	
It is easy to learn how to use mobile banking and conduct transactions (pe1)	Gu et al. (2009)
Mobile banking is easy to use (pe2)	Gu et al. (2009)
Using mobile for banking transactions requires less mental effort (pe3)	Kim et al. (2009)
It requires less effort to conduct my transactions through mobile banking (pe4)	Kim et al. (2009)
Instructions to conduct mobile banking are clear and understandable (pe5)	Kim et al. (2009)
I easily adopted previous alternative banking services such as ATM and I will do the same with mobile banking (pe6)	Wu and Wang (2005)
Attitude	
Using mobile banking is advantageous (att1)	Kim et al. (2009)
My using mobile banking is favorable (att2)	Kim et al. (2009)
Adopting mobile banking would make me feel good (att3)	Chaouali et al. (2017)
Adopting mobile banking would make me feel happy (att4)	Chaouali et al. (2017)
Adopting mobile banking would make me feel beneficial (att5)	Chaouali et al. (2017)
Attitude toward success	
Trying and succeeding at adopting mobile banking would make me feel good (as1)	Chaouali et al. (2017)
Trying and succeeding at adopting mobile banking would make me feel happy (as2)	Chaouali et al. (2017)
Trying and succeeding at adopting mobile banking would make me feel beneficial (as3)	Chaouali et al. (2017)
Attitude toward failure	
Trying but failing at adopting mobile banking would make me feel bad (af1)	Chaouali et al. (2017)
Trying but failing at adopting mobile banking would make me feel unhappy (af2)	Chaouali et al. (2017)
Trying but failing at adopting mobile banking would make me feel unbeneficial (af3)	Chaouali et al. (2017)
Attitude toward learning	
Learning to use mobile banking would make me feel good (al1)	Chaouali et al. (2017)
Learning to use mobile banking would make me feel happy (al2)	Chaouali et al. (2017)
Learning to use mobile banking would make me feel beneficial (al3)	Chaouali et al. (2017)
Attitude strength	
I feel certain about my attitude toward using the platform (attstr)	Kim et al. (2009)
Acceptance	
I think it is better for me to adopt mobile banking (i1)	Chaouali et al. (2017)
I intend to use mobile banking in the future (i2)	Gu et al. (2009)
I would use the mobile banking for my banking needs (i3)	Kim et al. (2009)
Using the mobile banking for handling my banking transactions is something I would do (i4)	Kim et al. (2009)
I would see myself using the mobile banking for handling my banking transactions (i5)	Kim et al. (2009)
I will frequently use mobile banking in the future (i6)	Gu et al. (2009)
I recommend others to use mobile banking (i7)	Gu et al. (2009)

Table 1: Items of the measurement models for TAM, TT and attitude strength

In the following, results will be evaluated with the help of the standardized factor loadings, some measures for global goodness of fit (Satorra Bentley corrected Root Mean Squared Error of Approximation, Comparative Fit Index, and Standardized Root Mean Squared Residual), and the coefficient of determination (R^2) of the latent variables attitude and acceptance.

Factor loadings are reported as standardized so that the magnitude of each loading reflects the strength of the relationship and different loadings can directly be compared. Standard errors of the loadings are used for calculating p-values of the test against the null hypothesis that loadings are zero (standard Wald tests are used for this purpose). Within the measurement components, we expect all loadings to be positive and significant on a 0.1% level with a magnitude of at least 0.6. Within the structural component, we expect loadings to be positive and significant. We have no hypothesis on the magnitude of the (positive) loadings, instead, we will use their magnitudes to compare the different specifications.

The measures for global fit serve to detect misspecifications: a poor fit will be taken as evidence against the suitability of the specification. All threshold values used in our study to decide whether the fit is poor, are taken from Acock (2013) and given in the following:

The RMSEA (Root Mean Squared Error of Approximation) measures how much error ("discrepancy") there is per degree of freedom where the error is defined as the deviation of the specified model from the saturated model. RMSEA<0.05 indicates a good fit, whereas a definitely bad fit is associated with values greater than 0.1. The CFI (Comparative Fit Index) captures how much the estimated model does better than a model in which the observed variables are all unrelated to each other, so it compares the estimated model with the baseline model. Here the recommended cut-off value for a good fit is CFI>0.95. The SRMR (Standardized Root Mean Squared Residual) indicates how close we come with our model to reproducing the observed correlations, on average, so here predicted and observed correlations are compared. The fit is considered as good if SRMR<0.08.

Finally, the coefficients of determination (R^2) of attitude and acceptance are used for comparing the different models' ability to explain these two core variables of our study. We would rate a model superior in explaining one of these variables if the respective value of R^2 is higher.

Before estimating SEM for TAM and TT individual confirmatory factor analyses are performed for each latent variable given in table 1. This is necessary because the items were taken from the literature and it is not guaranteed that they are appropriate for our data. Within the confirmatory factor analyses, we evaluated the size of the loadings as well as the goodness-of-fit measures whenever the model was over-identified. We excluded items with loadings lower than 0.6 and changed the model whenever RSMEA, CFI, or SRMR did not indicate a good fit. As a result, pu4, pe3, i1, i3, and i7 were excluded and the errors of att1 and att2 as well as between att3, att4, and att5 were allowed to correlate (table 1 includes an explanation of the abbreviations). Allowing for these correlations seems to be justified by the fact that the items for attitude were taken from two different sources (groups att1, att2 are from Kim et al. (2009) and att3, att4, att5 are from Chaoulali et al. 2017, see table 1). The results for the final measurement models are reported in table 2. Note that z-values of the Wald tests range between 14.47 and 33.51, so all loadings are highly significant. Most of the loadings are much higher than the threshold value of 0.6 that we used for excluding an item. The global fit values indicate an excellent fit with the exception of the RMSEA for attitude where the value of 0.081 can

be taken as evidence for an acceptable fit only. Since the values of CFI and SRMR for attitude reflect a very good fit, in what follows we will work with the measurement models shown in table 2. For ease of disposition, however, in the following, the estimation results for the measurement model (loadings and z-values) will be suppressed.

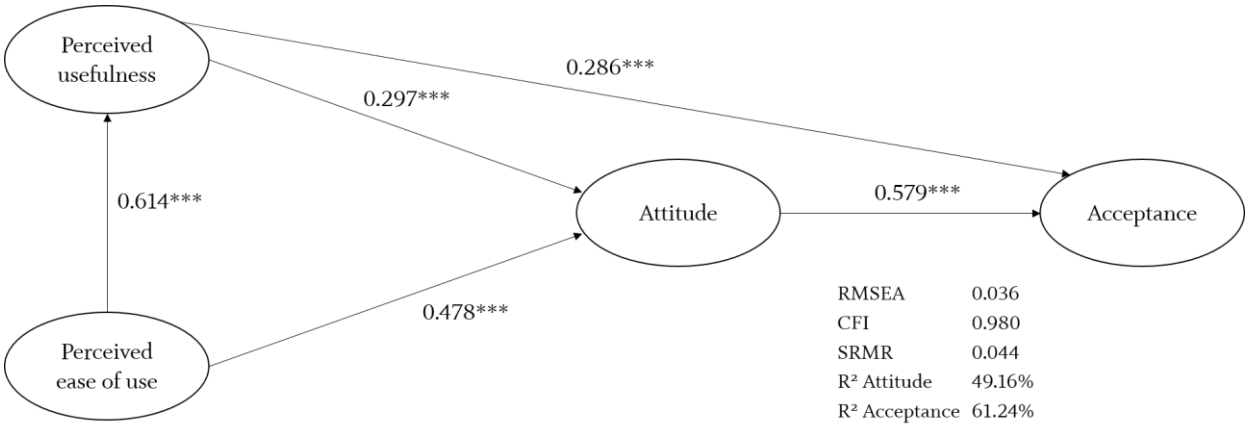
Items*	Loadings	z (Wald test)	Fit**	
Perceived usefulness				
pu1	0.816	25.25	RMSEA	0.046
pu2	0.853	28.03	CFI	0.993
pu3	0.829	30.43	SRMR	0.017
pu5	0.701	14.47		
Perceived ease of use				
pe1	0.724	19.27	RMSEA	0.045
pe2	0.692	16.75	CFI	0.997
pe4	0.791	25.90	SRMR	0.000
pe5	0.731	18.17		
Attitude				
att1	0.640	21.09	RMSEA	0.081
att2	0.718	15.43	CFI	0.990
att3	0.847	21.50	SRMR	0.015
att4	0.816	25.74		
att5	0.824	18.73		
Attitude towards success				
as1	0.893	29.40		
as2	0.878	37.22		
as3	0.837	28.56		
Attitude towards failure				
af1	0.810	21.51		
af2	0.848	25.40		
af3	0.767	19.66		
Attitude towards learning				
al1	0.837	27.06		
al2	0.957	59.02		
al3	0.875	34.57		
Acceptance				
i2	0.729	20.78	RMSEA	0.000
i4	0.749	18.63	CFI	1.000
i5	0.860	33.51	SRMR	0.008
i6	0.758	23.14		

Estimation with Satorra-Bentley corrected ML, RMSEA is Satorra Bently corrected, * Abbreviations of item names are explained in table 1, ** Fit measures are only given for overidentified models

Table 2: Confirmatory factor analyses for the measurement models

6 Estimation results

The results of estimating the TAM are given in figure 2.

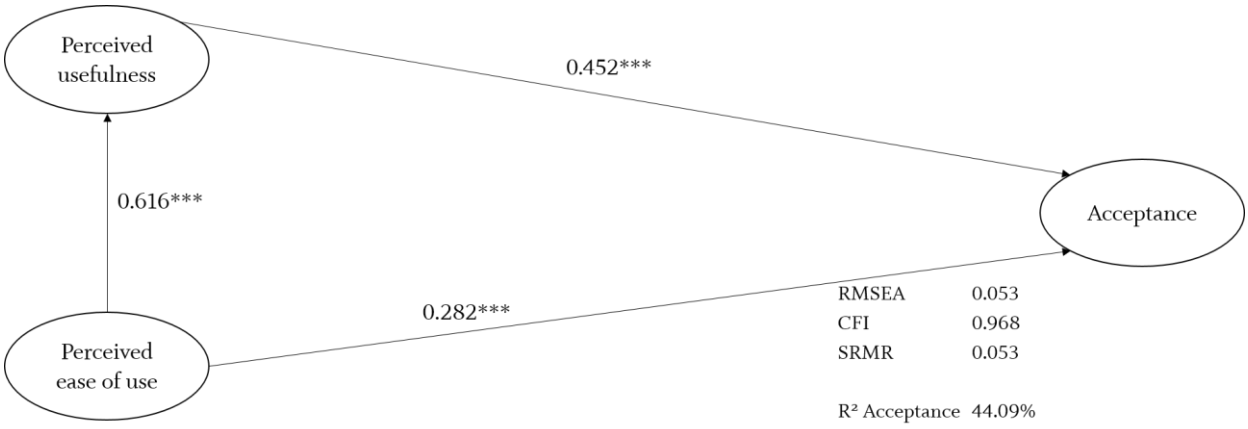


***, **, * significant on a 1%-, 5%-, 10%-level

Figure 2: Estimation results for TAM

With a value of 0.036 for RMESEA, CFI=0.98 and SRMR=0.044, all measures indicate a very good global fit. Loadings are highly significant and their magnitudes are in line with the model: Attitude appears as the most important antecedent for explaining acceptance. As can be seen from R^2, more than 60% of the variation of acceptance can be explained by the model. However, R^2 of attitude is much lower with a value 49.16%. The latter result gives rise to the idea of improving the measurement of attitude by accounting for attitude strength or the TT.

Although the results reported in figure 2 corroborate the importance of the concept of attitude for explaining acceptance, we try to find further evidence by excluding attitude from the model. Results of the estimation of such a reduced model are reported in figure 3.



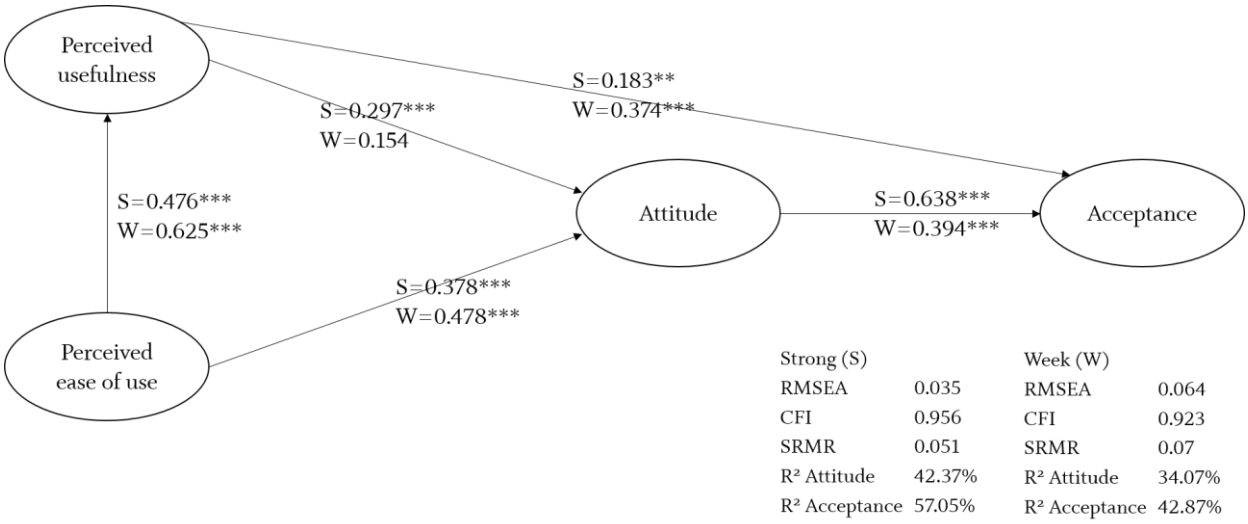
***, **, * significant on a 1%-, 5%-, 10%-level

Figure 3: Estimation results for TAM without attitude

As can be seen from figure 3, loadings in the reduced model are still highly significant with the expected signs. When comparing goodness-of-fit measures with those of figure 2, however, all values changed for the worse. Obviously, leaving out attitude impairs the overall fit. Also, only 44% of the

variance of acceptance can be explained by the model whereas in the TAM it was 61%. Overall, results can be taken as evidence for the importance of the concept of attitude and they favor the TAM for explaining acceptance.

In order to analyse the effect of strength of attitude, following Kim et al.'s (2009) argument, we split the sample into a group who (strongly) agreed to the question "I feel certain about my attitude toward using the platform" (category 4 or 5) and who did not (category 1, 2, or 3) and re-estimate the original TAM (see figure 4).



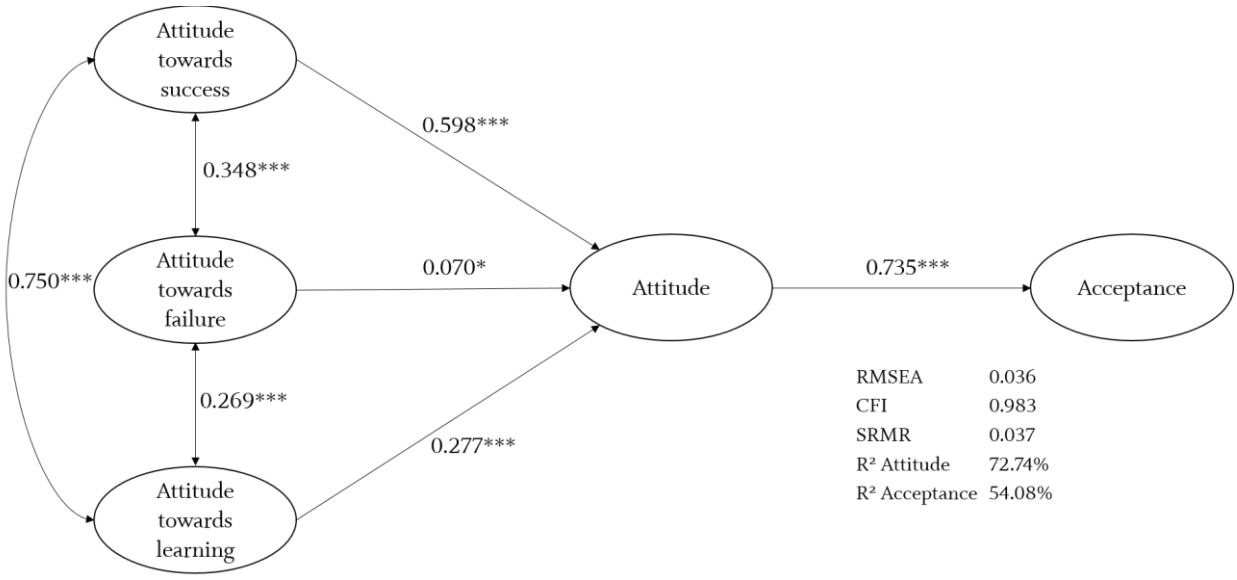
***, **, * significant on a 1%-, 5%-, 10%-level

Figure 4: Estimation results for TAM split into the subgroups strong attitude (S) and weak attitude (W)

The values for RMSEA, CFI as well as SRMR in figure 4 indicate a better fit for respondents with strong attitudes. Also, the R^2 for attitude and acceptance are considerably higher for this group compared to respondents with weak attitudes. The same is true for the loading of acceptance on attitude (0.64 for group S versus 0.39 for group W). In contrast, but in line with the findings of Kim et al. (2009), the loading of perceived usefulness on acceptance is higher for respondents with weak attitudes (0.18 for group S versus 0.37 for group W). Overall, this result is in line with our expectations and with Kim et al. (2009). However, from R^2, we do not observe that acceptance or attitude can be better explained by splitting the sample: The values of 49% (attitude) and 61% (acceptance) from the overall estimation given in figure 2 are even higher than for the subgroup S. To sum up, the results justify the adoption of the original TAM without accounting for attitude strength, albeit the explanatory power of attitude is not too high. Maybe attitude can be better explained by the three-dimensional concept of the TT.

According to the TT, attitude is shaped by the three dimensions of attitude towards success, towards failure, and towards learning. To keep the model as simple as possible, we do not include exogenous factors explaining these sub-dimensions but allow for correlations between them. The estimation results are presented in figure 5.

In figure 5, the loading of attitude towards failure on attitude is insignificant at a 5%-level (but not on a 10% level) and very low with a value of 0.07. All other coefficients are highly significant and come with the expected signs. RMSEA, CFI, and SRMR indicate a very good fit of the model, comparable to that of the TAM. Strikingly, almost 73% (R^2) of the variation of attitude can be explained by the model and this is much more than the corresponding 49% of the TAM. This result can be taken as evidence that, in Ethiopia, TT can better explain attitude towards mobile banking than the TAM. In contrast, the acceptance of mobile banking comes with a lower R^2: Here, the value is only 54%, whereas, in the TAM, it was 61%.



***, **, * significant on a 1%-, 5%-, 10%-level

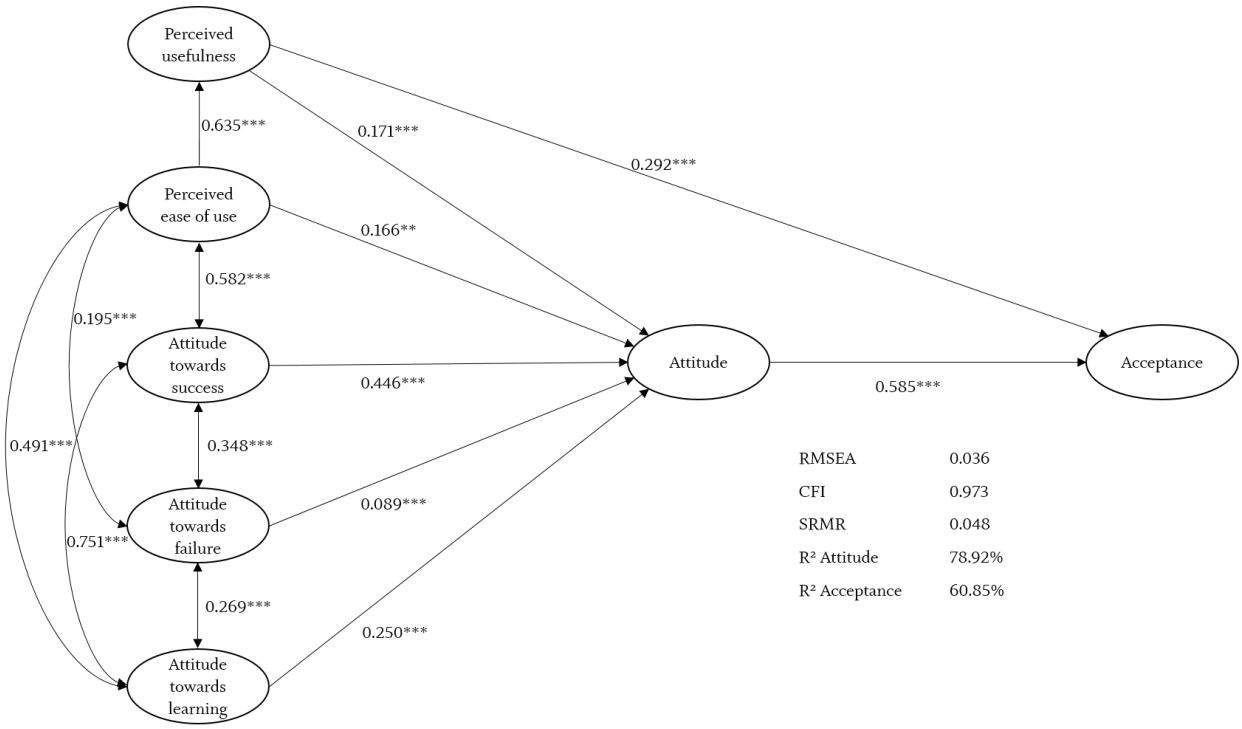
Figure 5: Estimation results for TT

Our results favor the TAM for explaining acceptance, but the TT for explaining attitude. Since the estimations also corroborate the key role that attitude plays in the TAM for explaining acceptance, incorporating the TT into the TAM might combine the strengths of both models and lead to a better explanation of acceptance.

We do so by adding the three dimensions of attitude as explanatory concepts for attitude. Perceived usefulness is allowed to be explained by perceived ease of use. The other exogenous variables (perceived ease of use and the three dimensions of attitude) are allowed to correlate in order to account for additional unobserved exogenous variables. The estimation results are given in figure 6.

All coefficients are significant on the 1% level, apart from the loading of attitude on perceived ease of use, which is only significant on the 5% level. Compared to the original TAM (reported in figure 2), major changes only can be found in the loadings on attitude; they are considerably lower in the combined model (for perceived usefulness: 0.171 instead of the value 0.286 from the original model; for perceived ease of use: 0.166 instead of 0.297). Apart from this, none of the other loadings are much affected by including the three dimensions of attitude. In contrast to figure 5, the coefficient of attitude towards failure is now highly significant, but with a magnitude close to 0. Still, attitude towards success is the most important factor for explaining attitude (the loading is 0.446), followed

by an attitude towards learning. Perceived usefulness and perceived ease of use seem to have a similar effect on attitude with loadings of around 0.17.



***, **, * significant on a 1%-, 5%-, 10%-level

Figure 6: Estimation results of TAM combined with TT

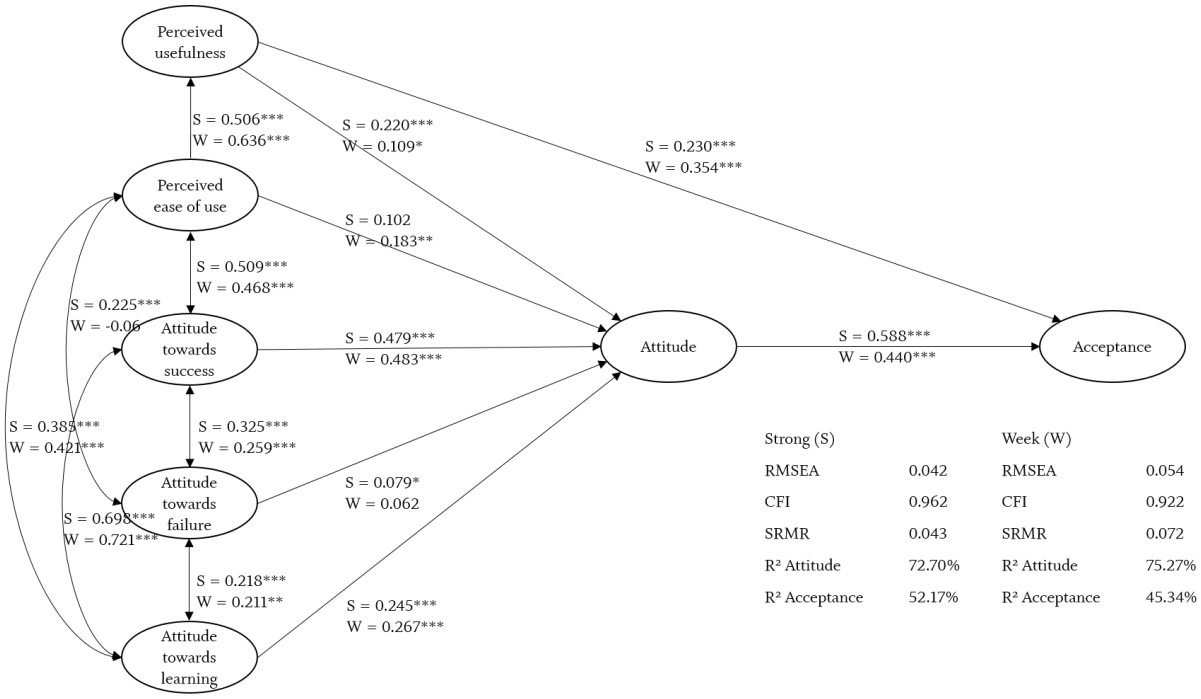
In figure 6, none of the measures for the goodness of fit gives evidence for misspecification of the combined model, but on the contrary, with their values far beyond the threshold, they indicate a very good fit. As can be seen from the R^2, more variance of attitude (R^2 = 79%) is explained than in all the other models presented so far: This result strongly favors the idea of combining the TAM and TT for explaining attitude in Ethiopia. However, contrary to our expectations, a better explanation of attitude does not translate into a better explanation of acceptance. With 61%, the R^2 of acceptance in the combined model is the same as in the original TAM. It is an obvious discrepancy of the combined model that the improved explanation of attitude does not improve the explanation of acceptance.

The reason for this discrepancy might be that different strengths of attitude affect the transformation of attitude into acceptance. To verify this assumption, we re-estimate the combined model for the two subgroups of respondents with strong attitudes and with weak attitudes. Results are presented in figure 7.

Comparing the coefficients of both subgroups in figure 7, it can be noted that the split affects more the part of the model taken from the TAM than that of the TT: Coefficients related to attitude towards success, attitude towards failure, or attitude towards learning are nearly the same for both subgroups, whereas they substantially differ for the components related to perceived usefulness and perceived ease of use. For the latter, generally, the differences in the combined model are less pronounced than

in the original TAM presented in figure 3. Obviously, the introduction of TT into the TAM can smooth the effect of different strengths of attitude. This conjecture is further corroborated by the R^2 observed for acceptance: Again, for subgroup S, the R^2 is higher than for W (52% versus 45%), but the difference is considerably lower than in the original TAM (57% versus 43%). Interestingly, the split into the subgroups does not lead to a higher R^2 for acceptance.

To summarize, the results favor the idea of combining the elements of TT with the TAM, mainly because the resulting model seems to be able to explain attitude in a more meaningful way. This conclusion is drawn from the observed effects on the loadings, the higher R^2 for attitude, and the reduced effect of strength of attitude on acceptance. However, we cannot observe that the superiority of the combined model concerning attitude leads to a better explanation of acceptance.



***, **, * significant on a 1%-, 5%-, 10%-level

Figure 7: Estimation results for combined TAM and TT split into the subgroups strong attitude (S) and weak attitude (W)

7 Conclusions

Several factors determine reluctance to use mobile banking in developing countries, which frequently emanate from personal reasons or situational interference affecting performance (see Chaouali et al. 2017; Bagozzi et al., 1992; Bagozzi and Warshaw, 1990). Under such conditions, decision making is perceived to be problematic as consumers consider outcomes of attempting to achieve behavioral goals (success or failure) (Xie et al., 2008). Besides, it is essential to consider the gap between the decision to act and the prerequisites necessary to act (process/learning) and the steps needed to use the technology (Bagozzi et al., 1992). Moreover, the decision on new technology usage, usually under uncertainty, relies on stored evaluation or feeling where attitude has an indispensable role (Yager,

1999; Sanbonmatsu et al., 2005). To address these factors in our study, we combined concepts from TAM, TT, and attitude strength.

Inferring from our analysis, first, in comparison to TT, the use of TAM for a specific assessment of variation in mobile banking acceptance is recommendable; a finding that contradicts the argument by Chaouali et al. (2017) that TT is a more suitable predictor for problematic perception on mobile banking in developing countries. Second, we find that attitude is the most significant factor determining the acceptance of mobile banking. Consequently, failure to understand the factors determining attitude in a persuasive manner can lead to misinformed decisions. This finding is in line with results from studies related to other countries, e.g. Curran and Meuter (2005) in the USA, Kim et al. (2009) in South Korea, and Chaouali et al. (2017) in Tunisia. Third, our analysis demonstrates that in Ethiopia TT better explains attitude than TAM. Thus, a multidimensional approach to attitude is more recommendable for understanding how Ethiopian mobile banking users shape their attitude than the one-dimensional suggestion.

Fourth, for a comprehensive understanding of both attitude and acceptance, combining TAM and TT is impactful and better explains the factors influencing attitude, although it generates a relatively similar significance to explaining acceptance.

Fifth, in our estimations, attitude toward success and learning have a significant influence on attitude toward mobile banking while attitude toward failure has an insignificant influence. This finding contradicts Chaouali et al. (2017) who demonstrate that attitude is determined by attitude toward success, failure, and learning, and attitude toward learning has the least significant among the three.

For the Ethiopian banking industry, our analysis suggests focusing on improving the attitude of users toward mobile banking since it is the integral component for acceptance decisions. In doing so, banks shall focus more on making their mobile banking service/platforms easy to use than promoting the usefulness of mobile banking. This is because the perception of ease of use has a more significant influence on attitude than usefulness; the finding from Curran and Meuter (2005) also supports this argument. Moreover, the most significant factors influencing attitude in our analysis, attitude toward success and learning shall be improved by well-structured promotion campaigns tailored for the purpose.

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APPENDIX: Questionnaire (translated from the original Amharic version)

1. **General information**
   1.1. Gender
   1.2. Education attainment
   1.3. Age
   1.4. Occupation
   1.5. Monthly income in ETB
   1.6. Service provider
2. Please indicate your **mobile internet** usage experience (per year) for any purpose
3. Average time spent on **mobile internet** (per day) for any purpose
4. Do you think it is necessary to have alternative service platforms besides to the traditional banking platforms?
5. Are you registered for mobile banking service?
6. Are you using the mobile banking service provided by your bank?
7. How often do you use mobile banking to conduct transactions?
8. Perceived usefulness of mobile banking (5-point Likert scale):
   8.1. Using mobile banking enhances your access to banking services
   8.2. Using mobile banking enables you to complete banking activities quickly
   8.3. Using mobile banking helps you use your time effectively
   8.4. Mobile banking is useful
9. Perceived ease of use of mobile banking (5-point Likert scale):
   9.1. It is easy to learn how to use mobile banking and conduct transactions
   9.2. Mobile banking is easy to use
   9.3. Using mobile for banking transactions requires less mental effort
   9.4. It requires less effort to conduct my transactions through mobile banking
   9.5. Instructions to conduct mobile banking are clear and understandable
   9.6. I easily adopted previous alternative banking services such as ATM and I will do the same with mobile banking
10. Attitude toward mobile banking (5-point Likert scale):
    10.1. Using mobile banking is advantageous
    10.2. My using mobile banking is favorable
    10.3. Adopting mobile banking would make me feel Good
    10.4. Adopting mobile banking would make me feel Happy
    10.5. Adopting mobile banking would make me feel Beneficial
11. Attitude toward trying mobile banking and succeeding (5-point Likert scale):
    11.1. Trying and succeeding at adopting mobile banking would make me feel Good
    11.2. Trying and succeeding at adopting mobile banking would make me feel Happy
    11.3. Trying and succeeding at adopting mobile banking would make me feel Beneficial
12. Attitude toward trying mobile banking, but failing to succeed (5-point Likert scale):
    12.1. Trying but failing at adopting mobile banking would make me feel Bad
    12.2. Trying but failing at adopting mobile banking would make me feel Unhappy
    12.3. Trying but failing at adopting mobile banking would make me feel Unbeneficial

13. Attitude toward learning to use mobile banking (5-point Likert scale):

13.1. Learning to use mobile banking would make me feel Good

13.2. Learning to use mobile banking would make me feel Happy

13.3. Learning to use mobile banking would make me feel Beneficial

14. Attitude strength (5-point Likert scale)

14.1. I feel certain about my attitude toward using the platform

15. Intention to use mobile banking (5-point Likert scale):

15.1. I think it is better for me to adopt mobile banking

15.2. I intend to use mobile banking in the future

15.3. I would use the mobile banking for my banking needs

15.4. Using the mobile banking for handling my banking transactions is something I would do

15.5. I would see myself using the mobile banking for handling my banking transactions

15.6. I will frequently use mobile banking in the future

15.7. I recommend others to use mobile banking