Factor Analysis of Customers Perception of Mobile Banking Services in Kenya

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Abstract
Mobile banking service, M-Shwari, allows users to save, earn interest and borrow loan over a short period of time using their mobile phones. The service has a potential to spur economic growth if consumers could understand the concept, its' benefits and adopts it. In our study, we investigated factors that influence the adoption of mobile banking services in Kenya. In particular we have shown empirically that the influence of the intervening demographic factors and the consumer perception may have differential impact in emerging market as compared to developed market situations. We extracted and grouped factors that were perceived by the clients as important in adoption of mobile banking. We then tested if the differences in perceptions on some of the factors extracted by exploratory factor analysis significantly differ between gender categories. The results indicated that there was no significant difference in the perception of ease of use and risk of use between genders in the decision to adopt mobile banking service in emerging market. The findings of our study will therefore provide the financial industry with a better understanding of the factors underlying consumer adoption of mobile banking services and help them formulate marketing and promotional strategies for mobile banking services.
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Keywords: M-Shwari, Mobile banking, technology acceptance models, personal/demographic factor, Factor analysis, emerging market finance.

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INTRODUCTION

Advances in application of computer networking technology are rapidly changing ways in which financial services are transacted in developed as well as developing countries. In Kenya, the money transfer technology known as M-Pesa, which was pioneered by Safaricom, a leading mobile service provider has been very successful. M-Pesa is responsible for transferring millions of shillings on a daily basis among its subscribers. Mobile banking is the latest development in this domain. This paper focuses on the factors influencing the adoption of mobile banking services by consumers in Kenya. In particular, it focuses on M-Shwari, the largest and fastest growing mobile banking service that was launched on 27th November, 2012 by Kenyan telecoms giant, Safaricom in collaboration with Commercial Bank of Africa. The technology acceptance models by Davis and Venkatesh and Roger's diffusion of innovation model have been adopted to study the determinants of consumer adoption of this innovation.

Ondiege, P (2013) outlined why Africa cannot afford to ignore the mobile banking technology. He argues that while Sub-Saharan Africa is now considered to be the fastest emergent continent for ICT sector growth, the majority of the population has no access to banking services (only 20% of African families have bank accounts). He further points out that in rural areas, which account for 60% of Africa's total population, there is limited access to financial services and the cost of providing banking services is exceedingly high due to factors such as underdeveloped commercial bank branch network, deficiency infrastructure and inaccessibility, and financial illiteracy. Therefore sub-Saharan Africa is creating a unique niche for mobile phone banking to develop on the continent. This could boost domestic savings, increase money transfers from the diaspora at low costs, and reduce financial transactions costs which leads to low cost of doing business and therefore benefit SMEs and overall private sector development.

In our study, we aim to determine whether demographic factors are important in influencing the adoption of mobile banking service in Kenya. Also we determine the consumer perception of the emerging mobile banking services concept in Kenya. The findings of our study provides the financial services industry with a better understanding of the factors underlying consumer adoption of mobile banking services and can help them formulate marketing and promotional strategies for mobile banking services.

The theoretical framework for this study is based on the 'technology acceptance model –TAM' postulated by Davies (1989) and the expanded version, 'the united theory of acceptance and use of technology-UTAUT by Venkatesh, Thong, and Xin (2012). It is also draws on the 'diffusion of innovations model' by Rogers (1993).

There have been several papers explaining the concept of technology adoption, but one of the widely accepted and applied models is the technology acceptance model -TAM (Phan and Daim, 2011). The technology acceptance model (TAM) identifies 'usefulness' and 'ease of use' as the important factors that determine user attitude towards adopting a new technology. Phan and Daim (2011) point out that despite TAM's popularity in its use in information system's study, its application is limited due to the nature of constantly changing information technology environments and they therefore advocate for looking into more factors in order to reach a more comprehensive understanding of what influences adoption of information systems.

In response to the complex nature of information technology environments and the resulting desperate nature of the multiple theories being applied to the understanding of how users accept technology, Venkatesh et al (2003 and 2012) sought to distill significant determinants from eight prominent theories, and subsequently derived the expanded 'unified theory of acceptance and use of technology (UTAUT)'. Among the eight theories that contributed to the popularly applied expanded UTAUT were TAM, Theory of Reasoned Action (TRA), and the Motivation Model (MM). According to Venkatesh et al (2012), the four constructs from the eight theories that play a significant role as direct determinants of user acceptance and usage behavior are: performance expectancy (perceived usefulness, extrinsic motivation, job-fit, relative advantage, outcome expectations); effort expectancy (perceived ease of use, complexity); social welfare (subjective norms, social factors, image); facilitating conditions (perceived behavioral control, facilitating conditions, compatibility). Four moderators salient across the eight models that were identified were: experience (duration and exposure to the new technology); voluntariness (whether it is mandatory to use the technology); gender, and age. Attitude towards using technology, self efficacy, and anxiety were theorized as indirect determinants of the intention to use the technology by the researchers.

On the other hand, the process of adopting new technologies has been studied for over 30 years. One of the most popular adoption methods is described by Rogers in his book published in 2003, 'Diffusion of Innovation' (Sahin, 2006). The innovation – decision process is described as an information-seeking and information-processing activity where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation by going through a five-step information decision process, namely; knowledge, persuasion, decision, implementation, and communication. Rogers (1995) categorized consumers in five categories based on level of innovativeness that influenced adoption of technological innovations. He named the categories as: innovators, early adopters, the early majority, the late majority, and the laggards. Roger's model can be used to select the relative advantage of the application and perception of risk (Riquelme and Rios, 2010).

The recent past (1995 up to date) has seen a growing number of studies that seek to determine the factors influencing the adoption of mobile baking technology. Literature review reveals that most of these studies have focused on the European, American, or Asian (including Australia) continents rather than the African continent. The relatively fewer studies conducted on the African continent may be attributed to the fact that for a number of countries, where the technology is emerging, it is still a very new concept with a small percentage of the population trying to test the innovation. South Africa and Kenya are at the forefront of providing mobile banking services on the African continent and with a high mobile penetration rate, South Africa is by far the country where mobile banking is most widely used on the continent and the most important emerging market in terms of mobile banking potential (Ondiege, 2013). Ainin et al (2007), in a study conducted in Kuala Lumpur, Malaysia, determined that the demographic/personal factors of age, gender, personal income, and educational background were significantly associated with mobile banking. Riquelme and Rios (2010), in a study conducted among Singaporean population using the factor analysis statistical technique and the theory of innovation diffusion, among other techniques, found that usefulness, social norms, and social risk to be factors that influence the intention to adopt mobile banking services. They also determined that ease of use has a stronger influence on female respondents than male, whereas relative advantage has a stronger effect on perception of usefulness of male respondents. Phan and Daim (2011), applied the analytical hierarchical analysis and cluster analysis to determine ease of use and usefulness as the top two factors that influence adoption of mobile services. Yu and Fang (2009), using exploratory factor analysis, identified relative advantage, security services, ease of use, and consumer satisfaction to be among six factors they consider as relevant for assessing the post adoption of mobile banking. Wessels and Drennan (2010) found similar results among mobile banker adopters in Australia, by using the attitudinal theory to identify perceived usefulness, compatibility,

and perceived risk as primary determinants of consumers' intention to use mobile banking. On the other hand, a review of literature reveals that limited empirical work has been carried out to identify factors that influence the adoption of mobile banking services in the context of an emerging African market such as Kenya. This is likely to be a unique market in which the influence of the intervening demographic factors and consumer perception may have differential impact as compared to foreign market situations. The study will contribute to filling this knowledge this gap.

RESEARCH METHODOLOGY

A research model is developed to illustrate the relationship between the independent variables (demographic and consumer perceptions) and the dependent variable (adoption of mobile banking). The proposed research model mainly draws from the expanded or unified theory of acceptance and use of technology (UTAUT) model by Venkatesh et.al (2012). The selected independent variables of research, that is, demographic factors of age, gender, income, and educational level as well as consumer perception items are largely informed by this model (See Appendix)

The primary data was collected using a questionnaire from a sample drawn from the population of clients of the M-Pesa money transfer service that are currently using the M-Shwari mobile services within the City of Nairobi, Kenya. Specifically, the population was drawn from residents of low and middle income locations such as Kibera and Umoja Estates. These locations were selected because preliminary survey indicated that mobile banking subscribers are likely to be found among the low and middle income groups in Kenya. The total sample size used in the study was 250. The questionnaire was divided into two sections. Section A focused on collecting the respondent's demographic details, that is, gender, age, personal income, and educational background. Section B comprised of 24 questions designed to measure the perception of the respondents towards the mobile banking concept in general, and specifically towards the M-Shwari mobile banking services. A 5-point likert scale was used for the battery of 24 items in section B of the questionnaire where the respondents indicated their level of agreement with carefully constructed statements that ranged from positive to very negative towards the attitudinal object.

In the interests of expediency and practicality, a convenience sampling method was used to obtain respondents. This method had a limitation in that the researcher was unable to determine the representativeness of the sample to the whole population. The target respondents were adults aged 18 years and above who were registered with the M-

Shwari mobile banking service and were active users. A drop-pick method administered by the researchers and assistants, accompanied by personal interaction with the respondents was used in order to assist a number of respondents whose level of formal education were inhibiting their understanding of some of the questions in questionnaire. Two hundred correctly completed questionnaires/ responses were received.

DATA ANALYSIS AND RESULTS

The analysis took place in different stages with the use of different statistical techniques. The first technique extracted and grouped factors that were perceived by the respondents as important in adoption of mobile banking. Factor analysis, using SPSS was carried out on the responses to the items from sections of the questionnaire that measure perception towards the mobile banking concept, in order to extract factors perceived as important in the adoption of mobile banking technology. Specifically, exploratory factors analysis was used because researchers were uncertain about how many factors exist among the set of variables used. The second technique tested if the differences in perceptions on some of the factors extracted by exploratory factor analysis (ease of use and risk of use) significantly differ between gender categories. In earlier studies (Riquelme and Rios, 2010; Venkatesh et al, 2012) gender was identified as a moderating factor in the adoption of mobile banking. The Mann-Whitney-Wilcoxon (MWW) was used to determine if there is a significance difference in the perception between men and women regarding perceived ease and risk of use of mobile banking from the seven important factors determined by the factor analysis technique. The Shapiro-Wilk test for normality was performed on the data sets representing perception on ease of use and risk of using mobile phone for banking, using the SPSS analysis and which returned p-values of 0.000 for both men and women, leading to the rejection of the null hypotheses that the data sets come from normally distributed populations. This necessitated the use of a non-parametric rather than a parametric test such as the t-Test to determine the significance of the perceived differences. Riquelme and Rios (2010) determined that ease of use was more relevant to women as compared to men in the decision to adopt mobile banking, while risk was relevant to both genders.

Demographic Characteristics of Mobile banking Users

The characteristics of mobile banking users were identified by examining their demographic profiles. From the 200 respondents, 128(64%) were male and 72(36%) were female. This is consistent with previous research which found that males are more

likely to adopt technological innovation than females (Ainin, et al, 2007).

Table 3.1 Mobile banking adoption and age

Age (years)	No. of Respondents	Percentage
18 - 25	66	33
26 - 30	52	26
31 - 40	59	29
41 - 50	12	6
Above 50	8	4
No age reported	3	2
Totals	200	100

The mobile banking service is popular among respondents of the age of 40 years and below, see Table 3.1; 18 – 25 years (33%), 26 – 30 years (26%), and 31 – 40 years (29%). In contrast, only 6% of the respondents between 41 and 50 years adopt mobile banking, with an even lower percentage (4%) adopting it at the age of 50 years and above. This shows that mobile banking is popular among young and middle aged consumers.
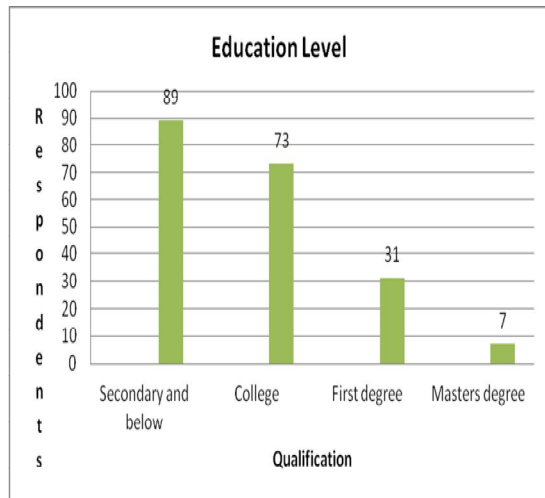

Figure 3.2: Mobile banking adoption and Education Level

Figure 3.2, represents the level of education of those who have adopted mobile banking. The majority of respondents, 89(45%) have a level of education of secondary schooling and below, followed by college education at 73(37%). Those having university level education include 31 (16%) with a first degree, and only 7 (4%) with a masters degree. This shows that mobile banking adopters are typically, customers who have low educational levels. This is not consistent with the findings of previous researches in more developed countries such as by Ainin et al (2007), where they found that mobile banking adopters in Malaysia were typically, customers who have high educational background.
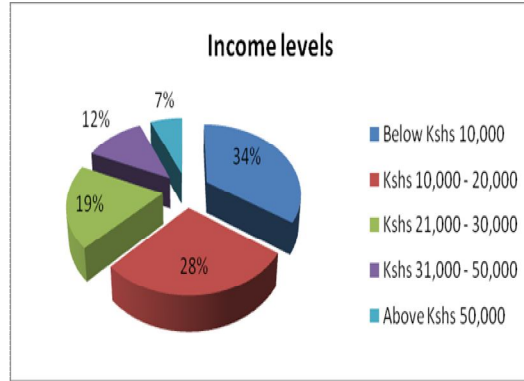

Figure 3.3: Mobile banking adoption and income level

Figure 3.3, displays the number of people adopting mobile banking according to income level. Most of the respondents who adopt mobile banking earn below Ksh 20,000, with 34% (69) earning below Ksh 10,000 and 28% (56) earning between Ksh 10,000 and Kshs 20,000. Only 7% (13) earn above Kshs 50,000, while 12 % (24) and 19% (38) earn between Ksh 21,000 and Kshs 30,000, and between Ksh 31,000 and Ksh 50,000, respectively. Hence, mobile banking adoption is prevalent among low income earners, and this finding is inconsistent with the situation found in a more developed country as determined by Ainin et al (2007).

FACTOR ANALYSIS AND INTERPRETATION
Data on the 24-item battery were analyzed using factor analysis performed using the SPSS to reveal the underlying scales in the data. Some of the key components of the output of this analysis and the interpretation are as below:

Table 3.4: The Kaiser-Meyer-Olkin (KMO) Measure of sample adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.814
Bartlett's Test of Sphericity	Approx. Chi-Square	1861.251
	df	276
	Sig.	0

Table 3.5 A Cronbach's alpha - measure of scalability

Reliability Statistics	
Cronbach's Alpha	N of Items
0.809	24

A principal axis factoring (PAC) extraction method was conducted on the battery of 24 items (factors) with the orthogonal rotation (varimax). The Kaiser-Meyer-Olkin (KMO)-measure which measures sampling adequacy for the analysis, KMO = 0.814, falls in the category of very good (Field et al, 2009).

For this kind of test, values between 0.7 and 0.8 are considered good for the sample while values between 0.5 and 0.7 are considered mediocre. Values above 0.9 are considered excellent. Therefore, the KMO of 0.814 indicates that factor analysis is appropriate for this data. Bartlett's test of sphericity, $\chi 2$ (1861.251), $P < 0.001$, indicates that there is correlation between items, and for factor analysis to work we need some relationships between variables (Field, 2009).

An initial analysis was run to obtain eigenvalues for each component in the data. Seven components had eigenvalues over Kaiser's criterion of 1 and in combination explained 53.59% of the variance. The screeplot curve (see figure 3.6) which begins to tail off after seven factors supports retaining the seven factors. Given the fairly adequate sample size (200) and the convergence of the scree plot and Kaiser's criterion on seven components, this is the number of components that were retained in the final analysis.

A Cronbach's alpha (α) of 0.809 (measure of scalability) implies that the questionnaire is reliable. A value of 0.7 to 0.8 is an acceptable value for Cronbach's α (Field, 2009). Values substantially lower indicate an unacceptable scale.
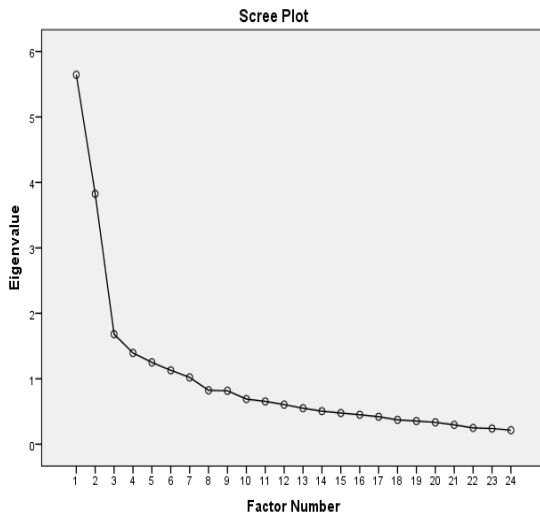

Figure 3.6: The factor analysis screeplot

In the rotated factor matrix table (factor loadings after rotation), the items that cluster on the same components have the following descriptions given to the seven groupings (factors) extracted from the original list of 24 items. Items considered under each cluster have a factor loading with an absolute value greater than the recommended value of at least 0.4 (Field, 2009).

Component /scale 1: Ease of use of mobile phone for banking
The cluster components with their respective factor loadings are: the mobile phone is easy to use to contact banking transactions (0.611); it is easy for me

to remember how to contact banking transactions on the mobile phone (0.625); it is easy to get the mobile phone to do banking transactions (0.619); the mobile phone banking makes it easier to contact banking transactions (0.608).

Component/scale 2: Loan features/terms
This cluster had the following items: the mobile phone banking is useful for me to eliminate constraints time and space when contacting banking transactions (0.755); the credit appraisal and approval process by M-Shwari is transparent (0.737); the size of loans offered by M-Shwari and the terms of repayment are adequate (0.626).

Component/scale 3: Relative advantage /disadvantage of mobile banking over electronic banking
Under this cluster the following items were grouped: there is no need for collateral to get a loan facility with M-Shwari is important to me (0.808); M-Shwari mobile service transactions are cost effective (0.562); allowing me to save as little as 1 shilling and to borrow as little as Kshs 100 with M-Shwari services is important to me (0.506); fixed-term savings for people who want to accumulate value should be introduced. By M-Shwari (0.476).

Component/scale 4: Usefulness/ flexibility of service offered
This cluster comprises of the following items: accessing a loan from M-Shwari service is easy (0.538); no documentation needed for an account with M-Shwari is important to me (0.808); the low-income earners benefit from M-Shwari services (0.541).

Component/scale 5: Risk of using phone for mobile banking
The following items are grouped under the perceived risk of using the phone for mobile banking; I think that the use of mobile phone for banking is risky (0.729); conducting banking on a mobile phone is risky because one can easily lose or misplace the mobile phone (0.598).

Component/scale 6: Interest accruing to money borrowed/invested
The cluster comprises of the following items: the annual interest of 5% earned on M-Shwari is attractive (0.766); I am satisfied with the interest rate of 7.5% per month charged on loan repayment by M-Shwari (0.579).

Component/scale 7: Concerns with and/or doubts on aspects of M-Shwari Mobile banking policy
Grouped under this factor are the following three items: M-shwari should freeze deposits when a customer has an outstanding loan (0.586); I have serious doubts that banking transactions performed

on mobile phones can work properly (0.455); M-Shwari should allow customers to have only one loan at a time (0.446).

Gender Versus the Perceptions of Ease of Use and Risk of Mobile banking

A Mann-Whitney-Wilcoxon (MWW) non-parametric test is employed to test the null and alternate hypotheses defined as:

H_0: The perception of ease of use and the risk of using a mobile phone for banking is not different between males and females when making the decision to adopt mobile banking.

H_1: The perception of ease of use is different between males and females when making the decision to adopt mobile banking.

H_2: The perception of risk of using a mobile phone for banking is different between males and females when making the decision to adopt mobile banking

The MWW non-parametric test was adopted to test the above hypotheses after performing the Shapiro – Wilk test to test for normality of the coded responses of the perception items from the likert scale. For datasets small than 2000 elements, the Shapiro-Wilk test is used to test for normality; otherwise, the Kolmogorov-Smirnov test is used. In our case, since we have 72 women and 128 men respondents, respectively, the Shapiro-Wilk test is used.

The results in table 3.7, led to the rejection of the null hypothesis that states that the data sets come from normally distributed populations (all had sig values = 0.000). Therefore, an assumption of normality was not appropriate for performing the test of hypothesis on the significance difference in the perception of risk of use and ease of use of a mobile phone for banking between male and female users. To obtain a numerical score for each member of the sample for the normality and the MWW tests, the response on the likert scale that indicated scores/codes of 1 for strongly disagree, 2 for disagree, 3 for neither agree nor disagree, 4 for agree, and 5 for strongly agree, were totaled for the items classified by factor analysis under the categories of ease of use and risk of use, respectively, so that the total score was an indication of the level of agreement with the item.

Table 3.7: Shapiro-Wilk test for normality

Shapiro – Wilk Test			
Perception	Statistic	Degrees of freedom	Sig
Ease of use – Female	0.703	72	0.000
Ease of use – Male	0.792	128	0.000
Risk of use – Female	0.881	72	0.000
Risk of use – Male	0.821	128	0.000

In table 3.8, we carry-out Mann-Whitney test statistics for perception of ease of use between male and female. A p-value of 0.064 lies above the critical

value considered for this test of 0.05, and therefore we failed to reject the null hypothesis. Hence from the MWW test, the perception of ease of use is not different between males and females when making the decision to adopt mobile banking. This conclusion differs from that determined by other researchers such as Riquelme and Rios (2010), who concluded that ease of use was more important to females than males in the decision to adopt mobile banking.

Table 3.8 Mann-Whitney Test – Test statistics for perception of ease of use between male and female

Test Statistics[a]

	Ease of use
Mann-Whitney U	3893.500
Wilcoxon W	12149.500
Z	-1.855
Asymp. Sig. (2-tailed)	.064

a. Grouping Variable: either Female or Male

In table 3.9, p-value of 0.294 leads to the rejection of the alternative hypothesis that the perception of risk of using a mobile phone for banking is different between males and females when making the decision to adopt mobile banking. This result is in agreement with that found by Riquelme and Rios (2010).

Table 3.9: Mann-Whitney– Test statistics for perception of risk of use between male and female

Test Statistics[a]

	Risk of use
Mann-Whitney U	4206.500
Wilcoxon W	12462.500
Z	-1.049
Asymp. Sig. (2-tailed)	.294

a. Grouping Variable: either Female or Male

DISCUSSION

This study has found that demographic factors such as age, gender, personal income, and educational background affect the adoption of mobile banking services. These results are generally similar to those found by other studies done in more developed countries except for fact that, in Kenya, income and level of education appear have the opposite impact on adoption of mobile banking when compared to the findings of the studies that were contacted in countries outside the African continent. However, these differences can probably be attributed to the current terms/features of the service in Kenya, which may not be appealing to the high income earners and those with higher levels of education. Mobile banking in Kenya can also be categorized as being in its infancy stage of implementation and acceptance, and it is likely that the mobile banking service

providers view the current market niche to lie in the lower income groups, a strategy similar to one that was initially adopted when launching the hugely successful mobile money transfer service known as M-Pesa by Safaricom. However, this situation may change with time when the service providers respond to the potential market needs by altering the features and composition of the mobile service package offered to customers.

Similar to other studies that have found that men are more willing to adopt technology than females, this study came up with similar results. The results could be attributed to the male masculine personality which is often willing to take risks and is anxious to try out new technology products (Ainin et al, 2007, Venaktesh et al, 2012). In line with other studies that showed that younger customers have a greater tendency to adopt innovations, such as mobile banking, this study found that mobile banking is predominantly adopted by people who are aged 40 years and below. In Kenya, this may partly be attributable to the low income levels of the majority of this group and the fact that a good number of them may not have a steady job and will therefore embrace mobile banking for urgent small credit needs.

The study also reveals that the perceived factors that can be categorized as the ease of use of mobile phone, loan features/terms, the relative advantage of using mobile banking over electronic banking, use and/or flexibility of the services offered by mobile banking, the interest paid on invested funds and the interest charged on borrowed funds, anxiety regarding some policies governing the M-Shwari service, as well as the risk of mobile banking, are the seven important factors considered by customers when adopting mobile banking services in Kenya. Perceived ease of use, relative advantage, and risk have also been identified by other researchers as determinants of adoption of mobile banking (Yu and Fang, 2009; Wessels and Drennan, 2010; Riquelme and Rios, 2010; Pank and Daim, 2011).

The study has also determined that there is no significant difference in the perception of ease of use and risk of use between genders (male and female) in as far as the decision to adopt mobile banking is concerned. This is in contrast to other researches which found at least one of these factors (ease of use) as important to female consumers (Riquelme, 2010).

CONCLUSION AND RECOMMENDATION
The mobile banking service providers such as M-Shwari needs to develop marketing strategies that target personal /demographic factors such as age, level of income, and level of education in order to effectively penetrate the hugely potential mobile banking market in Kenya. M-Shwari service provider, specifically, should be aware that customers

consider rules of administering the service such as restrictions on the amounts loaned to individuals and what is considered as non-transparency in the method used to determine the credit amount allowable to a borrower, as deterrents to the adoption of mobile banking. However, consumers recognize the advantage provided by a quick, collateral-free service for accessing credit over the more stringent 'brick and mortar' banking services. In order to attract consumers with high levels of education and more income, the mobile service providers in Kenya will have to improve the features of the loan facility, by for instance, providing a package with substantially higher loan amounts and setting attractive interest rates for borrowing and saving funds.

Further research could be conducted into deeper analysis of the moderating influence of demographic factors on mobile banking adoption in the Kenyan context. For example the relationship between the demographic factors (gender, age, income levels, and educational levels) and the adoption and/or non-adoption of mobile banking can be further analyzed for more enriched findings using other statistical tools such as tests for independence/dependence and regression analysis. This can be done with a larger sample size thus a limitation of our study. We have used a sample size of 200 which is fairly good for factor analysis, but one could use a larger sample size, for example 1000 which is considered excellent (Field, 2009). This study has drawn conclusions on the characteristics of mobile banking in Kenya based on consumers of one mobile service provider (M-Shwari by Safaricom mobile phone service) , but further studies need to focus on a wider consumer market of other emerging mobile banking services providers such as Orange mobile service provider. Future studies also need to target rural rather than urban consumers, because it is in the rural areas that mobile banking will play a significant role in overcoming the challenges of traditional banking. Ondiege (2013) pointed out that only 19% of the adult population in Kenya has access to a formal bank account, and banking services in Kenya are largely restricted to urban populations.

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