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An Examination of the Factors that Determine Consumers' Adoption of Mobile Banking Services in South Africa

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Abstract: Anecdotal evidence from research indicates that the majority of banks at global level are being forced to embrace modern technology in the provision of products and services to their patrons. This is due to competitive pressures, a change in banks' strategic focus and the ever increasing costs of running businesses against an increase in profitability requirements by shareholders. The risk associated with this is that as banks adopt technologically driven products like mobile banking, a majority of the population may end up being excluded. Based on the convenience sampling approach, and using a structured questionnaire to collect primary data from patrons who are retail banking customers with active bank accounts, this study examined the factors that determine consumers' adoption of mobile banking in South Africa. Frequencies, confirmatory factor analysis and structural equation model techniques were applied to analyze survey data using SPSS 21 and Stata 14 statistical programs. The overall Cronbach's alpha and Keiser-Meyer Olkin values show that the instrument's items met the internal consistency and statistical validity conditions. Structural equation model estimates show that perceived ease of use, perceived usefulness and relative advantage have significant positive influence on mobile banking adoption, but perceived risk has negative but insignificant influence.

Keywords: mobile banking; adoption; services; consumers

JEL Classification: E50

1. Introduction and Background

1.1. Introduction

Anecdotal evidence from recent research indicates that the majority of banks at global level are being forced to embrace modern technology in the provision of products and services to their patrons. This is mainly due to competitive pressures, a change in banks' strategic focus and the ever increasing costs of running businesses against an increase in profitability requirements by shareholders.

The main risk associated with this is that as banks adopt technologically driven products like mobile banking, a majority of the population may end up being excluded.

In the realm of financial inclusion, the provision and usage of banking services have remained largely driven by rapid transformation due to advanced technological inventions; with mobile banking being noticeably regarded as an effective means of convenience for consumer banking (Nayak, Nath & Goel, 2014). The use of mobile phones has created opportunities for the evolution of mobile banking services which make basic banking services easily accessible with reasonably minimum effort.

Although mobile banking has proved to be an effective instrument of retail banking business and consumer banking in terms of time saving, effort and cost reduction, there are numerous factors that exhibit distinct influences on consumers' adoption of mobile banking in different countries. Using South Africa as a tool of analysis, the study investigated perceived self-efficacy, supposed risk, relative

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advantage and perceived compatibility as key factors influencing the adoption of mobile banking in South Africa.

The banking sector in South Africa has emerged as one of the well-regulated financial sector relative to other financial sectors in numerous industrialised countries in the world.

The banking sector has become much more concentrated and dominated by the four largest banks; namely ABSA Bank, Standard Bank, First National Bank, and Nedbank. Combined, the respective four largest banks account for about 84% of the total banking sector assets, with the smaller banks accounting for the remaining 16% (Banking Association South Africa, 2012).

According to the World Bank (2013), South Africa's financial sector is fairly inclusive with approximately 54 percent of adults reported to be using formal accounts facilitating both deposit and withdrawal transactions with a bank.

1.2. Background

In South Africa, mobile banking was first introduced in August 2002 with about 31 426 consumers having registered for the service (Dagada, 2013). In 2002, mobile banking primarily provided the service for balance checking. ABSA was the first bank to launch this service; followed by FNB, Standard Bank and Nedbank. Increased consumer interest in mobile banking remains the key driver for sustained use of mobile banking. Mobile banking in South Africa has three formats; namely Wireless Application Protocol (WAP), Wireless Internet Gateway (WIG), and Unstructured Supplementary Service Data (USSD). Despite many people having mobile phones, the number of consumers with active bank accounts adopting mobile phone banking remain significantly low (Meyer, 2015). Based on the global banking report by KPMG (2015), there are noticeable challenges in South Africa that have limited the adoption and use of mobile banking services.

Prior to exploration of the challenges noted by KPMG (2015), Ramlakan (2012) had indicated that South Africa is however classified among countries that have highest mobile banking user rates in the world. In stressing the point that mobile banking is progressively emerging as the future of retail banking in South Africa, Ramlakan (2012) indicated that the increasing convergence between mobile phones and banking technology for conducting shopping and banking transactions reflect that the days of customers using their branches for banking are actually numbered.

1.3. Problem Statement

In April 2015, South Africa was reported to have about 79.8 million mobile phone subscribers; out of which 39.3% (31.4 million) are with Vodacom, 35.1% (28 million) with MTN, 22.7% (18.1 million) with Cell C, and the remaining 2.9% (2.3 million) with Telkom and Virgin Mobile (Bronkhorst, 2015). According to KPMG (2015), mobile banking services in South Africa have remained much lower than anticipated and still underused; with the mobile banking market still remaining very small when compared to the entire banking transactions (KPMG, 2015). Given the existence of growth in mobile phone ownership and low uptake in mobile banking services in the country, there was therefore need to investigate factors influencing consumers' adoption of mobile banking at distinct regional levels in the country.

1.4. Research Objective

The study set primarily to statically examine the influence of perceived ease of use (PEOU), perceived usefulness (PU), relative advantage (RA) and perceived risk (PR) on consumers' adoption of mobile banking services in South Africa.

In the process the study sought to provide answers to the broad question of what is the influence of perceived ease of use, perceived usefulness, relative advantage and perceived risk on consumers' adoption of mobile banking services in South Africa.

1.5. Research Propositions

Given mobile banking overall confidence as the dependent variable (proxy for mobile banking adoption) in this study, the exploratory variables that influence consumers' mobile banking adoption include perceived self-efficacy, supposed risk, relative advantage and perceived compatibility:

- Perceived ease of use has significant and positive influence on consumers' adoption of mobile banking services;
- Perceived usefulness has significant and positive influence on consumers' adoption of mobile banking services;
- Relative advantage has significant and positive influence on consumers' adoption of mobile banking services; and
- Perceived risk has significant and negative influence on consumers' adoption of mobile banking services.

1.6. Significance of the Study

Mobile banking plays a significant role in providing convenience, reducing the risk of carrying bulk notes and coins, saving time and effort to perform financial transactions (Standard bank, 2014). Accordingly, empirical findings from this study contribute the existing body of theoretical knowledge around adoption of mobile banking services. The study thus provides insights to financial institutions for use in their efforts to promote use of mobile banking services in context of South Africa. Overall, results from the research study provide retail banking experts with improved understanding of factors influencing adoption of mobile banking by consumers. Such understanding assists practitioners of banking institutions to develop mobile banking models and strategies that can exploit opportunities, reduce risks and build trust to improve use of mobile banking adoption in the retail banking sector.

2. Related Work

2.1. The Banking Sector in South Africa

Mobile banking services are largely associated with banking activities in the sense that mobile banking services are a subset of electronic banking. Technically, the mobile banking service requires a customer to hold a deposit account to and from which payments or transfers can be made (Alalwan, Rana, Dwivedi, Lal & Williams, 2015). Following Jeong & Yoon (2013), mobile banking can be considered as an electronic commerce application which for that reason, some literature surveys associated with e-commerce and internet banking remains relevant to provide valuable insights into assessing the magnitudes of acceptance and non-acceptance of mobile banking services adoption in different regions.

South Africa has a developed and well-regulated financial sector that compares favourably with many developed and emerging countries in the global economy. The financial regulation legislation, technology, products and the number of competing firms have changed levels of the competition landscape in the sector. According to the Banking Association of South Africa (2012), the South African banking industry during the calendar year 2012 consisted of 17 registered banks, 2 mutual banks, 12 local branches of foreign banks and 41 foreign banks all with approved local representative offices that were under financial regulation by South African Reserve Bank (SARB). Based on World

Bank (2013) report, South Africa's financial sector is fairly inclusive with some 54% of adults reported to using a formal account enabling both deposits and withdrawals at banks, credit unions, cooperatives, post offices, or microfinance institutions. During 2012, FinScope SA (2013) indicated that the figure of banked adults stood at 75% in as much as it includes individuals who receive government-to-person social welfare payments for children, the disabled and elderly.

The banking sector in South Africa is much more concentrated and dominated by four largest banks, namely ABSA Bank, Standard Bank, First National Bank (FNB), and Nedbank. The respective four banks account for approximately 84% of banking sector total assets, while smaller banks account for the remaining 16% (Banking Association South Africa, 2012). These large banks are equipped with operations and technology systems, sector compliance structures and procedures. The decision making processes are better aligned to providing services to middle-high income population segments than with lower income markets (World Bank, 2013). Standard Bank, the largest bank in terms of assets, had a market share of 31 percent, followed by ABSA, First National (FirstRand) Bank and Nedbank with about 26 percent, 23 percent and 20 percent; respectively (Banking Association South Africa, 2012).

2.3. Transformational Mobile Banking

World Bank (2013) indicated that MNOs have great potential to provide branchless financial services at a lower cost and more efficiently. The large MNOs and retailers are well placed to be cost-effective and competitive due to their network coverage and footprint respectively. Nonetheless, there is no universal form of mobile banking but rather varying models for purposes and structures to fit the dynamics of the country of operation. Factors that influence mobile banking models include political climate, regulatory environment, state of the economy, nature of financial systems, demographics and customer profile (Nayak, Nath & Goel, 2014).

Mobile banking systems offer a variety of financial functions such as local and international money remittances, airtime purchases, person-to-person payments, bill payments, and a full set of account management options such as balance enquiries (Samudra & Phadtare, 2012). Some of these platforms are offered entirely by banks, others entirely by telecommunications providers and still others involve a partnership between a bank and a telecommunications provider (Alpesh, 2013). The most compelling strategic reasons for transformational mobile banking services are: increased convenience for the customer and a cost reduction opportunity for banks. The mobile banking channels are actually used to enable provision of services to existing banking customers. It is a self-service distribution channel that can be used anytime and anywhere through a mobile device. With more customers adopting mobile banking, banks would have an opportunity to reduce further investments in expensive infrastructure such as branches and ATMs (Jeong & Yoon, 2013).

Access to financial services has remained difficult for the low income population segment of the society. As such, the respective population group has been excluded from participating in the formal financial sector by traditional banks. Nonetheless, mobile devices have demonstrated the potential to extend and transform the access of financial services to the unbanked segments of the population anywhere in the world. This improved financial service delivery can be achieved through exploiting the reach of the mobile networks and the pervasiveness of the mobile phones globally. The need for financial inclusion in the developing and emerging markets has resulted in the development of innovative transformational mobile phone enabled financial solutions targeted at the unbanked (World Bank, 2014).

2.4. Mobile Banking in South Africa

Mobile money is a form of transformational mobile banking that utilises the mobile phone to transfer money and make payments to the unbanked and underserved individuals or population segments (GSMA, 2014). At the end of 2013, there were 219 services live in 84 countries with 113 new

implementations (GSMA, 2014). Customers were reported to have embraced the mobile technology in their day to day lives given the fact that mobile phones can perform mobile banking transactions.

The newly emerged mobile banking services represent an innovation where both intangible service and an innovative medium of service delivery employing high technology are present. Financial institutions mobile banking platforms rely on one or a combination of strategies which include downloadable mobile-banking applications, mobile browser-based programs and text messaging applications (Odhiambo, 2012). These strategies ensure that mobile banking can be accessible to a customer with even the most basic mobile phone handset. In an effort to avoid loss of control over money supply, South Africa Reserve Bank regulation stipulates that only banks registered under the Banks Act are allowed to engage in the business of banking. This implies that only banks are permitted to take deposits from the general public or issue electronic money (CGAP, 2014). Non-bank entities wishing to offer branchless banking services that entail taking deposits from the public such as mobile banking can do so only in partnership with a registered bank (CGAP, 2013).

In South Africa, in the pre-digital age, visiting a local branch was the only way to access banking services. The introduction of ATMs 1981 was done to ease the customer demand for the task of withdrawing money and became the first implementation of self-service banking made available to the customers (Standard Bank, 2013). Internet banking was launched in South Africa around 1996, thus elevating the concept of self service banking further (Banking Association South Africa, 2014). The launch of internet banking was followed by cell phone banking in early 2000 as introduced by ABSA with just a single limited functionality of balance checking (Banking Association South Africa, 2014). According to the World Wide Worx Mobility (2014), there was a decline of internet banking on personal computers or laptop but an increase in the uptake of the three modes of cellphone banking in use of text messaging applications from 26% to 32%. Internet banking on cellphone showed a trivial increase from 11% to 12%, while downloadable mobile banking applications increased somewhat significantly from 1% to 9% (Bizcommunity, 2014). However, the about 94% of South Africans still prefer to access their bank accounts through ATMs while 83% prefer branch visits (Bizcommunity, 2014). From all the banking consumers who use mobile banking in South Africa, FinScope (2013) documented that the transactional behaviour of banking consumers reveals 84 percent for airtime purchase, 54 percent account balance enquiries, 15 percent bill payments, and 12 percent money remittances.

2.5. M-Pesa in Kenya and South Africa

The advent of M-PESA in Kenya was developed with the initial goal to create a service that would allow microfinance borrowers to conveniently receive and repay loans using Safaricom airtime re-sellers network to enable microfinance institutions to provide more competitive loan rates to users (Cudjoe, Anim & Nyanyofio, 2015). M-PESA means mobile money where M stands for mobile and PESA stands for money in Swahili (Amin, Supinah, Aris & Baba, 2012). The concept was launched in March 2007 in Kenya by Safaricom (Mas & Radcliffe, 2010). M-PESA is technically a mobile phone-based money transfer, financing and micro financing service launched by Vodafone for Safaricom and Vodacom, the largest mobile network operators in Kenya and Tanzania. Since 2007, the concept expanded to Afghanistan, South Africa, India and Romania in 2014 and Albania in 2015. The service allows users to make deposits, withdraws, transfer money and facilitate payments for goods and services quite easily with a mobile device (Yu, 2012).

The initial proposition for M-PESA was specifically to send money home targeted at the urban migrants who have left their unbanked fellows in the rural areas (Heyer & Mas, 2011) given the poor domestic money transfer environment Kenya had in the past. Traditional methods that were employed presented a risk of money not successfully reaching intended beneficiaries. The formal post office money transfer service was proved to be inefficient and suffered frequent money shortages (Mas & Radcliffe, 2010).

Since then, M-PESA has become popular with both the banked and unbanked population segments (Mbongo, 2012). The mobile platform offers a convenient additional method for managing money without handling cash (Mbongo, 2012). In 2007, over 70 percent of Kenyan households did not have bank accounts or they relied on informal sources of finance (Kimenyi & Ndungú, 2013). For households who had bank accounts, physical distances to branch banks or points of financial service added significantly to transactions costs (Samudra & Phadtare, 2012). There was a significant gap in the market for a trustworthy and efficient money transfer service. In an effort to improve competitive positioning, M-PESA introduced a service that increased convenience while reducing costs related to travel. The service increased both safety and trust in the system with transactions occurring in real time and recorded on a log as well as confirming with recipient immediately (Mas & Radcliffe, 2014).

In South Africa, Vodacom and Nedbank announced the launch of the service in September 2010. At the respective period, the economically active people without a bank account were estimated to be approximately 13 million. M-PESA was slow to gain a toehold in the South African market compared to Vodacom's projections that it would sign up 10 million users in the following three years. By May 2011, M-PESA had registered approximately 100,000 customers. The gap between expectations for M-PESA's performance and its actual performance can be partly attributed to differences between the Kenyan and South African markets, including the banking regulations that were in existence at the time of M-PESA's launch in each country. Based on the view by MoneyWeb (2014), a tough regulatory environment with regards to customer registration and the acquisition of outlets also compounded the company's troubles since the local regulations are more stringent in comparison to other African countries. Lack of education and product understanding also hindered efforts in the initial roll out of the product. In June 2011, Vodacom and Nedbank launched a campaign to re-position M-PESA, targeting the product to potential customers who have a higher living standard measures than were first targeted. By March 2015, M-PESA still struggled to grow its customer base, which leaves South Africa behind Tanzania and Kenya (Cudjoe, Anim & Nyanyofio, 2015).

2.6. Technology Acceptance Model (Tam) In Mobile Banking

Empirical researches on the reasons and conditions that lead individuals to adopt a new information technology application have dominated the centre stage in the realm of banking and financial literacy studies. Numerous competing theories or models of technology diffusion or acceptance have been analysed to understand factors that influence the individuals' behavioural intentions to use technology (Petrova, 2015). As such, the TAM remains one such widely used model in electronic commerce (e-commerce). The model adopted the "theory of reasoned actions" (TRA) causal relationships to explain the influence on an individual's acceptance behaviour of information systems. In light of this background, the purpose of TAM is to explain and predict the acceptance of technology based on two behavioural beliefs, namely "perceived ease of use" and "perceived usefulness" (AlSoufi & Ali, 2014). As emphasised by Nayak, Nath & Goel (2014), Davies (1986) defines "perceived usefulness" as the "degree to which an individual believes that using the particular system would enhance his" while "perceived ease of use" is defined as the "degree to which a person believes that using a particular system would be free of effort".

Based on the TAM, perceived usefulness is regarded to be influenced by ease of use because the easier the system to use the more useful it can be. In results from many empirical test of TAM, perceived usefulness has consistently been found to be a strong determinant of intentions to adopt (Samudra & Phadtare, 2012). Alpesh (2013) accentuates that customers can be willing to use mobile banking service when they perceive it to be useful. Perceived ease of use in the context of mobile banking services centres on the navigational structure of the website (Nayak, Nath & Goel, 2014). Accordingly, factors contributing to the acceptance of new information of technology innovations are likely to vary dependent upon the type of technology, target users and context. It is therefore reasonable to expect

situational variables to influence perceived usefulness and perceived ease of use by customers (Yu, 2012). According to Alalwan, Rana, Dwivedi, Lal & Williams (2015), when deploying a technology perceived as risky by the targeted customer, there is serious need to place emphasis on the ease of use of the product or service.

Perceived usefulness and ease of use may not however fully explain the customers' behaviour in an emerging environment such as mobile banking services. In this study, perceived risk and trust are introduced as additional beliefs that may have an impact on the acceptance of mobile banking. Due to mobile banking service's intangibility and dependency on mobile service network connectivity, the service distribution chain seems to be plagued with uncertainty. Therefore, the service is perceived as highly risky as compared to other traditional modes of banking (Kazemi, Nilipour, Kabiry & Hoseini (2013). Adoption of mobile banking is more complex than one-time online purchases since there is an initiation of a long-term relationship between the customer and mobile banking service provider (Yu, 2012).

3. Methodology and Analytical Techniques

3.1. Introduction

In conducting the analysis, the research methodology applied comprised the suitable research design, target population and sample, research, validity of the research instrument, scale reliability and statistical data analysis techniques.

3.2. Research Design

Given that the survey data to be collected was numerical in measurement (Kabir, 2013); the research design for this study was a quantitative approach. From the 514 195 total population estimate delimited to Region 3 of Tshwane reported from the 2011 Census (Statistics South Africa, 2011), a target adult population of 64 418 was used and a sample of 150 participants was selected. Data was collected using a structured questionnaire. In exploring the factors relating to perceptions of retail bank consumers on adoption of mobile banking, frequencies, factor analysis and structural equation modelling techniques were applied to analyse the data to be collected from participants using structured questionnaires.

3.3. Target Population and Sampling Strategy

The target population for this research study comprised of retail banking customers. Given the absence of a readily available sampling frame, convenience sampling was applied in this study. Selection and application of this approach was based on the rationale that the population size of the target participants was not known. A sample of one hundred and fifty (n=150) respondents was selected for data collection.

3.4. Research Instrument

Primary data collection was done through physical distribution of self-administered structured questionnaires to research participants. Self-administered structured questionnaires were used in light of the rationale that they are less intrusive than face to face interviews; and also ensure that participants provide responses to all questions at the time most convenient to them. The questionnaires were constructed based on a 5-point Likert scale upon which the levels agreement or disagreement were determined as follows: 1=Strongly Disagree; 2=Disagree; 3=Neither Agree nor Disagree; 4=Agree; and 5=Strongly Agree.

3.5. Statistical Data Analysis

Data analysis refers to the process of converting data into information (Saunders et al., 2003). The primary focus of data analysis in both qualitative and quantitative studies is to obtain relevant answers to specific questions and draw conclusions. In order to derive benefits associated with research triangulation, principal data integrity analytics were undertaken by applying appropriate statistical techniques using Statistical Package for Social Sciences (SPSS) 21 and Stata 14 statistical programs. Cross tabulation of frequencies, and exploratory factor analysis were performed using SPSS, while the structural equation model of mobile banking adoption was estimated using Stata to derive conclusions on the propositions.

The statistical validity of the measurement instrument was examined through factor analysis; a process by which total correlation analysis of items is evaluated (Beavers et al, 2013). Prior to conducting factor analysis, the Keiser Meyer Olkin - Measure of Sampling Adequacy (KMO-MAS) analysis was undertaken to determine suitability of the size of sampling for factor analysis. The KMO value was used to indicate whether the data was suitable for confirmatory factor analysis. The KMO value was computed in statistical program based on the function specified below:

$$KMO = \left(\sum\sum r_{ij}^2\right) / \left(\sum\sum r_{ij}^2 + \left(\sum\sum a_{ij}^2\right)\right); \text{where } a_{ij} = \left(r_{ij} \bullet 1,2,3,...,k\right) \quad \text{---------- (1)}$$

Where $a_{ij} \approx 0.0$, then the variables are measuring a common factor and the KMO value ≈ 1.0. Conversely, where $a_{ij} \approx 0.0$, then the variables are not measuring a common factor and the KMO value ≈ 0.0. Proceeding further, the Bartlett's test of sphericity was conducted to determine whether factor analysis could sufficiently be performed on the surveyed data. Computation of the KMO was based on the function of exploratory factor analysis; which is a multivariate statistical method that examines the dimensionality of a set of variables; for which latent variables are unobserved constructs referred to as factors. Operationally, the technique explored the dimensionality of a measurement instrument by finding the smallest number of interpretable factors that explain the correlations among a set of variables.

$$\begin{bmatrix} X_1 \\ \dots \\ X_n \end{bmatrix}_{nx1} = \begin{bmatrix} \lambda_{11} & \dots & \lambda_{1m} \\ \dots & \dots & \dots \\ \lambda_{n1} & \dots & \lambda_{nm} \end{bmatrix}_{nxm} \begin{bmatrix} F_1 \\ \dots \\ F_m \end{bmatrix}_{mx1} + \begin{bmatrix} e_1 \\ \dots \\ e_n \end{bmatrix}_{nx1} \quad \text{---- (2)}$$

The matrix of the factor analysis model above indicates that given n variables $X_1, \dots, X_n$ measured on a sample of m subjects was specified based on these assumptions.

a) $Var(e_j) = \sigma_j^2 \;;\; E(e_j) = 0$. The measurement error has a constant variance and on average equals zero; ----- (3)

b) $Cov(F, e_j) = 0$. No association between the factor and measurement error; ----- (4)

c) $Cov(e_j, e_k) = 0$ No association between errors ----- (5)

d) $Cov(X_j, X_k \mid F) = 0$, observed variables are independent of one another ----- (6)

The exploratory factor analysis method specifies only latent variables by placing no structure on relationships between the observed variables and on the relationships between the observed variables. In order to evaluate the degree to which the chosen set of items measures a single one-dimensional

latent construct, internal consistency or scale reliability of the research instrument's items was examined using the Cronbach's alpha criterion. The Cronbach's alpha value was computed to examine the homogeneity of internal consistency of the underlying items.

4. Results and Analysis

4.1. Scale Reliability

The internal consistency of the research instrument's items was examined based on the Cronbach's alpha criterion (Peters, 2014). Technically, the scale reliability test was undertaken to statistically determine the degree to which the chosen set of survey items measured a single one-dimensional latent construct. In other words, Cronbach's alpha coefficient was statistically measured to assess the extent to which if the same questions were to be asked to same respondents several times under similar conditions, identical responses could be obtained (Peters, 2014). The disaggregated and the overall scale reliability results on the four dimensions of the research instrument; namely perceived self-efficacy, perceived risk, relative advantage and perceived compatibility are presented in Table 4.1.

Table 4.1. Scale Reliability of Items

Dimension	No. of Items	α value
Perceived ease of use (PEOU)	4	0.751
Perceived usefulness (PU)	4	0.916
Relative advantage (RA)	3	0.729
Perceived privacy risk (PRR)	3	0.690
Overall	14	0.907

The Cronbach's alpha coefficient value (α = 0.907) for the selected fourteen items exceeded the minimum acceptable (α = 0.7) scale reliability score. The results reveal that the items used measured a single unidimensional latent construct.

4.2. Statistical Validity

The sampling adequacy of survey items of the research instrument was measured based on the Keiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) criterion. Disaggregated statistical validity results on factors influencing consumers' mobile banking adoption by surveyed respondents are presented in Table 4.2.

Table 4.2. Statistical Validity of Disaggregated Dimensions and Overall KMO-MSA criterion

Dimension	No. of Items	KMO- MSA value
Perceived ease of use (PEOU)	4	0.750
Perceived usefulness (PU)	4	0.776
Relative advantage (RA)	3	0.679
Perceived privacy risk (PRR)	3	0.657
Overall	14	0.844

The Keiser-Meyer-Olkin (KMO) approach was applied to determine suitability of sampling adequacy. Given the statistically acceptable minimum KMO-MSA value of 0.600, the computed overall KMO-MSA value (=0.844) for the fourteen questionnaire items on consumers' adoption of mobile banking services confirms adequacy of the sample of items explored under all the given dimensions. The KMO-MSA values below the score 0.600 for the questionnaire items under the dimensions "perceived ease of use" (= 0.750), "perceived usefulness" (= 0.776), "relative advantage" (= 0.679) and "perceived privacy risk" (= 0.657) indicate that the items sampled under the respective dimension were inadequate for the study.

4.3. Respondents' Demographic Profiles

This section presents results on frequencies on demographic profiles of respondents from whom survey data was collected to determine factors influencing consumers' adoption of mobile banking.

Table 4.3. Respondents' demographic profiles

	Proportion (%)	Frequency (count)
Gender		
Male	48%	72
Female	52%	78
Age group (in years		
< 20 years	20%	30
	27%	41
20-29 years	24%	3636
30-39 years	24%	36
	11%	17
40-49 years	17	26
> = 50 years	17%	26
Highest education attained		
Primary school	18%	27
	24%	
Secondary school	20%	36
Bachelor's degree	27%	41
Honours degree	11%	16
Masters/PhD	27%	41
Masters/PhD	20%	30
Primary bank with active account		
	17%	26
	21.3	
	18.7	
Absa	20.7	
		32
Capitec	21%	
FNB	19%	28
Nedbank	21%	31
Standard Bank	22%	33
Frequency of mobile banking use		
Never	1%	1
Rarely	1%	1
Sometimes	9%	13
Often	25%	38
Always	64%	97

Frequency statistics on respondents' demographic profiles reveal that 52% (n = 78) majority of respondents were females while the remaining 48% (n = 72) were males. The dominating age group was 20-29 years which accounted for 27% (n = 41) of the total valid responses, followed by the age group 30-39 years which comprised of 24% (n = 36) of the total respondents surveyed. With regards to educational qualifications attained, 27% (n =41) of respondents reported that they had bachelors' degree, followed by 24% (n = 36) who had secondary education and 20% (n = 30) who had Masters/PhD degrees at the time the survey was conducted. The relative majority of about 22% (n = 33) of the respondents reported that they had active bank accounts with Standard Bank, followed by Capitec

with 21% (n = 32) and Nedbank with 21% (n = 31). From the total 150 participants with valid responses, the majority 64% (n = 97) reported that they always use mobile banking.

4.4. Total Variance Explained

Following measurement of scale reliability and statistical validity, factor analysis was conducted to retain items with high loadings with regards to their perceived influence on consumer mobile banking adoption. The latent root criterion was applied to examine the amount of variance that was distributed across extracted items. Results on total variances explained by retained items are presented in Table 4.4.

Table 4.4. Total variance explained

Dimension	Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
PEOU	1	2.558	51.163	51.163	2.151	43.023	43.023
PU	1	3.220	80.501	80.501	3.007	75.178	75.178
RA	1	1.948	64.946	64.946	1.432	47.719	47.719
PRR	1	1.883	62.753	62.753	1.352	45.053	45.053
Extraction Method: Alpha Factoring.							

Results presented in Table 4.4 show that from the final iterations, each dimension had one initial eigenvalue greater than 1; hence one factor was extracted from the selected items in the dataset for each of the dimension, namely perceived ease of use (PEOU), perceived usefulness (PU), relative advantage (RA) and perceived privacy risk (PRR). Based on the extraction sums of squared loadings, results show that total variances explained by the dataset are approximately 43% for perceived ease of use (PEOU), 75% for perceived usefulness (PU), 48% for relative advantage (RA) and 45% for perceived privacy risk (PRR).

4.5. Factor Loadings

Results on factors with retained items that demonstrated significantly high loadings under each dimension are presented in Tables 4.5.

Table 4.5. Factor loadings

Dimension and items†	Factor loadings
	1
Perceived Ease of Use (PEOU)[a]	
PEOU1. I strongly feel mobile banking is reliable and stable to use	.676
PEOU2. Conducting cell phone banking would be an easy thing for me to do	.903
PEOU3. I find it quite pleasurable using mobile banking services	.538
PEOU4. It requires minimal effort to learn using mobile banking	.700
Perceived Usefulness (PU)[b]	
PU1. Use of mobile banking provides flexibility in making use of my time	.670
PU2. Mobile banking makes it easier for me to perform banking transactions	.910
PU3. Mobile banking gives me greater control over my personal banking	.967
PU4. Mobile banking allows execution of more transactions at own times	.891
Relative Advantage (RA)[c]	
RA1. I trust my bank and the technology it uses for mobile banking	.702
RA2. I generally have trust in new technological innovations introduced	.741
RA3. I believe my bank is trustworthy, given how it deals with customers	.625
Perceived Relative Risk (PRR)[d]	
PRR1. Mobile banking security is not strong enough to protect personal data	.546
PRR2. Hackers (internet criminals) might take control of my bank account	.739
PRR3. Loss of cell phone can expose security of personal data at serious risk	.712

† Extraction Method: Alpha Factoring.

a. 1 factors extracted. 9 iterations required.

b. 1 factors extracted. 8 iterations required.

c. 1 factors extracted. 8 iterations required.

d. 1 factors extracted. 8 iterations required.

Following final iterations, none of the retained items under each dimension (PEOU, PU, RA and PRR) in Table 4.5 demonstrated complex structure. Hence, there was no statistical basis to eliminate any item from the remaining dataset. In terms of perceived ease of use (PUOU), the item that had highest significance based on factor loadings was that "conducting cell phone banking would be an easy thing for customers to easily do" (loading = 0.954). Regarding perceived usefulness (PU), customers highly perceive that "mobile banking gives them greater control over their personal banking" (loading=0.967). In respect of relative advantage (RA), customers perceived that they "usually have trust in new technological innovations introduced" (loading = 0.741). With regards to perceived relative risk (PRR), customers largely perceive that "hackers (internet criminals) might take control of their bank accounts".

4.6. Structural Equation Model

This section presents results of the mobile banking adoption actual use (AU) model estimated using the structural equation model (SEM) using Stata statistical program. The dimensions PEOU, PU, RA and PRR were the independent variables based on relative indices computed from items retained during confirmatory factor analysis. The dependent variable modelled in terms of how it fitted the data was the variable labelled actual use (AU), which was the reported frequency of use of mobile banking. Estimates of the structural equation model are presented in Table 4.6 below.

Table 4.6. Structural equation model estimates

Standardized	Coeff.	Robust Std. Err.	Z-score	P > | z |	[95% Conf. Int.]	
Actual use (AU) ←						
Perceived ease of use (PEOU)	.613	.075	8.07	0.000	.464	.762
Perceived usefulness (PU)	.299	.129	2.31	0.021	.045	.554
Relative Advantage (RA)	.317	.127	2.50	0.012	.068	.566
Perceived privacy risk (PRR)	-.138	.212	-0.65	0.515	-.554	.278
var (e.AU)	.822	.108			.634	1.065

The structural equation model estimates show that perceived ease of use (PEOU) has relatively more pronounced statistically significant positive influence on mobile banking adoption, followed by relative advantage (RA) and perceived usefulness (PU). Conversely, perceived risk (PRR) had negative but statistically insignificant influence on mobile banking adoption in South Africa. Findings indicate that mobile banking is regarded as reliable and stable to use, easy to conduct, requires minimal effort to learn, quite flexibility and easy to perform banking transactions and provides greater control over personal banking. Customers generally trust their banks and the technology used for providing mobile services banking by their banks.

5. Conclusion and Recommendations

Factor analysis and scale reliability tests were first performed to determine the statistical validity and internal consistency of the research instrument's survey items prior to computation of descriptive statistics and stepwise linear regression analysis. Based on the Keiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA), all items were retained in the analysis. Furthermore, the same items were retained in the factor analysis performed via the Varimax rotation with Keiser Normalization. Structural equation modelling was conducted to examine the influence of perceived ease of use, perceived usefulness, relative advantage and perceived privacy risk. Results indicate that perceived ease of use and perceived usefulness have positive and significant influence on mobile banking adoption, while perceived privacy risk has negative but insignificant influence on mobile banking adoption. In order to promote adoption and use of mobile banking services, it is recommended that retail banks should implement mechanisms that enable the recall of funds in situations where funds get erroneously transferred. This can help reduce the magnitude of perceived risk banking customers would have and it has to be done in a manner that does not compromise the integrity of mobile banking as a payment channel. To enhance an improvement in adoption and usage of mobile banking services, retails banks continuously improve mobile banking services by matching user interfaces, paying consistent attention to and addressing the risks that could affect the day-to-day transactions performed through mobile devices, motivating retail banking customers to adopt new banking technology and exhibit the benefits associate with it in respect of convenience, security, ease of use and reliability. Further research in this area should also integrate and examine the influence of consumers' social and demographic characteristics on adoption of mobile banking.

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