

# **Factors affecting the adoption and use of mobile banking in South Africa**

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**A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration**

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## **ABSTRACT**

Mobile banking offers the banking industry an opportunity to reduce their cost-to-income ratios and to improve their service by reducing their focus on daily, lower-value banking functions to higher-value financial services. The high cellphone ownership among the economically active population makes mobile banking an obvious banking channel for banks to focus on. In the light of this opportunity, the purpose of this research was to identify factors that facilitate and inhibit the adoption and use of mobile banking services in South Africa.

Data was collected using a structured survey questionnaire with closed-response questions. The questionnaire used in the study was a 7-point Likert scale questionnaire, which required respondents to indicate their degree of agreement or disagreement with a variety of statements related to hypotheses drawn from technology adoption literature. For the analysis of the impact of customer demographics on the likelihood of the adoption of mobile banking, a database of banked customers with selected demographic variables was used. A binary logistic regression model was used to analyse the data.

This study confirmed what international studies identified as the main factors that drive adoption of technology in general, and banking technology in particular. The study confirmed that usefulness and ease-of-use of mobile banking are central in the adoption of mobile banking services in South Africa. The ability to try mobile banking and experience with mobile technology were found to be significant in explaining the adoption and usage of mobile banking. The study also found that customer demographics have an impact on the adoption of mobile banking services.

The challenge for banks is to ensure that customers see mobile banking as relevant in their day-to-day banking and financial lives. Without creating this relevance, very useful services will remain unused and their importance will go unnoticed. It is also important to make sure that mobile banking is as easy to use as possible while also ensuring that making the service secure does not compromise the service's ease of use.

## DECLARATION

I, Patrick Abel Shaniseka Baloyi, declare that this research report is my own work, except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Patrick Abel Shaniseka Baloyi

Signed at .....

On the ..... day of ..... 2011

## **DEDICATION**

**To my friend, the late Ananius Makhado**

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# **CHAPTER 1: INTRODUCTION**

## **1.1 Purpose of the study**

The purpose of the research is to identify factors that facilitate and inhibit the adoption and use of mobile banking services in South Africa.

## **1.2 Context of the study**

The cost-to-income ratio is arguably one of the most important ratios in any bank's annual report. It shows what portion of every rand earned, is used to pay for the costs of running the business and therefore, also how efficient the bank is in creating value for its shareholders. One of the areas that banks are focussing on in their quest to improve the ratio is to reduce customers' reliance on branches and to encourage customers to start using cheaper self-service channels like the ATMs and other self-service banking solutions (Lobenhofer, 2003).

The banking industry is looking at online and mobile banking as a source of reduced operating costs and as an area which they can use to retain customers (Rotchanakitumnuai and Speece, 2003; Lee and Lee, 2000; Liao et al, 1999). The growth of cellphone ownership and internet access in South Africa has provided banks with a window of hope to further reduce their costs and improve their cost-to-income ratios. It is estimated that 88.4 per cent of economically active South Africans have access to cellphone communication while 13.6 per cent have access to the internet at least once in seven days (Koenderman, 2010; SAARF AMPS, 2010). Individual mobile operators' subscriber numbers

are higher: Vodacom reported 39.9 million, MTN 16.07 million and Cell C had more than 7 million subscribers (Vodacom, 2010; MTN, 2009; [www.cellc.co.za](http://www.cellc.co.za)). It is clear from the two sets of numbers that a significant portion of the South African population has more than one cellphone number.

The growth of cellphone ownership has, however, not yielded results in terms of higher usage of mobile banking services across the banking industry. Mobile banking subscription and usage is still very low compared to cellphone ownership. Absa has over 2.5 million mobile banking subscribers and is acknowledged as one of the leading banks in the provision of mobile banking services (The Asian Banker, March, 2011). This, however, represents less than 20 per cent of the over 11.8 million customers that the bank boasts (Absa Annual Report, 2010). FNB also has more than 2.6 million of its 6.8 million customers registered for cellphone banking (My Digital Life, 2011; First Rand Annual Report 2010).

Standard Bank and Nedbank mobile banking subscribers are even lower compared to Absa and FNB and stand at around 1 million subscribers for Standard Bank and less than 1 million for Nedbank for their respective bases of 8.5 million and 4.9 million customers (Mittner, 2011). These numbers are a small fraction of the number of customers who have bank accounts. There is therefore a need to understand why and how mobile banking is adopted by customers to enable banks to grow their mobile banking subscriptions as a way of not only improving their cost-to-income ratios but also as a way of continuing the banking industry's unprecedented technology-led service improvement (Laukkanen, 2007).

### **1.3 Problem statement**

The purpose of the research is to identify factors that facilitate and inhibit the adoption and use of mobile banking services.

## **1.4 Significance of the study**

The study seeks to determine factors influencing the adoption and use of mobile banking by integrating existing theories on technology adoption to see if there are unique factors facilitating or inhibiting adoption of mobile banking in South Africa. A broad technology adoption framework used by Lichtenstein and Williamson (2006) was used in conjunction with established technology adoption models like the Technology Acceptance Model (TAM) and the Theory of Reasoned Action (TRA) to further determine and confirm influences on the adoption of mobile banking by the South African banked customers. Demographic factors were also looked at to determine their impact on mobile banking adoption.

The study provides guidance to financial services providers regarding issues to consider when implementing or enhancing mobile banking. They are also likely to save money by launching only those technologies that have a higher likelihood of adoption and by enhancing the likelihood of adoption through focusing on aspects of their service that are most important to their customers.

While it is generally agreed that mobile banking offers affordable and convenient access to banking, there is also a realisation that mobile banking services will appeal to a selected customer base. The challenge lies in identifying customers who see value in the service and who are likely to use the service instead of relying on traditional banking channels. It is therefore critical that banks know the profile of customers who are most likely to use mobile banking and which aspects enhance their experience of the service. This understanding will help banks understand their mobile banking users and what it is that drives them to use the service. This is possible if banks fully understand mobile banking user characteristics and how these characteristics can be aligned with the bank's mobile banking offerings (Lassar, et al, 2005)

If this area is fully understood, future mobile banking product development will be informed by what customers need, and marketing efforts to introduce

customers to mobile banking services will be informed by relevant insights. In addition banks will be able to target customers who are more likely to take up the service. One of the most important benefits of this exercise is that customers with a mobile user profile but who are not using the service, can be reached with relevant marketing communication based on their potential motivation for using mobile banking.

## **1.5 Delimitations and limitations**

### **1.5.1 *Delimitations***

Banking services investigated were limited to mobile banking or the use of cellphones to access a bank account and conduct banking transactions.

### **1.5.2 *Limitations***

This is a quantitative study and it is therefore not as in-depth as qualitative studies. The study is also a general study across all market segments and is therefore not able to explain differences in mobile banking adoption between different market segments besides the impact of demographic factors on the adoption and usage of mobile banking.

## **1.6 Definition of terms**

### **1.6.1 *Internet banking***

Internet banking is defined as the conduct of banking through the internet. Other countries have experimented with a home banking service which gives customers access to their accounts through bank proprietary software installed on personal computers. The difference between home banking and internet

banking is that internet banking does not require proprietary software to be installed to access an account through the internet (Liao et al, 1999).

### **1.6.2 *Mobile banking***

Mobile banking is defined as banking conducted through a mobile or handheld device. Mobile banking is also used to refer to customer-led interaction with their banking account through a mobile device and therefore exclude bank-led messaging services like account activity notification services. All forms of accessing a bank account through a mobile device are included, i.e. SMS, WAP and USSD-based mobile banking services.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1. Introduction**

Online banking is generally used to refer to all other banking methods outside of the traditional banking channels such as branches and ATMs (Hoppe, 2001). These channels include the internet, telephone and mobile banking. Through these online channels, customers can check their account balances, pay accounts and bills, transfer money between accounts, apply for new banking services, change bank account limits, etc (Moodley-Isaacs, 2008 and October, 2003). The only day-to-day banking activity that cannot be conducted through online banking is the withdrawal of cash, which can only be done at a branch or at an ATM.

Despite increasing access to the internet and high ownership of cellphones, online and mobile banking have not enjoyed proportional increases in registration and usage. The literature review explores studies in technology adoption to generate hypotheses on factors that facilitate and inhibit the use of mobile banking services.

### **2.2. Mobile banking in South Africa**

#### ***2.2.1. Background***

With mobile banking, a cellphone handset acts as a banking terminal just like an ATM; the only difference being the dispensing and acceptance of cash. Customers have instant access to their bank accounts through their cellphones and this gives them the advantage of convenient banking anytime and from



anywhere. From their cellphones users are able to access their accounts for the following:

- Pay utility bills and accounts
- Pay other bank accounts
- Buy prepaid airtime or electricity
- Transfer funds between customers' accounts
- Request or send a proof of payment via SMS, fax or e-mail after making a payment and many other banking functions

Due to the limited nature of mobile technology, memory capacity, smaller screens and security concerns, mobile banking has not been used for advanced banking functions like online account opening, amendment of banking limits, addition of new beneficiaries, etc. With technological advances, it is expected that advanced banking functions available through internet banking will in time also be made available through mobile banking.

### ***2.2.2. Forms of mobile banking***

Mobile banking is made available in South Africa using three forms of technology, namely Wireless Internet Gateway (WIG), Wireless Application Protocol (WAP) and Unstructured Supplementary Service Data (USSD).

#### **2.2.2.1. Wireless Internet Gateway (WIG) or SMS-based mobile banking**

This service allows customers to transact through a Subscriber Identity Module card (SIM card). A subscriber requests for a banking menu to be sent to a cellphone by dialling a code provided by a bank. A banking menu is then downloaded on the customer's cellphone SIM card. The menu enables bank

customers registered for this service to select and perform banking transactions from their cellphones. Banking transactions are concluded by sending transaction requests through SMSs. Despite the fact that the menu is downloaded on the cellphone SIM card, the customer's account or card number and a special PIN code are required before an account can be accessed. In addition, information that is sent while transacting through WIG or SMS-based mobile banking is encrypted and therefore the information is secure and confidential (Moodley, 2006).

This is the oldest mobile banking technology and the fact that it is accessed through SMS messaging, makes it accessible through all makes of cellphones and it is therefore potentially accessible to all cellphone subscribers who are capable of sending and receiving SMS messages. Bank customers can self-register for the service by following steps that banks provide or they can ask for assistance at branches or through call centres. The disadvantage is that sending SMS messages to make banking transactions is expensive and regular use of the service would prove especially costly for customers and more so for low-income customers. This is made worse by the fact that each transaction request involves sending a number of SMS messages (October, 2003).

#### **2.2.2.2. Wireless Application Protocol (WAP) or Internet-based mobile banking**

With WAP or internet-based mobile banking, subscribers access their bank accounts through the internet using a cellphone. WAP mobile banking is similar to internet banking in many respects and transactions are secured in a similar way to internet banking transactions – through information encryption. As with internet banking, users log on to the mobile banking site using a WAP URL provided by their bank. Unlike WIG mobile banking, there is no need to download a banking menu but registration for the service is essential. During

the registration process, a customer creates his or her own PIN code that is used in together with either a card or account number to access a bank account for transactions (Absa Bank, 2009).

This service can only be accessed through handsets that support WAP, GPRS, 3G or EDGE, which in turn excludes a significant number of cellphones especially those used by customers at the lower end of the market. Customers who have never had experienced using the internet might also find it difficult to register for, and use the service. Given that accessing the internet through WAP is cheaper compared to other forms of internet access, transacting using this mobile banking channel is cheaper compared to SMS-based mobile banking (Moodley-Isaacs, 2008).

#### **2.2.2.3. USSD mobile banking**

The USSD platform has, for the last number of years, been used in South Africa to enable mobile marketing as well as mobile commerce in general with emphasis on content sales for services like ring tones, cellphone wallpapers, music, etc. Standard Bank, FNB and Absa have extended the use of this platform to banking. The service is accessed by dialling a USSD code from a registered cellphone number and keying in a PIN code. The service allows customers immediate access to balances, account statements, account payments, prepaid airtime and a growing list of other functions (ITNews Africa.com, 2009 and First National Bank, 2009).

The purchase of prepaid airtime using this channel has lower daily and monthly limits, which confirms the lower level of security the channel affords compared to WIG and WAP mobile banking. This can be seen as a 'lite' version of mobile banking but it might work to spark interest in banking using a cellphone.

### **2.2.3. *Brief history of mobile banking in South Africa***

Mobile banking was first introduced in South Africa in August 2000 when Absa launched an SMS-based mobile banking service. Similar services were launched by FNB, Standard Bank and Nedbank soon after. Growth was however, limited. By 2003 only 67 650 customers had registered for the service across all South African banks (Goldstuck, 2006). In 2003 Standard Bank launched a service for all its Vodacom prepaid customers that enabled the recharge of prepaid cellphone airtime from a cellphone with money debited directly from the customer's Standard Bank account. The service was launched as a first by a South African bank (Standard Bank, 2003). The service was SMS-based. This service was later integrated into the full service mobile banking offer and ceased to be offered as a standalone mobile offer to the bank's customers.

The increase in newer model cellphones that could now also access the internet made the launch of an internet-based mobile banking service possible. In March 2006, Absa and FNB launched their internet-based mobile banking services within days from each other. The launch of WAP banking in March 2006 was ahead of major American banks like Wachovia whose WAP mobile banking service was only launched in December of the same year with a claim of being the first major US bank to offer a WAP mobile banking service (Bruene, 2007). The WAP mobile banking service is closely aligned with internet banking and offers a wider range of services and some flexibility compared to SMS-based and USSD mobile banking.

To increase their subscription volumes, FNB and Absa offered their mobile banking users free monthly subscriptions for both WIG and WAP services for limited campaign periods. These free subscription offers were typically extended after each campaign period. FNB eventually offered its service free of charge indefinitely from 1 June 2007 (First National Bank, 2007). The bank extended the free service to also include any type of transaction done through

their mobile banking service. Absa, Standard Bank and Nedbank also started offering their service without a monthly subscription with customers only paying for payment transactions like money transfers, account payments and other value-added services (Absa Bank, 2006, Standard Bank, 2008 and Doyle K, 2007).

Aggressive marketing campaigns by Absa and FNB saw subscriptions grow to over 1 million for the respective brands by March 2009. Standard Bank had grown its base to over 100 000 while Nedbank appeared to be the smallest player in the market out of the top 4 banks with only about 70 500 subscribers by May 2008 (Stovin-Bradford, 2008). By March 2011 Absa and FNB had grown their bases to over 2.5 million subscribers each.

The use of cellphones in banking received a huge boost when FNB launched a transaction notification service in 2005. The notification service alerts customers when their accounts are accessed through both incoming and outgoing transactions. An alert is sent to the customer's cellphone as an SMS or as an e-mail to the customer's e-mail address. The service was made available free of charge to all FNB customers (First National Bank, 2005). Absa, Standard Bank and Nedbank followed with their respective notification services more than a year later. Even though Absa's service is a paid for service, it had attracted 4 million users by the end of March 2009, with 40 000 new subscribers added every month (Absa Bank, 2009).

Even though a notification service is not a mobile banking service as per the mobile banking definition, it can be argued that this could be a significant first step to using a full mobile banking service because it affords users their first step to acknowledging a cellphone device as a source of credible personal account information.

In October 2008 FNB extended their account notification service to allow customers to request banking information such as account balances and ministatements. In addition to information-based services, the extended notification service enabled customers to buy prepaid airtime through their cellphones (First National Bank, 2009). Absa launched a similar service in November 2008. This service extension was probably another step forward in getting customers to taste the convenience of banking via a mobile phone. Internet banking had a similar origin when Wells Fargo in the USA offered its customers the ability to access their account statements online and later giving them access to a fuller internet banking service (Goldstuck, 2006).

Another development in the banking industry that took mobile banking yet another step forward was the launch of the Absa CashSend service. This service allows Absa accountholders to send money through an ATM, internet banking and mobile banking to anyone, irrespective of whether the receiver has a bank account or not. The sender uses any of the channels to transfer an amount from his or her account to a recipient who owns a cellphone. The sender creates a special code that is communicated to the cash recipient. The cash recipient receives a notice of the deposit plus a bank-generated withdrawal code on their cellphone. The cash is then withdrawn at any Absa ATM by keying in the bank-created code received via an SMS and a special code communicated by the sender (Moodley-Isaacs, 2008 and INet Bridge Staff Writer, 2008). While this is not a full mobile banking offer, the central involvement of a cellphone in a transaction could be a stepping stone towards bank customers embracing a mobile handset as a credible commerce enabler. The FNB eWallet also has the same functionality and has now enabled card-less cash withdrawals using a cellphone.

This cash transfer model has been in use elsewhere in Africa even though slightly different in application. The M-Pesa service in Kenya is one of the most

successful of such initiatives. The Kenyan M-Pesa service is a joint venture between Vodafone, a local cellphone service provider Safaricom and Commercial Bank of Africa (Morawczynski and Miscione, 2008). To use the service, customers need to register for the service by downloading a banking application onto their cellphones. The service allows cash deposits at a cellphone agent who credits the amount to a cellphone account. The credit on the phone can then be transferred to any cellphone user who can then withdraw the cash from an M-Pesa vendor wherever they are in the country after presenting an identity document and a cellphone number (Kimani, 2008). A similar service was launched in Tanzania by Vodacom in April 2008 as a way of extending banking services to the 19.4 million Tanzanians over the age of 16 who do not have access to banking services (Vodacom, 2008). Vodacom South Africa in partnership with Nedbank has launched the service in the country. Its success is, however, still to be seen.

#### ***2.2.4. Standalone mobile banking services – Wizzit and MTN Banking***

The history of online banking in South Africa shows a lower success rate of standalone online banking services. 20Twenty and BlueBean are the two online banking service offers that held the most promise but failed to survive for more than 2 years as virtual banks. Absa's RedMouse bank was aborted before it was launched. FNB's eBucks online banking offer was converted to a customer rewards programme a few years after launch (Van Niekerk, 2002). Enthusiasm for standalone mobile banking services has been low, but given the promise that the mobile channel holds for the rollout of banking services to markets previously underserved by 'brick and mortar' banks and its potential to improve the profitability of mobile service providers attempts to launch standalone mobile banking services are ongoing.

The Wizzit mobile banking service was launched in 2005 as a standalone division of the South African Bank of Athens to enable the underbanked market to pay bills, transfer money, recharge airtime and receive money. Wizzit offers a

transactions account accessible through a mobile phone and a debit card. Any cellphone model can access the service, which makes it accessible to the lower end of the market, which typically uses older cellphone models (Kimani, 2008). There is an arrangement with Absa and the South African Post Office to accept deposits from Wizzit customers (Crotty, 2005). Salaries can also be paid into a Wizzit account. Maestro debit cards are used to withdraw money from any bank's ATM or to pay for goods and services at any merchant accepting Maestro debit cards (Kimani, 2008).

The banking model involves the use of agents recruited from the community to sign up new members and help signed-up members to use the service. Agents receive a commission on the customer's signing fee as well as on the transaction fees of such signed customers. This incentive structure is credited with ensuring that 60% of the signed-up members use their accounts (Fisher-French, 2008).

MTN's MobileMoney was also launched in August 2005 as a partnership between MTN and Standard Bank. The banking service was meant to help MTN deepen their relationship with their customers by extending the relationship to a more durable interaction through a transactional banking account and also reduce the amount of commission paid to agents like banks and retailers by ensuring that prepaid airtime is bought directly through a MobileMoney account. For Standard Bank, the partnership was a way of showing the bank's commitment to the Financial Services Charter by providing an innovative channel to help increase access to banking services for historically disadvantaged groups (Standard Bank, 2005). Account starter packs are sold through independent agents and through Standard Bank branches. The MobileMoney application is downloaded to the customer's 32k SIM card (MTN Banking, 2009). The account comes with a CashCard debit card that can be used to withdraw money and pay for goods and services at merchants that accept debit card payments.



Even though the two services had exceeded the 300 000 mark by the end of 2008, account activity levels were still low. The relatively higher account activity level that Wizzit enjoyed, could be attributed to the close involvement of agents to drive the use of the service. The agents drive the activity as incentives are involved. MobileMoney's account activity level remains as low as 20%. The financial sustainability of the MobileMoney service has been under scrutiny and its continuation was doubtful (Fisher-French, 2008 and Rose, 2008).

## **2.3. Technology adoption**

Technology adoption is a subject that has preoccupied information technology scientists, social scientists and marketers for some time and is supported by a growing body of literature covering both qualitative and quantitative studies.

The following are some of the theories that have been used to explain why customers adopt or reject technologies in general and banking technology in particular:

- Theory of Reasoned Action (Ajzen, 1985; Sutton, 2000)
- Technology Adoption Model (Davis and Venkatesh, 1989)
- Theory of Planned Behaviour (Sutton, 2000)
- Decomposed Theory of Planned Behaviour (Tan and Teo, 2003)
- Innovation Diffusion Model (Rogers, 1983)

These theories are evaluated for their ability to explain customer adoption of technologies and together with other recent studies, form the basis of the framework used in the current study.

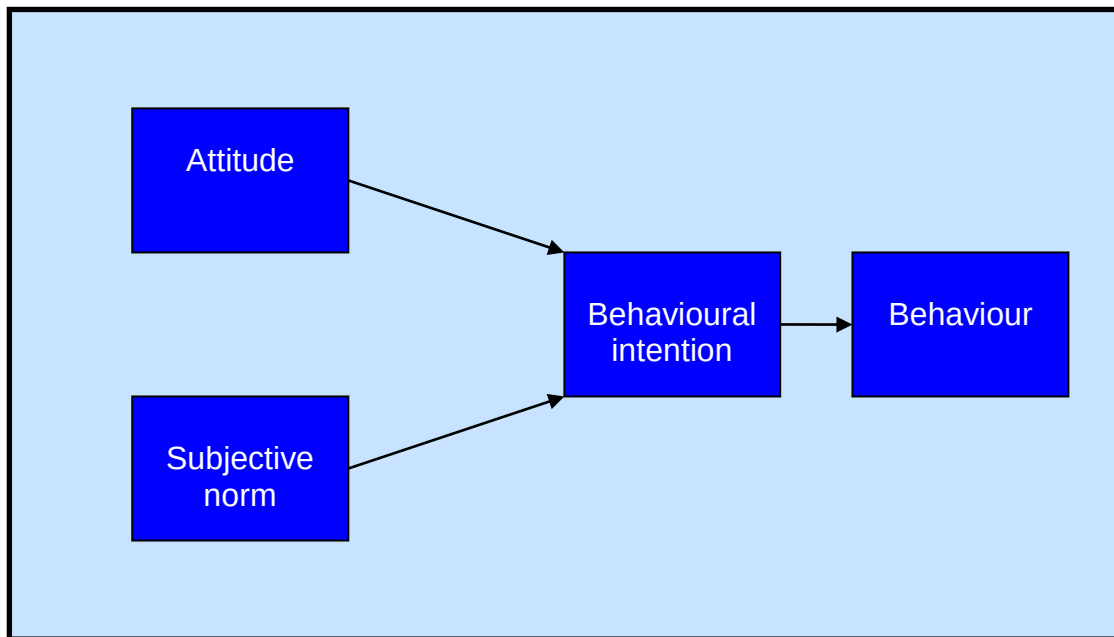
## **2.4. Theoretical basis for technology adoption**

### ***2.4.1. Theory of Reasoned Action (TRA)***

The TRA forms part of social cognition models that are used to predict human behaviour. Social cognition models use a limited number of cognitive factors, beliefs and attitudes as determinants of social behaviour (Sutton, 2002). Other theories and models in the social cognition field include the Health Belief Model, Protection Motivation Theory, Self-efficacy Theory and the Theory of Planned Behaviour (Sutton, 2002). These models and theories have been used extensively in the study of psycho-social behaviour with special focus on health issues such as smoking and weight loss. These models have been extended to study human behaviour beyond their traditional area of health research and are now increasingly relied on in the study of human behaviour with regard to the adoption and use of technology.

The TRA model assumes that personal social behaviour stems from a wilful conscious decision and that intention to perform behaviour is the strongest determinant of that behaviour. Behavioural intention is a function of attitude towards that behaviour and of subjective norms (Sutton, 2002). Attitude is defined as the person's evaluation of the behaviour or action intended while subjective norms are perceived expectations of the person's significant others with respect to the behaviour intended.

The TRA has been used successfully in understanding and predicting human behaviour in a variety of settings (Pikkarainen et al, 2004). Figure 1: Theory of Reasoned Action, below gives a summary of the TRA.



**Figure 2.1: Theory of Reasoned Action**

Intention to perform an action is stronger if the personal evaluation of the idea or attitude is positive and strong and if the person thinks his or her significant others would like him or her to perform such action (Sutton, 2002). Attitude is driven by the person's evaluation of the benefits of the action. Subjective norms are driven by the person's belief about what specific individuals or groups will think about such person performing or not performing an action.

The TRA developed some fundamental ideas on technology adoption. Attitude as laid out in the TRA can be readily used in the study of mobile banking adoption. The extent to which attitude relates to the person's evaluation of the action encompasses factors such as perceived usefulness and relative advantage gained by adopting a technology. These constructs are well laid out in theories that are discussed later and are used as the basis of this particular research. Subjective norms on the other hand are not readily usable in explaining the adoption of mobile banking services. This is because mobile banking is a personal banking choice which it can be argued is unlikely to affect the user's significant others in a way that requires their opinion. Completing a

course of TB medication or losing weight, on the other hand, can be influenced by third-party opinion as the TRA was originally meant to research.

Studies that sought to use the extension of subjective norms such as personal status to explain adoption and usage of certain functionalities have found such determinants not strong enough to explain technology adoption behaviour. A study done by Rose and Fogarty (2006) among Australian seniors found that subjective norms did not have any influence on the acceptance and use of self-service banking technologies. A similar conclusion was reached by Teo and Pok (2003) in a study that focused on the adoption of WAP enabled phones which concluded that potential users view the decision as a personal matter that is within their own control.

#### ***2.4.2. Technology Acceptance Model (TAM)***

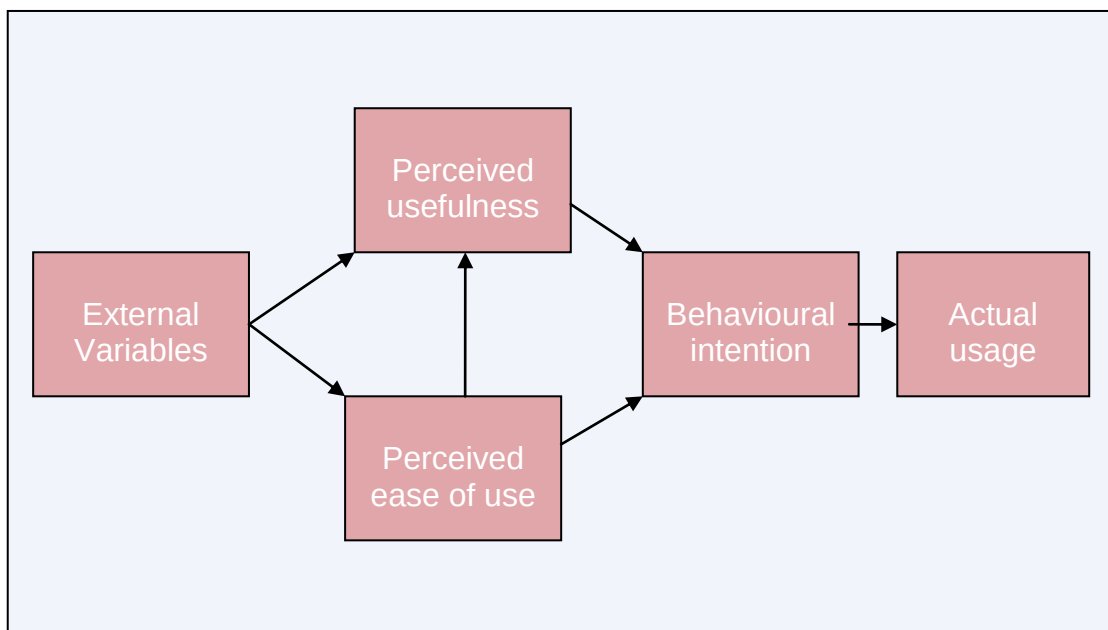
The TAM was developed by Fred Davis when working on a contract for IBM Canada in the mid 1980s. The model was used to evaluate market potential for new computer applications that IBM was developing. Applications included multi-media, image processing and pen-based computing (Davis and Venkatesh, 1995). The aim was to provide IBM with guidance for investment decisions in new product development. The TAM is derived from the TRA and identified two main factors that drive the adoption and use of computer technology, namely perceived usefulness and perceived ease-of-use of the new technology (Davis and Venkatesh, 1995; Venkatesh 2000, Davis, 1989).

According to the TAM, usefulness is the degree to which the user believes that using the new system or technology function will improve his or her work performance or banking experience. Perceived ease-of-use is tied to the individual's assessment or perception of the effort required in the process of using a system or technology. It is defined as the extent to which a person

believes that using a technology will require less effort compared to the traditional way of doing things (Davis and Venkatesh, 1995; Venkatesh 2000; Davis, 1989; Rose and Fogarty, 2006; Venkatesh and Morris, 2000).

According to the TAM, these two factors affect favourable or unfavourable feelings towards a new technology and therefore also the intention to use the technology (Teo and Pok, 2003). Intention to use then determines actual usage of the technology. Technology that is easy to use and is found to be useful by users will increase its user base and have continuous loyal users.

The original TAM model did not take into consideration that perceived usefulness and perceived ease-of-use are subject to external influence. The revised model (Davis and Venkatesh, 1995) takes external influence into account as shown below in Figure 2: Technology Acceptance Model.



**. Figure 2.2: Technology Acceptance Model (Davis and Venkatesh, 1995)**

The model shows that perceived usefulness and perceived ease-of-use are not independent of external influence. External influences include training, technology self-efficacy, user involvement in design and how the new system or

technical application is implemented (Davis and Venkatesh, 1995). The model shows that external variables ultimately influence behavioural intention and consequently also actual usage of the technology.

In conclusion, the TAM was successful in showing how perceived ease-of-use and perceived usefulness drive the adoption and usage of technology. The model has been widely used to explain technology adoption and the two constructs have proven to be parsimonious in many studies that sought to confirm the original model and those that sought to extend the original model by adding other constructs to better explain human behaviour in the adoption of general technology and banking technology in particular (Davis and Venkatesh, 1995; Venkatesh and Morris, 2000; Venkatesh 2000; Ayyagari, 2006; Pikkarainen et al, 2004; Wang et al, 2003).

Below are hypotheses drawn from the literature reviewed on the TAM model:

**H0\_1: Perceived usefulness of mobile banking does not affect adoption of mobile banking**

**H0\_2: Perceived ease-of-use of mobile banking does not affect the adoption of mobile banking**

#### ***2.4.3. Enjoyment and self-efficacy in technology usage***

There is an assertion that technology users can adopt technology without seriously considering the outcome of their interaction with the technology but that they interact purely for the enjoyment qualities of the technology.

Technology enjoyment was acknowledged by TAM author Davis (1992), when he included enjoyment in his model as a third construct in addition to the two pillars of the model – usefulness and ease-of-use. Perceived enjoyment was defined as the extent to which using the technology to perform an activity was perceived as enjoyable in its own right apart from any performance results that might be anticipated. The importance of the enjoyment factor in technology adoption was also explored by Tao et al (2007) among Taiwanese consumers

and it was found that the adoption of online shopping was not only driven by utilitarian factors like convenience, cost savings and availability of information, but also by hedonistic factors like adventure and status.

The importance of hedonistic factors in technology adoption was confirmed by the study that was done by Ayyagari (2006), which sought to identify literature on technology adoption to see how extensive the inclusion of hedonistic qualities in the adoption of technology was. It was found that 80% of the literature on the adoption of technology included hedonistic factors in their quest to understand reasons for adoption.

Ayyagari (2006) concluded that given the importance of hedonistic factors and their extensive usage in adoption literature, exclusion of such factors could reduce the predictive qualities of any study on technology adoption. Exclusive focus on usefulness could therefore undermine the importance of the aesthetics of technology by only focusing on technical functionality. A study by Pikkarainen et al (2004) also made an attempt to extend the TAM by adding perceived enjoyment to the model. They, however, found that in the Finnish context, enjoyment did not play a big role in driving adoption of internet banking.

The hedonistic or enjoyment factor seems to be more evident in the South African cellphone handset industry. While two cellphones may have similar functions such as making and receiving calls, sending SMSs, etc an aesthetically appealing cellphone is likely to be selected compared to a plain phone. This means that cellphones are bought and used for more than just their perceived ease-of-use and perceived usefulness but for hedonistic reasons as well. The focus on increasing the attractiveness of banking sites could also be as a result of banks realising that enjoyment and ease-of-use are important in getting customers to use internet banking to bank. FNB, Standard Bank and Absa have recently revamped their online banking sites and in most cases these revamps involved the aesthetics of the respective sites.

Computer or technology self-efficacy was considered by Wang et al (2003) as a factor to consider when looking at technology adoption. Wang's study found that technology self-efficacy had an overall positive impact on intention to use a new technology. This is easy to see because customers who are familiar with computer technology, for example will find it easier to use a new computer function or online banking services.

Self-efficacy represents the user's belief about his or her ability to perform certain tasks using a technology. Venkatesh (2000) argues that in the absence of direct experience with a new system or new banking technology, confidence in one's technical abilities and knowledge can be expected to serve as a basis for an individual's judgement about how easy or difficult a new system or online banking functionality will be to use. This is also supported by a study done by Rose and Fogarty (2006), which found that perceived self-efficacy was one of the key constructs that were significant predictors of perceived usefulness and ease-of-use, which in turn determined adoption and use of banking technology. Self-efficacy was also found to have a direct influence on attitude towards self-service banking technologies.

Lassar et al (2005), sought to extend the TAM by including several measures of computer self-efficacy and personal innovativeness. Self-efficacy was measured in terms of web usage intensity, length of usage and technology comfort. The conclusion was that people who are generally innovative and people who use computers more often are more likely to adopt online banking services.

#### ***2.4.4. Availability of mobile banking information***

Pikkarainen et al (2004) joined a list of scholars who extended the TAM with a view of improving its technology adoption predictive abilities. Their additions



included perceived enjoyment, availability of information on the benefits of online banking and security. Pikkarainen et al (2004) confirmed what was already confirmed by other studies, namely that perceived usefulness was an important determinant in the adoption and use of online banking. In addition to this confirmation, the study found that the availability of information about the benefits of online banking was an important determinant of acceptance of online banking.

A study among American consumers found that consumers who communicated with professional information providers were more likely to adopt self-service banking technologies (Lee and Lee, 2000). Communication with professional information providers included information available from magazines, newspapers and bank personnel. Litchenstein and Williamson (2006) included a similar factor in their technology adoption framework by arguing that a bank has to first draw the attention of the consumer to online banking before the service can be considered as a banking alternative. In a qualitative study among Australian bank customers, it was evident that the marketing of internet banking had eluded the attention of many banking consumers who might have adopted the service. Interviewees pointed out the usefulness of research interviews as information sessions on the benefits of internet banking.

Below is a hypothesis drawn from literature reviewed on TAM extensions:

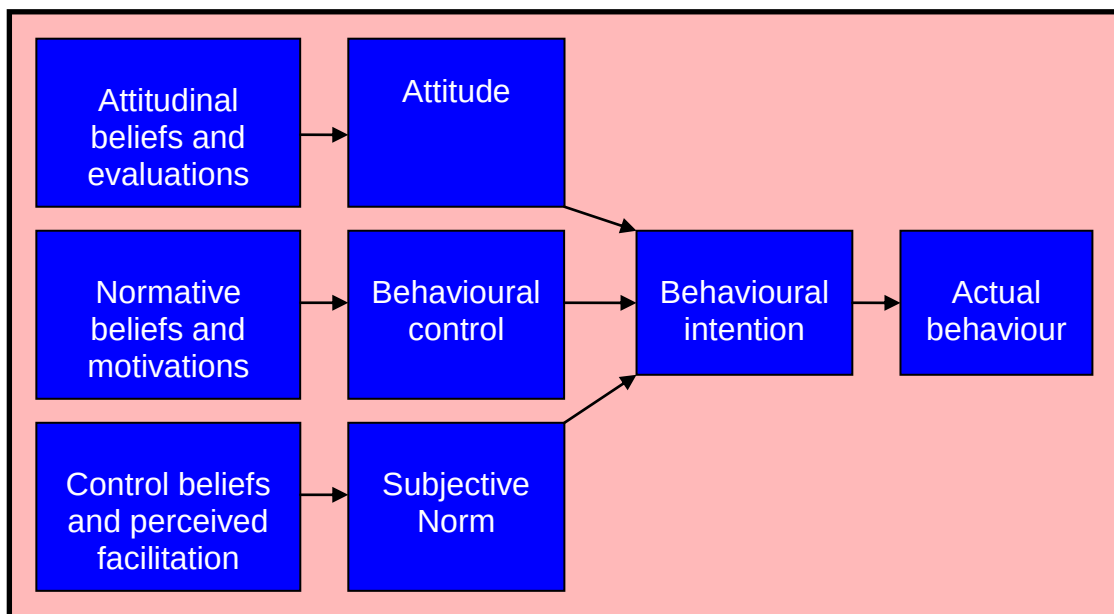
**H0\_3: Experience and comfort with mobile technology does not affect the adoption of mobile banking.**

#### ***2.4.5. Theory of planned behaviour (TPB)***

The TPB is also an extension of the TRA but unlike the TAM, the TPB brings subjective norm back into the technology acceptance theory. The theory asserts that behavioural intention is influenced by attitude, subjective norms and perceived behavioural control (Teo and Pok, 2003, Liao et al, 1999). The inclusion of perceived behavioural control is an acknowledgement by the model that subjective norms are not only internal but are largely influenced by the

external environment. Figure 3: Theory of Planned Behaviour below gives a summary of the theory.

This theory looks like an attempt to bridge the gap between the TAM and its predecessor, the TRA. Its constructs were discussed fully under the TAM and TRA sections. Given this, no new insight could be gained from the TPB.



**Figure 2.3: Theory of Planned Behaviour (Teo and Pok, 2003, Liao et al, 1999)**

#### **2.4.6. *Innovation diffusion theory***

Rogers (1995) developed a model to explain why consumers adopt certain technologies. Rogers' theory covers five important factors that affect the adoption of technology in general and some of them are particularly relevant to the adoption of mobile banking technology. The factors are: Relative advantage, compatibility, complexity, trial-ability and observability.

Relative advantage takes into consideration that most technologies are launched in an environment where there are existing technologies and other alternatives. It is defined as the degree to which consumers perceive a new

product or service as being different and better compared to its substitutes (Kolodinsky and Hogarth, 2001). For a banking channel, advantages include time-saving and convenience. The new technology needs to have some advantage for it to be considered for adoption. This factor is related to perceived usefulness in TAM (Venkatesh and Morris, 2000, Venkatesh 2000).

The second factor Rogers identified is the compatibility of the new technology with the potential user's values, experiences and needs (Kolodinsky and Hogarth, 2001). This relates to how the new banking technology fits in with how customers have always conducted their banking or managed their financial matters. To the extent that compatibility refers to the user's values, it is related to subjective norms in the TRA. The needs and experiences aspect of compatibility aligns it more closely with TAM's perceived usefulness. Compatibility also implies the perceived complexity of the service. The complexity of the new service determines whether the service will be adopted or not. It is important to note that it is not necessarily about the actual complexity of the service, but about the user's perception of the service's complexity. The TAM also has perceived ease-of-use as one of its two main constructs (Venkatesh and Morris, 2000, Venkatesh 2000).

The diffusion of innovation theory makes an assertion that the adoption of an innovation is primarily an outcome of learning and communication processes. To understand the process of adoption, there is a need to identify and understand factors that are related to how information flows, as well as how information is received. Rogers' model has two important factors that are not well explored by other authors, namely trial-ability and observability. These two are important in the flow of information about the new innovation. Trial-ability refers to the degree to which the new technology or system function can be experienced before the adoption or purchase decision is made. This is a crucial element which should allow new users to test how easy the service is to use and whether or not the service can add value to their banking experience. The

observability of the new service while in use is the last factor identified by Rogers (1995) as a reason for the adoption of new technology. Observability is defined as the extent to which an innovation is visible and communicable to consumers (Kolodinsky and Hogarth, 2001).

The two factors are most relevant in the banking sector technology adoption. Due to the private nature of banking, having customers observe mobile banking 'live' has not featured in the South African banking scene. This is in contrast with ATM adoption, which was made popular by live demonstrations and transaction assistance. The Standard Bank AutoBank E delivery channel owed its success to a unique combination of 'high tech with high touch'; that is ATM technology supported by human assistance (Lobenhofer et al, 2003).

Similar support was given by all South African banks when savings books were replaced by ATM cards. Given the importance of demonstrations in the acceptance and use of ATM technology, the role of trial-ability and service observability in the adoption of mobile banking needs to be understood. It might be unfair though to compare ATM adoption with mobile banking, which happens mainly in private, but this might help with understanding how these two factors could contribute to mobile banking adoption. Kolodinsky and Hogarth (2007) found that trial-ability and observability were positively related to banking technology adoption.

The hypothesis below is used to test the importance of trial-ability and observability in the adoption of mobile banking in the South African context:

**H0\_4: The ability to test and observe a mobile banking transaction does not affect mobile banking adoption.**

#### **2.4.7. Risk and credibility as barriers to adoption**

Risk has been identified in literature as one of the factors that inhibit adoption of mobile banking or other new technology (Rotchanakitumnuai and Speece, 2003, Featherman and Pavlou, 2003). Perceived risk is defined as a felt uncertainty regarding possible negative consequences of using a service. An action can generally be considered risky if there is a potential for loss in the pursuit of a desired positive outcome (Featherman and Pavlou, 2003, Wang et al, 2003). Risk was deemed necessary to consider as a determinant of adoption because consumers consciously or unconsciously perceive risk when evaluating products or services for purchase or adoption (Bauer, 1967). Usage of online channels is considered to add additional uncertainties and potential dangers due to its perceived unsecured nature (Featherman and Pavlou, 2003).

While other studies on risk and its effects focused on the overall risk construct, Featherman and Pavlou (2003) decomposed the risk construct into seven risk facets, which included performance, financial, privacy, psychological, time and social risk. Their study found strong evidence to suggest that time, financial and privacy risks were the most important concerns regarding the use of online commerce. Risk in general was found to exert a strong inhibiting influence on both perceived usefulness and perceived ease-of-use and thus also an inhibiting factor on adoption. The study by Featherman and Pavlou (2003) was conducted among a younger and more educated sample and it was considered highly likely that older and less educated consumers with lower computing skills would perceive a higher inherent risk in using online commerce services.

A study among Thai customers found that security, reliability of transactions and trust in the service provider were barriers to the adoption and use of internet banking services. Security was considered to be one of the major barriers in the process of adopting a technology (Rotchanakitumnuai and Speece, 2003). The basis of this was a general concern about network security.

Another practical consideration was that problems that occur during an internet transaction cannot be resolved immediately and one would have to go into a branch to resolve such issues. Rotchanakitumnuai and Speece (2003) also found that customers were not convinced that there was enough legal protection of internet banking losses compared to losses that occur when dealing with a banking teller or a consultant inside a branch. There was a strong belief that online banking did not provide enough documentation to use as evidence in case of fraud and that tracing and dealing with online fraud was difficult.

Pikkarainen et al (2004) extended the TAM to include security and privacy to the model but they found that in Finland the two constructs played a minor role in explaining the adoption of internet banking, which could have been as a result of the absence of online crime in Finnish media during the year of the study and the previous years. The situation is very different in South Africa where we have had a high number of reported cases of online fraud in recent years.

Concerns raised by Featherman and Pavlou (2003) about the impact of risk on the adoption of banking technology are relevant to the South African banking space where in recent years online fraud has been a serious concern. The banking sector has lost a considerable amount of money from identity theft, phishing and skimming. Banks have been discouraging their customers from using public internet access points as these have been identified as high risk areas (Absa, 2008, Standard Bank, 2008, FNB, 2008). Media coverage of internet fraud has not only increased awareness of online fraud but there is also a possibility that security risk has now become a significant consideration in the adoption and use of online and mobile banking.

Wang et al (2003) used an acknowledgement in Davis (1989) that future research could focus on how other variables affected usefulness and ease-of-use to launch perceived credibility as an additional construct on the TAM. Perceived credibility is defined as the extent to which a customer believes that a service provider or the service has the required expertise and capability to perform a job or service effectively and reliably (Wang et al, 2003). Credibility was also found to be an extension of trust, which is the basis of many transactional relationships.

Credibility also implies security and privacy, which were exclusively dealt with in a study conducted by Featherman and Pavlou (2003). Wang et al (2003) found that perceived credibility had a stronger influence on intention to use technology than the traditional TAM variable – perceived usefulness. This is an important factor to look at when considering the adoption and use of mobile banking because unlike other studies that used the TAM, mobile banking is a voluntary personal service while the other studies investigated workplace technologies which on the main, are not voluntary and their adoption is driven by ease-of-use and perceived usefulness.

The Vodacom study (Vodacom, 2005) found that trust was one of the most important drivers of adoption and usage of mobile commerce. A cellular phone as a channel for commerce lost its credibility when cellular service providers promised ringtones, pictures, videos, etc and failed to deliver or failed to provide more information on how cellphone users could access such services and how such services would be paid for. In most cases customers who could not access the service because of handset incompatibility were fully charged for the service. In some cases where customers thought they were applying for a once-off service, they continued to be charged on a regular basis for a service they were no longer using. In many cases, only small amounts were involved, but nevertheless provided a lesson for users about how a cellphone cannot be trusted as a channel of commerce.

Below is a hypothesis that is used to test the impact of risk on mobile banking adoption:

**H0\_5: The risk associated with mobile banking does not have an impact on the likelihood of adoption of the mobile banking service.**

#### ***2.4.8. The impact of demographics on the adoption of mobile banking***

Technology adoption models and theories have tended to focus on attitudinal and behavioural factors to explain technology behavioural influences. Demographic influence on the adoption of technology has received limited attention. The Venkatesh and Morris (2000) study is one of the few studies that focused on gender differences and the adoption of technology. The study focused on the two main TAM constructs, namely perceived usefulness and perceived ease-of-use to determine how men and women differ in their decision-making process regarding technology adoption. Their study revealed that men consider perceived usefulness to a greater extent than women when making technology acceptance decisions. Women, on the other hand, considered ease-of-use and subjective norms to a greater extent than men did. Men appeared to be more focused and looked at productivity-related factors while women had a balanced decision-making process which included ease-of-use, productivity and subjective norms.

A study conducted by Kolodinsky and Hogarth (2001) sought to determine the influence of, among others, demographics on adoption. Their finding regarding demographics was that income was a strong predictor of technology adoption. Income was actually found to be the only one demographic variable that showed consistent significance across all online banking services that their study included. Income was also confirmed by Lassar et al (2005) as having a positive effect on the adoption of online services. The study also concluded that education and age had an impact on online banking adoption, which was in support of the Lee and Lee (2000) study, which found that college and



university education made a significant difference to the consumer's willingness to adopt online financial services compared to only high school education. The study also confirmed the conclusion reached by Lassar et al (2005), that income had an effect on technology adoption. Lassar et al (2005) found that non-adopters were less affluent than adopters.

The influence of education levels on online banking adoption cannot be underestimated. To the extent that the level of education has an influence on the perception of ease-of-use and computer self-efficacy, which have been supported in literature as determinants of technology acceptance, the importance of education will remain an important determinant of the adoption of technology. Consumers with higher levels of education are more likely to have access to and use computers and other technologies and in time, this reduces technology anxiety where it exists and enhances technology self-efficacy. While cellphone availability is high in South Africa even among the lower income/education market, the limited use of mobile banking might be as a result of higher perceived complexity of mobile banking services by the lower-income and education market.

Demographic variables were analysed to see which ones have an impact on the adoption and usage of mobile banking in the South African context.

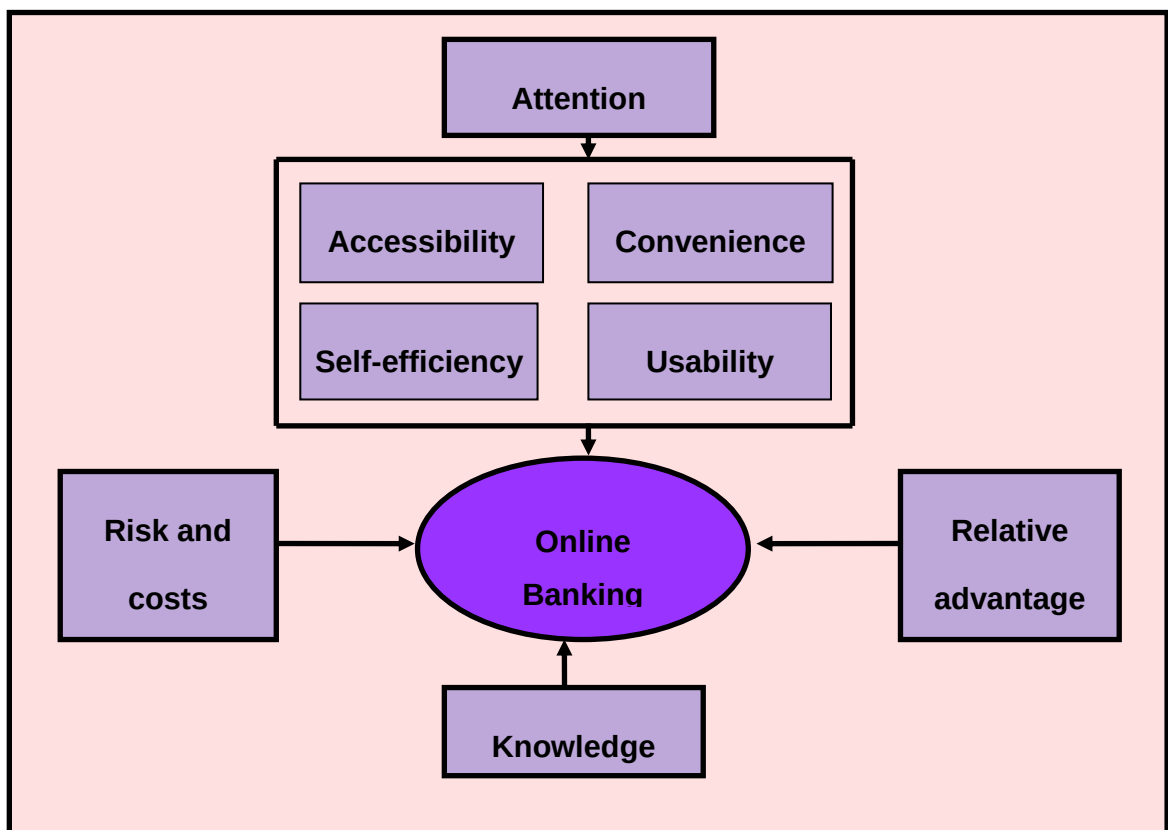
**H0\_6: Customer demographics do not have an impact on the likelihood of adoption of mobile banking.**

## **2.5. Conclusion of literature review**

In summary, literature suggests that customer adoption of technology is not only driven by the convenience factor as most banks' communication about mobile banking suggests, but by a myriad of factors that include the customers' existing

technical competence, usefulness of the service, risks and the advantage that the new technology affords the user.

Borrowing from a wide range of technology adoption literature, Lichtenstein and Williamson (2006), developed a framework to explain the process of adoption. The framework serves as a good visual summary of the main factors that facilitate and inhibit the adoption of online banking. The model also summarises the main areas already covered by the literature review as shown below:



**Figure 2.4: Key factors in consumer adoption of internet banking (Lichtenstein and Williamson, 2006)**

According to the model a bank or a financial services provider must first attract consumers' attention to their online banking service before consumers can consider their service. Attention on its own does not result in acceptance and adoption but should be supported by the accessibility of online banking tools such as cellphones and computers. Customers must also believe that the

service is convenient, easy to use and that they have enough competence to use the service. Below follows the list of hypotheses that were gathered from the literature reviewed in the current study.

### ***2.5.1. Hypotheses generated from the literature survey***

H0\_1: Perceived usefulness of mobile banking does not affect the likelihood of adoption of mobile banking.

H0\_2: Perceived ease-of-use of mobile banking does not affect the likelihood of adoption of mobile banking.

H0\_3: Experience and comfort with mobile technology does not affect the likelihood of adoption of mobile banking.

H0\_4: The ability to test and observe a mobile banking transaction does not affect the likelihood of adoption of mobile banking.

H0\_5: The risk associated with mobile banking does not have an impact on the likelihood of adoption of mobile banking.

H0\_6: Customer demographics do not have an impact on the likelihood of adoption of mobile banking.

## CHAPTER 3: RESEARCH METHODOLOGY

### 3.1. Introduction

This chapter focuses on the methodology used in the research. The chapter offers reasons for selecting the methodology used to collect data and how data was analysed.

### 3.2. Research methodology

The literature reviewed included a fair number of qualitative studies but most of the literature was based on international quantitative studies done to confirm technology adoption theories and models such as the TAM (Davies, 1989, Davis and Venkatesh, 2000) and TRA (Ajzen, 1989), which are highly regarded in the field of technology adoption. Figure 3.1: Research methodology, which follows below, is a summary of the research methodology.

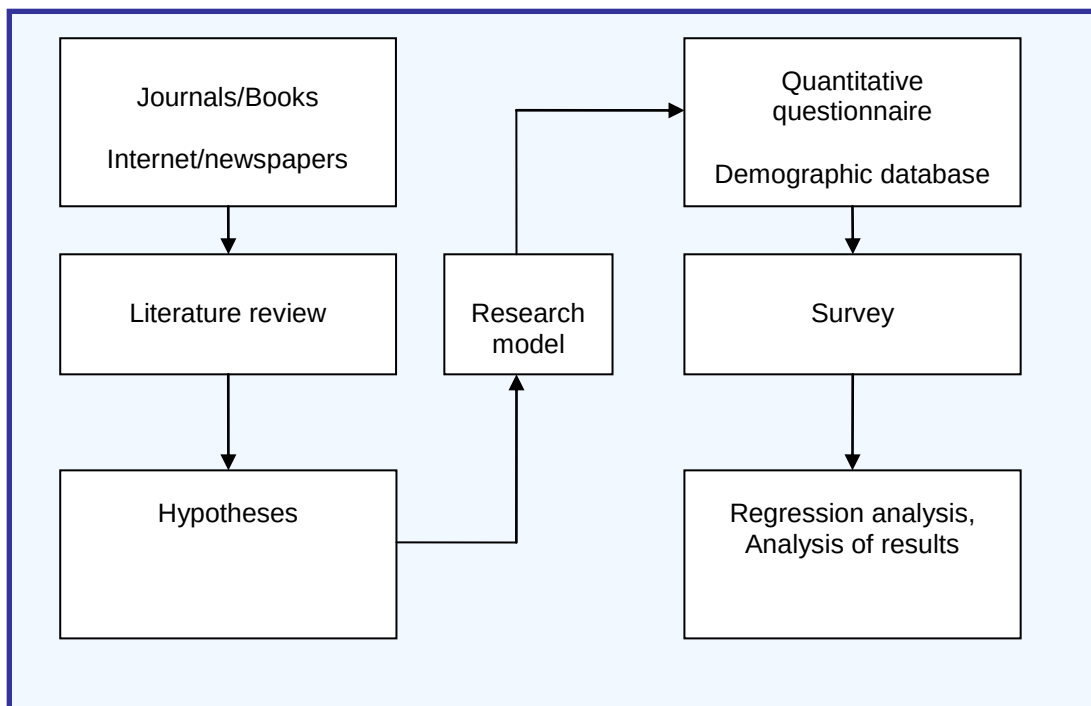


Figure 3.1: Research methodology

### **3.2.1. Research approach**

Technology adoption has received its fair share of research attention over the last few decades. This is clear from the theoretical base that has been built on the subject over the years. Based on the current rate of technology innovation, the subject should continue getting the attention it has enjoyed over the years. Given the theoretical base that technology adoption enjoys and the need to understand the relevance of theory in the South African mobile banking context, a causal research approach was applied in the current study. Aaker and Day (1983:51) recommend a causal research approach when it is necessary to show how (a) variable/s determine(s) the value/s of other variable/s, which in this case helps with identifying variables or factors that determine usage and non-usage of mobile banking services in South Africa.

International studies, which informed the theoretical basis of the current study and the subsequent hypotheses, are based on a combination of quantitative and qualitative studies. There was a need to conduct a quantitative study in South Africa to confirm the applicability of technology adoption theories in the South African banked market at a time when cellphone ownership and usage is approaching a 90 per cent mark across all economically active segments in South Africa (Koenderman, 2010; SAARF AMPS, 2010).

It is also important to use the study to confirm the theory of technology adoption directly with banked South African customers rather than relying only on industry experts only to understand the reasons for use and non-use of mobile banking services. The quantitative study assists with applying the results of the current study to a broader South African context.

### **3.2.2. Research hypotheses**

Below is a summary of all hypotheses that were tested in the study:

H0\_1: Perceived usefulness of mobile banking does not affect the likelihood of adoption of mobile banking.

H0\_2: Perceived ease-of-use of mobile banking does not affect the likelihood of adoption of mobile banking.

H0\_3: Experience and comfort with mobile technology does not affect the likelihood of adoption of mobile banking.

H0\_4: The ability to test and observe a mobile banking transaction does not affect the likelihood of adoption of mobile banking.

H0\_5: The risk associated with mobile banking does not have an impact on the likelihood of adoption of mobile banking services.

H0\_6: Customer demographics do not have an impact on the likelihood of adoption of mobile banking.

### **3.3. Research Design**

Data was collected using a structured survey questionnaire with closed-response questions. The advantage of closed-response questions is that they do not require much effort from both interviewer and respondent; they take less time to complete and they are less prone to the type of errors that are likely in the case of open-ended questions (Aaker and Day, 1983: 183).

The questionnaire used in the study is a 7-point Likert scale questionnaire. Respondents were required to indicate their degree of agreement or disagreement with a variety of statements relating to hypotheses drawn from

technology adoption literature (Aaker and Day, 1983). For ease-of-use and better flow of the questionnaire, statements were grouped and each section was made up of statements relating to a specific hypothesis. A score of 1 represents strong disagreement with the statement while a score of 7 represents strong agreement with such statement. A score of 4 represents the respondent's lack of opinion on a specific statement or that the respondent neither agrees nor disagrees with the specific statement. Demographic data which included age, income and education was also collected. The survey questionnaire is attached as Appendix A.

For the analysis of the impact of customer demographics on the likelihood of adoption of mobile banking, Absa Bank Limited transactions information was used. Permission was sought prior to the information being used in this study.

### **3.4. Population and sample**

#### ***3.4.1. Population***

The population for the sample selection is all individuals in South Africa with bank accounts, irrespective of which bank they bank with.

#### ***3.4.2. Sample and sampling method***

The survey is a combination of non-probability purposive and convenience sampling of banked customers based in Gauteng. To qualify for completion of the survey, respondents were required to at least have a bank account with any one of the banks in the country and to have a cellphone. The distinction between mobile banking and its functions versus SMS notification services and telephone banking, which are usually confused with mobile banking, was discussed as an introduction to the survey to ensure that respondents were aware of what mobile banking services entail. It was also important to ensure

that responses were based on respondents' experience or perceptions of mobile banking services rather than the SMS notification or telephone banking service.

Of the 418 questionnaires completed, a third was completed by Absa customers at two branches. Absa is the biggest retail bank in South Africa and has customers from all customer segments. Unlike niche banks like Investec and Capitec, Absa customers and those of other mainstream banks represent a general make-up of banked customers in South Africa. Mainstream South African banks do not have vastly different customer profiles and their profiles are a good representation of the country's general profile of banked customers. So the use of Absa branches to pick a sample for the study does not introduce any bias in the sample. The other questionnaires were completed through a network of individuals who have bank accounts with any of the banks. The e-mail facility and face-to-face interviews were used to complete questionnaires with the latter group.

A sample of customers from the Absa database was also used to analyse the impact of demographics on the adoption and usage of cellphone banking. Half of the sample was registered for cellphone banking while the other half was not registered for this service.

### **3.5. Procedure for data collection**

Data was collected from Absa branches, through e-mails and through a network of family and friend volunteers who were fully briefed on the questionnaire and the objectives of the survey. Permission was sought to conduct the survey in selected Absa branches. The plan was to use month ends to collect data as these are usually times when queues are longest in branches and therefore it was thought to be an ideal time when customers would be more likely to have



time to spare to complete a questionnaire. Permission was sought for access to the following branches:

- Pretoria: Vermeulen Street and Van der Walt Street
- Johannesburg: Alexandra and Rissik Street

Permission was secured for access to the Alexandra and Van der Walt Street branches. The initial plan was to collect data from customers queuing to use Absa ATMs outside the branch. ATM queues, however, moved relatively quickly and did not allow respondents the 10 minutes needed to complete the questionnaire. In addition, customers were less comfortable when approached to complete the questionnaire when they were about to withdraw or deposit money at the ATM.

The most suitable queues for the survey were customer service enquiries and teller queues. Even though the enquiries queues were shorter, enquiries generally took longer to resolve and customers were more comfortable with completing the survey in these queues as they had more time and their transactions did not involve handling cash. Teller queues were the longest in branches and customers had enough time to complete the survey questionnaire.

To encourage customers to participate in the survey in branches and as a token of appreciation for their time, participants were promised the pen given to them to complete the questionnaire with. It was also made clear that the interviewer had no intention of selling them any service but rather wanted to get their views on the mobile or cellphone banking service irrespective of whether they used such service or not. Clipboards were provided to all respondents to make the completion of the questionnaire as comfortable as possible. 140 questionnaires were completed in the two branches over two days.

In addition to the survey questionnaires completed at branches, 29 e-mails were sent to friends, family and colleagues with the survey questionnaire and guidelines on how to complete the questionnaire. E-mail recipients were requested to forward the questionnaire to their friends and colleagues. All e-mail recipients were given a week to complete and return the survey. Out of the 29 e-mails, 112 completed survey questionnaires were received, which is a response rate of close to 4 responses per e-mail sent.

A further 220 survey questionnaires were handed out to a team of eight volunteering friends and relatives to complete among their own network of friends and colleagues. These questionnaires were handed out with a matching number of letters explaining the purpose of the study and guidelines on how to complete the questionnaire. Volunteers were also given promotional pens to facilitate the completion of the survey and respondents were informed that they could keep the pens after completing the survey. 167 out of the 220 questionnaires were received from the volunteering group, which is a response rate of 76%.

For the demographic study, a sample of 7 500 accounts was extracted from the Absa database. Half of the sample was registered for the cellphone banking service while the other half was not registered for the service. Personal details such as contact details, names and ID numbers were not included in the extraction.

### **3.6. Data analysis and interpretation**

The objective of the research was to confirm the relationship between use of mobile banking and constructs drawn from literature. To confirm this relationship, a regression analysis was conducted on the data. Regression

analysis is a study of relationships between variables, that is, how a variable depends on other relevant sets of variables (Winston et al: 2006: 562). In a regression analysis there is a dependent variable, which is explained below. The dependent variable is explained by one or a number of independent or explanatory variables.

The dependent variable that this study uses is the use and intention to use mobile banking. This variable is not interval but rather categorical in nature as per the Likert-scale data used to collect data.

Independent or explanatory variables:

- Perceived usefulness of cellphone banking
- Perceived ease-of-use of cellphone banking
- Experience and comfort with mobile technology
- The ability to test and observe a cellphone banking transaction
- The risk associated with mobile banking
- Customer demographics

As with the dependent variable, a Likert-scale questionnaire was used to collect independent variable data. The majority of studies to confirm technology acceptance theories have used the normal multiple regression analysis to analyse ordinal categorical data gathered through Likert-scale questionnaires. Considering that the main assumption or requirement for a multiple regression analysis is that data must be interval and normally distributed this study could not use a normal multiple regression analysis as the data was not interval and not normally distributed. A further reason for the reluctance to use a normal multiple regression analysis is that the real distance between categories in Likert scales of agree, disagree, etc is unknown and as such, Likert-scale data

cannot be treated as interval data as required by the normal regression analysis (Norušis, 2006: 69).

A binary logistic regression analysis was used instead. Logistic regression analysis is better suited for testing hypotheses about relationships between a categorical dependent variable and one or more categorical or interval explanatory variables (Peng, 2002).

### **3.7. Validity and reliability**

External validity refers to the extent to which results from a study apply to situations beyond the study. Internal validity on the other hand is the extent to which the design and data produced by the measuring instrument allow for accurate conclusions to be drawn. Reliability refers to the accuracy and precision of the measurement procedure (Stacey, 2008).

#### **3.7.1. External validity**

The sample was selected from Gauteng, which is the capital of banking in South Africa. The province is home to diverse population groups from diverse socio-economic backgrounds and has the most representative population compared to other provinces. Given all these factors, research results can be generalised to represent the banking population of South Africa. There is, however, a possibility that if a particular segment or geographical area is selected, different conclusions might be arrived at.

#### **3.7.2. Internal validity**

The survey questionnaire was based on well established technology acceptance models like the TAM, TRA and Diffusion Theory. Hypotheses were

based on constructs confirmed by other researchers in the technology adoption field. Each construct was represented by at least four questions. The sample size of 418 banked individuals who completed the survey and a further 7 500 banked customers from the Absa database also provided a sound basis for analysis. In addition, the predictive ability of the TAM model is well documented in literature (Davis and Venkatesh, 1995; Venkatesh 2000; Davis, 1989; Ayyagari, 2006; Pikkarainen et al, 2004; Wang et al, 2003).

### **3.7.3. Reliability**

Reliability refers to the consistency and stability of the measuring instrument and in this case the extent to which the questionnaire provides consistent results even if questions were replaced with similar questions. To ensure the reliability of the questionnaire, a standard questionnaire based on prior technology adoption studies was used. The questionnaire was also piloted before it was used to eliminate any ambiguity and misunderstanding.

In addition, the Chronbach's alpha analysis was used to examine and ensure the reliability of the questionnaire. This is one of the widely used measures of reliability and is estimated by determining the degree to which each item in the scale correlates with other items in the scale. The reliability coefficient alpha or Chronbach's alpha is based on the inter-correlation among all test items and ranges in value from 0 to 1. The higher the correlation is, the higher the reliability of the instrument (Kerlinger, 1986). According to Nunnally, a Chronbach's alpha coefficient of 0.7 is an acceptable reliability coefficient even though a number of studies have used a coefficient of 0.6 to indicate the reliability of their instruments.

## CHAPTER 4: PRESENTATION OF RESULTS

### 4.1. Introduction

This chapter presents the results of the statistical analysis performed to test hypotheses developed from the literature study. The statistical analysis was carried out using the XLSTAT statistical software.

Given that the study was investigating the impact of independent variables on usage and non-usage of mobile banking, a binary logistic regression model was used to analyse the data. Question 3 (Cellphone banking is or will be a better way to bank) on the questionnaire was used as a basis for determining usage and non-usage of mobile banking. Of the three questions that were asked to determine usage, Question 3 was best suited to determine usage or intention to use mobile banking. The question does not only look at what the customer currently uses, but also tests the customer's attitude towards the mobile banking service, whether currently actively using the service or not. Question 1 was left out because it looks at the current registration status which could be affected by over claim as well as not taking into consideration the fact that many customers might be registered for, but are not using the service or are not currently using the service but intend doing so in future.

The independent variable was changed from a 7-point Likert scale from the questionnaire to a binary Yes or No scale. Responses from 7 to 5 (Strongly agree to Agree) were converted through the Excel IF function into a Yes response and coded as **1**. Responses from 4 to 1 were converted to No to mobile banking and coded as **0** to construct a set of binary independent variables.

The following binary logistic regression tests were carried out:

- Statistical tests of individual predictors were used to test the significance of individual regression coefficients.
- Goodness-of-fit statistics were used to assess the fit of the model against actual outcomes (Peng, Lee and Ingersoll, 2002).
- Probability statistics in the form of logistic odds ratios and the equation of the model are also presented to test the strength of each construct on the dependent variable.
- The receiver operating characteristic curve (ROC curve) is a graphical display that measures the predictive accuracy of a logistic regression model. The ROC curve shows the predictive ability of the model by showing sensitivity (measures how many events were successfully predicted) versus specificity (measures how many non-events were successfully predicted). Sensitivity (true positive proportion) is plotted against specificity (false positive proportion) for a range of threshold probabilities. A smooth curve is drawn through the points to derive the ROC curve. The 45° line represents the sensitivity and false positive values expected to be achieved by chance alone for each decision threshold. The line also represents a 50% area under the curve, which is the minimum percentage indicating the predictive ability of the model (Peng and Ingersoll, 2002 and Pearce and Ferrier, 2000).

The confidence interval was set at 95% and the Best/Likelihood model was selected for the analysis.

The reliability of the questionnaire was confirmed for each construct by the following Chronbach's Alpha scores as shown in Table 4.1 Chronbach's Alpha. Chronbach's Alpha scores for all constructs are more than 0.6 which confirms the reliability of the questionnaire.

**Table 4.1: Chronbach's Alpha**

| <b>Construct</b>                | <b>Chrobach's Alpha</b> |
|---------------------------------|-------------------------|
| Perceived usefulness            | 0.75                    |
| Perceived ease of use           | 0.78                    |
| Technology experience           | 0.78                    |
| Trial ability and observability | 0.68                    |
| Perceived risk                  | 0.74                    |

## **4.2. Demographic profile of respondents**

The table below presents a summary of the demographics of the study sample. The demographics pertain to the data collected to test hypotheses one to five. The gender split was close to the 2010 AMPS study. Compared to the 2010 AMPS study, respondents' age split was over-represented in the younger age categories and under-represented in the 50+ age category. Given that the most potential for mobile banking is in the young and mid-age groups, the sample of respondents is relevant to the study. The over-representation of the younger population groups is also evident in the over-representation of the lower income groups. Just over 60% of respondents had higher than a matric level of education.



**Table 4.2: Demographic profile of respondents**

| <b>Gender</b>          | <b>Frequency</b> | <b>Percentage</b> |
|------------------------|------------------|-------------------|
| Female                 | 220              | 52.63             |
| Male                   | 198              | 47.37             |
| <b>Age groups</b>      | <b>Frequency</b> | <b>Percentage</b> |
| 18 - 25                | 132              | 31.58             |
| 26 - 30                | 101              | 24.16             |
| 31 - 35                | 56               | 13.40             |
| 36 - 40                | 47               | 11.24             |
| 41-50                  | 45               | 10.77             |
| 51-60                  | 13               | 3.11              |
| 61+                    | 24               | 5.74              |
| <b>Education level</b> | <b>Frequency</b> | <b>Percentage</b> |
| 0 - Primary            | 5                | 1.20              |
| Secondary              | 39               | 9.33              |
| Matric                 | 118              | 28.23             |
| Certificate            | 73               | 17.46             |
| Diploma                | 81               | 19.38             |
| Degree                 | 59               | 14.11             |
| Degree+                | 43               | 10.29             |
| <b>Income Level</b>    | <b>Frequency</b> | <b>Percentage</b> |
| 0000 - 1 000           | 87               | 20.81             |
| 1 000 - 3 000          | 67               | 16.03             |
| 3 000 - 6 000          | 80               | 19.14             |
| 6 000 - 10 000         | 66               | 15.79             |

|                 |    |       |
|-----------------|----|-------|
| 10 000 - 15 000 | 28 | 6.70  |
| 15 000 - 20 000 | 32 | 7.66  |
| 20 000 +        | 58 | 13.88 |

### 4.3. Results pertaining to hypothesis 1: Perceived usefulness of mobile banking does not affect the likelihood of adoption

The hypothesis was measured using four variables to determine the importance of usefulness of the mobile banking service on usage and non-usage of the service. The model found **Q4** (Cellphone banking makes it easier to bank from anywhere) and **Q7** (It is cheaper to use cellphone banking than going to the branch) useful in determining the likelihood of usage of mobile banking.

**Table 4.3: Hypothesis 1: Goodness-of-fit statistics**

| Goodness-of-fit statistics (Variable Sum Q3): |             |         |
|-----------------------------------------------|-------------|---------|
| Statistic                                     | Independent | Full    |
| Observations                                  | 417         | 417     |
| Sum of weights                                | 417.000     | 417.000 |
| DF                                            | 416         | 414     |
| -2 Log(Likelihood)                            | 468.437     | 359.109 |
| R <sup>2</sup> (McFadden)                     | 0.000       | 0.233   |
| R <sup>2</sup> (Cox and Snell)                | 0.000       | 0.231   |
| R <sup>2</sup> (Nagelkerke)                   | 0.000       | 0.342   |

|                                                           |         |            |           |
|-----------------------------------------------------------|---------|------------|-----------|
| AIC                                                       | 472.437 | 367.109    |           |
| SBC                                                       | 492.570 | 407.374    |           |
| Iterations                                                | 0       | 6          |           |
| Test of the null hypothesis H0: Y=0.751 (Variable Sum Q3) |         |            |           |
| Statistic                                                 | DF      | Chi-square | Pr > Chi² |
| -2 Log(Likelihood)                                        | 2       | 109.328    | < 0.0001  |
| Score                                                     | 2       | 111.109    | < 0.0001  |
| Wald                                                      | 2       | 76.482     | < 0.0001  |

The goodness-of-fit statistics in Table 4.3: Hypothesis 1: Goodness-of-fit statistics, shows that the model returned  $R^2$  scores ranging from 23% to 34% for the MacFadden, Cox and Snell and Nagelkerke respectively. The  $R^2$  in a binary logistic model is not as informative as its OLS counterpart; it is used in this study to compare the magnitude of the impact that each construct has on the adoption of mobile banking compared to other constructs.  $R^2$ s in this model are higher compared to the  $R^2$ s of the constructs that will follow. The distance between the -2 Log(Likelihood) scores of the null model (468.437) and the model with predictors (359.109) is wide, suggesting that the model with predictors is significantly different from the null model.

In addition, the -2 Log(Likelihood), Score and the Wald all have p-values of less than 0.05, which means that the model is significantly different from the null hypothesis model that only has an intercept and does not have independent variables or predictors (Peng and Ingersoll, 2002). We can then conclude that the model is significant in explaining the impact of usefulness of mobile banking on the adoption and usage of the service by customers.

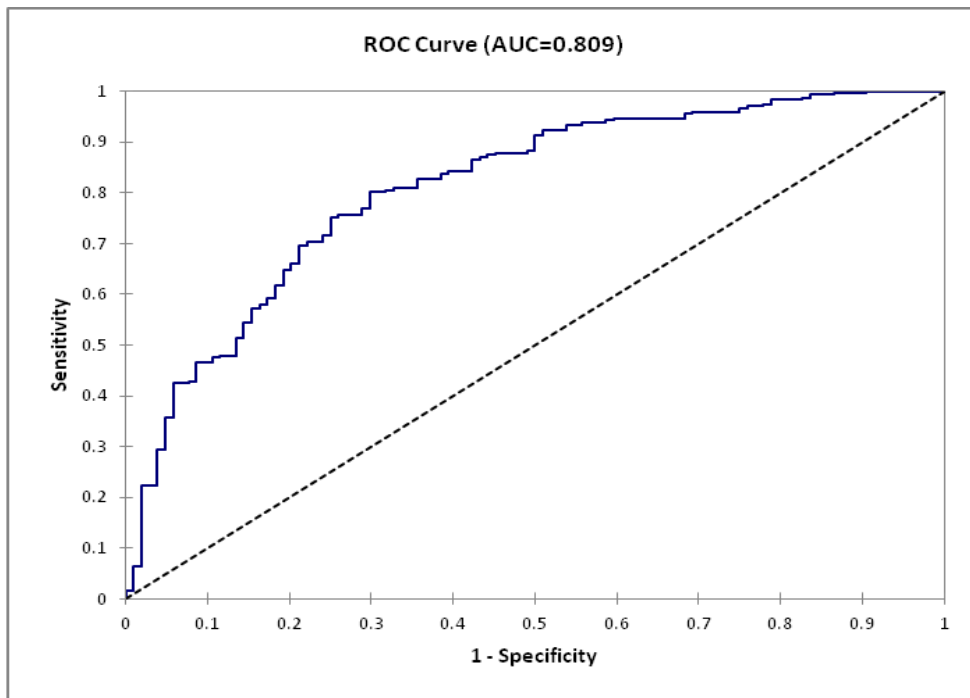
**Table 4.4: Hypothesis 1: Model parameters**

| Model parameters (Variable Sum Q3): |        |                |                 |           |            |
|-------------------------------------|--------|----------------|-----------------|-----------|------------|
| Source                              | Value  | Standard error | Wald Chi-Square | Pr > Chi² | Odds ratio |
| Intercept                           | -5.146 | 0.862          | 35.617          | < 0.0001  |            |
| Q 4                                 | 0.771  | 0.109          | 49.968          | < 0.0001  | 2.162      |
| Q 5                                 | 0.000  | 0.000          |                 |           |            |
| Q 6                                 | 0.000  | 0.000          |                 |           |            |
| Q 7                                 | 0.348  | 0.095          | 13.342          | 0.000     | 1.416      |

The equation of the model is:

$$\text{Sum Q3} = 1 / (1 + \exp(-(-5.1455514028111 + 0.771024578286 * Q4 + 0.347724644472935 * Q7)))$$

According to Table 4.4: Hypothesis 1: Model parameters, **Q4** (Cellphone banking makes it easier to bank from anywhere) and Q7 (It is cheaper to use Cellphone banking than going to the branch) are significant predictors of usage of mobile banking with p-values of Wald Chi-Square at <0.05 each. The odds of a customer taking up mobile banking are 2.2 higher if the customer believes that mobile banking makes banking convenient compared to the customer who believes that the service does not make banking convenient. In addition the odds of using mobile banking are 1.4 higher for customers who believe that the service is affordable compared to those who do not believe that the service is affordable.



**Figure 4.1: Usefulness ROC curve**

**Figure 4.1:** Usefulness ROC curve above is the ROC curve of the model. The predictive accuracy of the model is good, with the area under the curve at 80.9%. A model is considered predictive if the area under the curve is at least 50%.

Based on the results of statistical tests for individual predictors, goodness-of-fit statistics, logistic odds ratios and the ROC curve, **we reject the null hypothesis** and accept the alternative hypothesis that the usefulness of mobile banking has an impact on the adoption and usage of the service.

#### 4.4. Results pertaining to Hypothesis 2: Perceived ease-of-use of mobile banking does not affect the likelihood of adoption

Null hypothesis 2 was tested using four variables. Of the four variables, two were selected by the model as the best ones to explain the relationship between the adoption of mobile banking and ease-of-use of the service. The two variables that were selected to represent perceived ease-of-use were **Q8** (I think that it is easy to use cellphone banking) and **Q11** (Information on how to use cellphone banking is easy to understand).

**Table 4.5: Hypothesis 2: Goodness-of-fit statistics**

| Goodness-of-fit statistics (Variable Sum Q3):             |             |            |           |
|-----------------------------------------------------------|-------------|------------|-----------|
| Statistic                                                 | Independent |            | Full      |
| Observations                                              | 417         |            | 417       |
| Sum of weights                                            | 417.000     |            | 417.000   |
| DF                                                        | 416         |            | 414       |
| -2 Log(Likelihood)                                        | 468.437     |            | 377.329   |
| R²(McFadden)                                              | 0.000       |            | 0.194     |
| R²(Cox and Snell)                                         | 0.000       |            | 0.196     |
| R²(Nagelkerke)                                            | 0.000       |            | 0.291     |
| AIC                                                       | 472.437     |            | 385.329   |
| SBC                                                       | 492.570     |            | 425.594   |
| Iterations                                                | 0           |            | 6         |
| Test of the null hypothesis H0: Y=0.751 (Variable Sum Q3) |             |            |           |
| Statistic                                                 | DF          | Chi-square | Pr > Chi² |
| -2 Log(Likelihood)                                        | 2           | 91.108     | < 0.0001  |

|       |   |        |          |
|-------|---|--------|----------|
| Score | 2 | 91.364 | < 0.0001 |
| Wald  | 2 | 66.668 | < 0.0001 |

The model returned the following  $R^2$  scores: 19.4% for MacFadden, 19.6% for Cox and Snell and 29% for Nagelkerke. The OLS  $R^2$  gives the proportion of the variation in the dependent variable that can be explained by the predictive or independent variables. The logistic regression  $R^2$  is not as predictive as its OLS counterpart and in this case it is used for comparison purposes only. Compared to the constructs that will follow, the  $R^2$ s are much higher, which points to the strength of the construct in explaining the adoption and usage of mobile banking compared to other constructs. The distance between the -2 Log (Likelihood) scores of the null or independent and full models is wide (90.1) compared to constructs like mobile banking risk and experience with mobile technology. The greater the difference between the two -2 Log (Likelihood) scores, the more information the selected variables bring to the model.

The -2 Log(Likelihood), Score and the Wald all have p-values of less than 0.05. This suggests that the model is significantly different from the base model or null hypothesis model which does not have independent variables or predictors. The low p-values also confirm that the probability of being wrong when saying that ease-of-use brings significant information to explain usage of mobile banking is low. We can therefore conclude that the model is significant in explaining the effect of perceived ease-of-use of mobile banking on the adoption and usage of the mobile banking service.

**Table 4.6: Hypothesis 2: Model parameters**

| Model parameters (Variable Sum Q3): |       |                |                 |                       |            |
|-------------------------------------|-------|----------------|-----------------|-----------------------|------------|
| Source                              | Value | Standard error | Wald Chi-Square | Pr > Chi <sup>2</sup> | Odds ratio |

|           |        |       |        |          |       |
|-----------|--------|-------|--------|----------|-------|
| Intercept | -3.867 | 0.637 | 36.813 | < 0.0001 |       |
| Q 8       | 0.585  | 0.098 | 35.425 | < 0.0001 | 1.795 |
| Q 9       | 0.000  | 0.000 |        |          |       |
| Q 10      | 0.000  | 0.000 |        |          |       |
| Q 11      | 0.372  | 0.091 | 16.575 | < 0.0001 | 1.451 |

The equation of the model is:

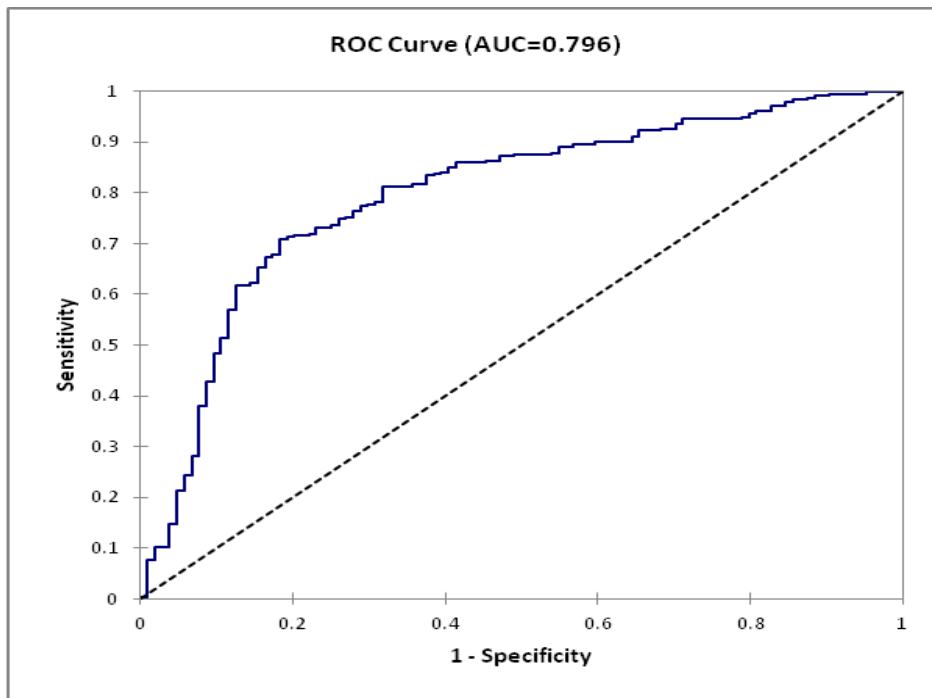
$$\text{Sum Q3} = 1 / (1 + \exp(-(-3.86704374936907 + 0.584752967418667 * \text{Q 8} + 0.372282275984462 * \text{Q 11})))$$

The p-values of the Wald Chi-Squares for both **Q8** and **Q11** are less than 0.05.

This means that the ease-of-use construct represented by **Q8** and **Q11** is a significant predictor of adoption and usage of mobile banking. Table 4.6:

Hypothesis 2: Model parameters above shows that the odds of a customer adopting and using mobile banking are 1.8 higher if the customer believes that it is easy to use the mobile banking service compared to those who do not believe that the service is easy to use. In addition, the odds of using mobile banking are 1.5 times higher if the customer believes that the information about the mobile banking service is easy to understand compared to those who do not think that mobile banking information is easy to understand.





**Figure 4.2: Ease-of-use ROC curve**

The ROC curve of the model as shown above confirms the predictive ability of the model. For the model to be considered predictive, the area under the curve should be at least 50%. The area under the curve in the model is 79.6%, which is a good indicator of the ability of the ease-of-use construct to predict adoption of the mobile banking service.

Based on the statistical tests of individual predictors, goodness-of-fit statistics, logistic odds ratios and the ROC curve, **we reject the null hypothesis** and accept the alternative hypothesis that ease-of-use of mobile banking has an impact on the adoption and usage of the service.

#### 4.5. Results pertaining to hypothesis 3: Experience and comfort with mobile technology do not affect the adoption of mobile banking

Four variables were used to determine whether the comfort and experience with technology construct had an impact on the adoption and usage of mobile banking. These variables sought to test how comfortable banked customers were with basic mobile technologies. The model selected two variables out of the four as important in explaining the impact of the construct on the adoption and usage of mobile banking. The two variables are **Q12** (I like trying out new technology and new ways of doing things) and **Q14** (I use a cellphone to visit internet websites sometimes).

**Table 4.7: Hypothesis 3: Goodness-of-fit statistics**

| <b>Goodness-of-fit statistics (Variable Sum Q3):</b>             |                    |             |
|------------------------------------------------------------------|--------------------|-------------|
| <b>Statistic</b>                                                 | <b>Independent</b> | <b>Full</b> |
| Observations                                                     | 418                | 418         |
| Sum of weights                                                   | 418.000            | 418.000     |
| DF                                                               | 417                | 415         |
| -2 Log(Likelihood)                                               | 469.010            | 445.370     |
| R <sup>2</sup> (McFadden)                                        | 0.000              | 0.050       |
| R <sup>2</sup> (Cox and Snell)                                   | 0.000              | 0.055       |
| R <sup>2</sup> (Nagelkerke)                                      | 0.000              | 0.082       |
| AIC                                                              | 473.010            | 453.370     |
| SBC                                                              | 493.152            | 493.654     |
| Iterations                                                       | 0                  | 6           |
| <b>Test of the null hypothesis H0: Y=0.751 (Variable Sum Q3)</b> |                    |             |

| Statistic          | DF | Chi-square | Pr > Chi² |
|--------------------|----|------------|-----------|
| -2 Log(Likelihood) | 2  | 23.641     | < 0.0001  |
| Score              | 2  | 25.784     | < 0.0001  |
| Wald               | 2  | 22.578     | < 0.0001  |

The model returned the following  $R^2$  scores: 5.0% for MacFadden, 5.5% for Cox and Snell and 8.2% for Nagelkerke. The  $R^2$  scores are much lower compared to the ease-of-use construct, which returned the following  $R^2$  scores: 19.4% for MacFadden, 19.6% for Cox and Snell and 29% for Nagelkerke. Given the less conclusive nature of logistic regression  $R^2$  scores, the  $R^2$  is used for comparison only and other statistical analysis outputs are used to evaluate the model.

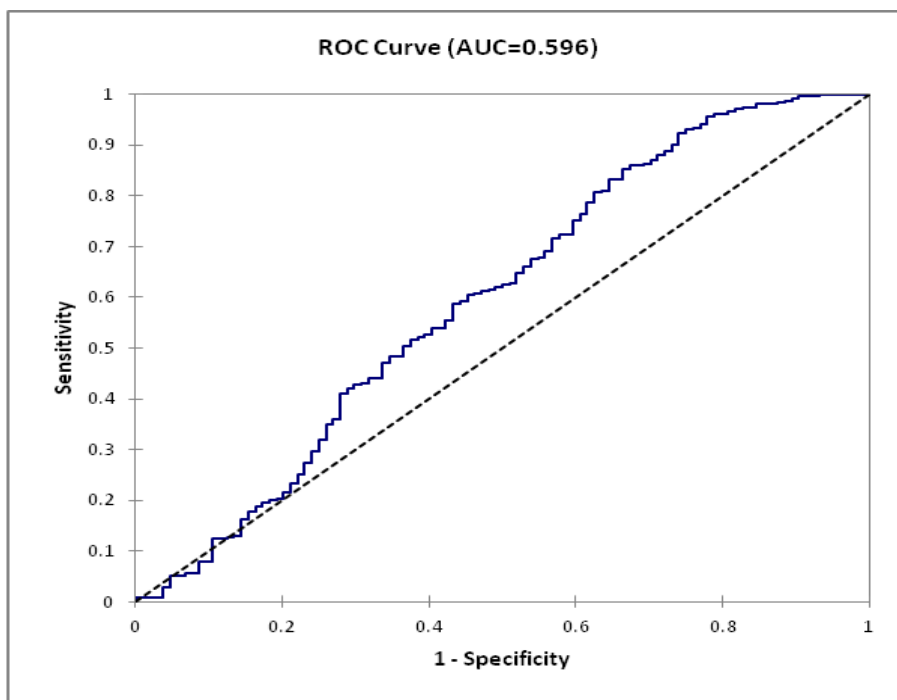
The -2 Log(Likelihood), Score and the Wald all have p-values of less than 0.05. This suggests that the model is significantly different from the null hypothesis model, which does not have predictors. We can then conclude that the model is significant in explaining the effect of experience with mobile technology on the adoption and usage of the mobile banking service by customers.

**Table 4.8: Hypothesis 3: Model parameters**

| Model parameters (Variable Sum Q3): |        |                |                 |           |            |
|-------------------------------------|--------|----------------|-----------------|-----------|------------|
| Source                              | Value  | Standard error | Wald Chi-Square | Pr > Chi² | Odds ratio |
| Intercept                           | -1.483 | 0.678          | 4.777           | 0.029     |            |
| Q 12                                | 0.270  | 0.087          | 9.740           | 0.002     | 1.310      |
| Q 13                                | 0.000  | 0.000          |                 |           |            |
| Q 14                                | 0.174  | 0.079          | 4.890           | 0.027     | 1.190      |
| Q 15                                | 0.000  | 0.000          |                 |           |            |

The p-value of the Wald Chi-Squares for **Q12** is 0.002 and 0.027 for **Q14**. Both are less than 0.05. The experience with mobile technology construct is therefore a significant predictor of adoption and usage of mobile banking.

The odds of a customer adopting and using mobile banking are 1.3 higher if the customer generally likes experimenting with new technologies compared to those customers who do not. In addition, the odds of using the mobile banking service are 1.19 times higher for customers who use their cellphones to access the internet compared to those who do not use their cellphones to access the internet.



**Figure 4.3: Experience and comfort with technology ROC curve**

The ROC curve for the experience and comfort with technology construct shows a poorer predictive ability of the model compared to the first two models. However, for the model to be considered predictive, the area under the curve should be at least 50%. With the area under the curve in the model at 59.6%,

the model is considered predictive even if this ability is lower compared to the usefulness and ease-of-use models.

Based on the statistical tests of individual predictors, goodness-of-fit statistics, logistic odds ratios and the ROC curve, **we reject the null hypothesis** and accept the alternative hypothesis that experience with mobile technology has an impact on the adoption and usage of mobile banking services.

#### **4.6. Results pertaining to hypothesis 4: The ability to test and observe a mobile banking transaction does not affect mobile banking adoption**

The ability to test and observe mobile banking construct was tested using four variables as per questionnaire. The logistic model selected two variables from the construct to test the hypothesis. The two variables that were selected are **Q16** (I learn new things by trying them out) and **Q17** (Banks must show and teach customers how to bank using cellphones).

**Table 4.9: Hypothesis 4: Goodness-of-fit statistics**

| <b>Goodness-of-fit statistics (Variable Sum Q3):</b> |                    |             |
|------------------------------------------------------|--------------------|-------------|
| <b>Statistic</b>                                     | <b>Independent</b> | <b>Full</b> |
| Observations                                         | 418                | 418         |
| Sum of weights                                       | 418.000            | 418.000     |
| DF                                                   | 417                | 415         |

|                                                           |         |            |           |
|-----------------------------------------------------------|---------|------------|-----------|
| -2 Log(Likelihood)                                        | 469.010 | 452.873    |           |
| R²(McFadden)                                              | 0.000   | 0.034      |           |
| R²(Cox and Snell)                                         | 0.000   | 0.038      |           |
| R²(Nagelkerke)                                            | 0.000   | 0.056      |           |
| AIC                                                       | 473.010 | 460.873    |           |
| SBC                                                       | 493.152 | 501.156    |           |
| Iterations                                                | 0       | 6          |           |
| Test of the null hypothesis H0: Y=0.751 (Variable Sum Q3) |         |            |           |
|                                                           |         |            |           |
| Statistic                                                 | DF      | Chi-square | Pr > Chi² |
| -2 Log(Likelihood)                                        | 2       | 16.138     | 0.000     |
| Score                                                     | 2       | 17.607     | 0.000     |
| Wald                                                      | 2       | 15.662     | 0.000     |

The model returned the following R<sup>2</sup> scores: 3.4% for MacFadden, 3.8% for Cox and Snell and 5.6% for Nagelkerke. The R<sup>2</sup> scores were much lower compared to the model used to test ease-of-use and usefulness constructs which returned higher R<sup>2</sup> scores. Even though the R<sup>2</sup> in the logistic regression does not have the same predictive abilities compared to the R<sup>2</sup> in the OLS regression, a comparison can be drawn between the constructs used in this study to see which constructs are better at explaining adoption and usage of mobile banking.

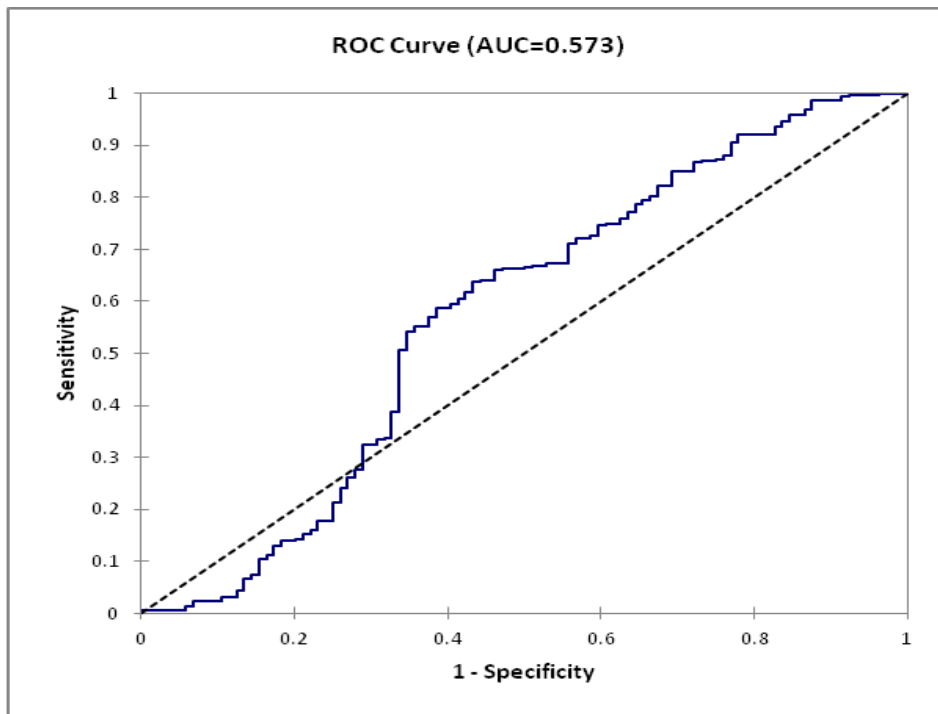
The -2 Log(Likelihood), Score and the Wald all have p-values of less than 0.05. This suggests that the model is significantly different from the null hypothesis model which does not have predictors. We can then conclude that the model is significant in explaining the effect of trial-ability and observability of mobile banking services on the adoption and usage of the mobile banking service.

**Table 4.10: Hypothesis 4: Model parameters**

| <b>Model parameters (Variable Sum Q3):</b> |              |                       |                        |                     |                   |
|--------------------------------------------|--------------|-----------------------|------------------------|---------------------|-------------------|
| <b>Source</b>                              | <b>Value</b> | <b>Standard error</b> | <b>Wald Chi-Square</b> | <b>Pr &gt; Chi²</b> | <b>Odds ratio</b> |
| Intercept                                  | -1.475       | 0.745                 | 3.927                  | 0.048               |                   |
| Q 16                                       | 0.183        | 0.095                 | 3.715                  | 0.054               | 1.201             |
| Q 17                                       | 0.247        | 0.101                 | 5.945                  | 0.015               | 1.280             |
| Q 18                                       | 0.000        | 0.000                 |                        |                     |                   |
| Q 19                                       | 0.000        | 0.000                 |                        |                     |                   |

The p-value of the Wald Chi-Square for **Q16** is 0.054 and 0.015 for **Q17**. The p-value of the Wald Chi-Square for **Q16** is more than 0.05 and the variable is not a significant predictor of adoption and usage of mobile banking. Only **Q17** with a p-value of less than 0.05 is a significant predictor of adoption and usage of mobile banking.

The odds of a customer adopting and using mobile banking are 1.28 higher if customers are exposed to how mobile banking works in the branch compared to when customers are not exposed to the service.



**Figure 4.4: Trial-ability and observability ROC curve**

The ROC curve shows the predictive ability of the model. For the model to be considered predictive, the area under the curve should be at least 50%. The area under the curve in the model is 57.3% which, like the experience construct, shows a lower predictive ability compared to the usefulness and ease-of-use models. It is also clear that at certain thresholds, the area under the curve is less than 50%. This means that at certain thresholds, the model cannot be considered predictive and is then no better than a model without predictive variables.

Based on the statistical tests of individual predictors, goodness-of-fit statistics, logistic odds ratios and the ROC curve, **we reject the null hypothesis** and accept the alternative hypothesis that testing and observing mobile banking has an impact on adoption and usage of mobile banking services.



#### 4.7. Results pertaining to hypothesis 5: The risk associated with mobile banking does not have an impact on the likelihood of adoption of the service

As with the other hypotheses, four variables were used to test whether the perceived risk associated with mobile banking has an impact on the likelihood of the adoption of mobile banking services. Out of the four variables used, the model dropped two and used the other half. The two variables are **Q20** (Losing the cellphone I use for cellphone banking will put my bank account at risk) and **Q21** (Using cellphone banking is not as secure as using the ATM or banking inside the branch).

**Table 4.11: Hypothesis 5: Goodness-of-fit statistics**

| Goodness-of-fit statistics (Variable Sum Q3):         |             |            |           |
|-------------------------------------------------------|-------------|------------|-----------|
| Statistic                                             | Independent |            | Full      |
| Observations                                          | 418         |            | 418       |
| Sum of weights                                        | 418.000     |            | 418.000   |
| DF                                                    | 417         |            | 415       |
| -2 Log(Likelihood)                                    | 469.010     |            | 462.384   |
| R²(McFadden)                                          | 0.000       |            | 0.014     |
| R²(Cox and Snell)                                     | 0.000       |            | 0.016     |
| R²(Nagelkerke)                                        | 0.000       |            | 0.023     |
| AIC                                                   | 473.010     |            | 470.384   |
| SBC                                                   | 493.152     |            | 510.668   |
| Iterations                                            | 0           |            | 6         |
| Test of null hypothesis H0: Y=0.751 (Variable Sum Q3) |             |            |           |
| Statistic                                             | DF          | Chi-square | Pr > Chi² |
| -2 Log (Likelihood)                                   | 2           | 6.626      | 0.036     |

|       |   |       |       |
|-------|---|-------|-------|
| Score | 2 | 6.480 | 0.039 |
| Wald  | 2 | 6.383 | 0.041 |

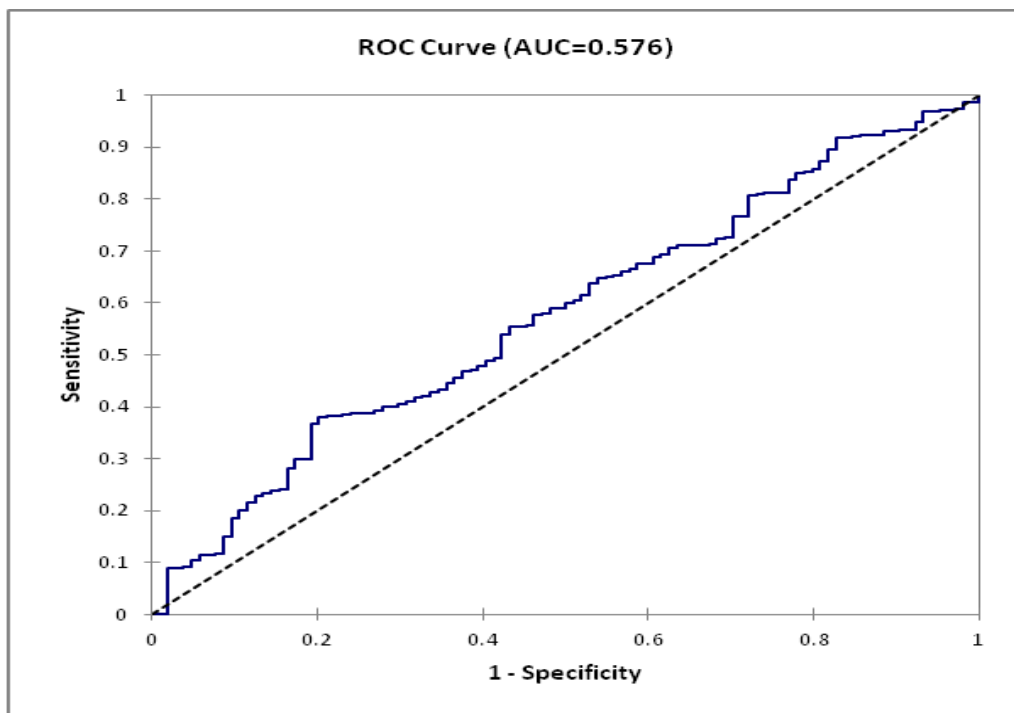
As shown in Table 4.11: Hypothesis 5: Goodness-of-fit statistics, the model returned  $R^2$  scores of less than 2.5 % for all  $R^2$  measures. The  $R^2$  scores are much lower compared to the model used to test ease-of-use and usefulness constructs. The latter returned higher  $R^2$  scores.

The -2 Log(Likelihood), Score and the Wald have p-values of less than 0.05. The p-values are however very close to the 0.05 level of significance. Even though this still suggests that the model is significantly different from the null hypothesis model which does not have predictors, the difference is not as pronounced as those seen in the usefulness and ease-of-use constructs of which the p-values were as low as 0.0000. In addition, the distance between the -2 Log(Likelihood) independent model and the full model with predictors is very narrow (6.716). The greater the difference between the two -2 Log(Likelihood) scores, the more information the selected construct brings to the model. The small difference between the two models suggests that the construct does not bring much information to the model.

**Table 4.12: Hypothesis 5: Model parameters**

| Model parameters (Variable Sum Q3): |        |                |                 |                       |            |
|-------------------------------------|--------|----------------|-----------------|-----------------------|------------|
| Source                              | Value  | Standard error | Wald Chi-Square | Pr > Chi <sup>2</sup> | Odds ratio |
| Intercept                           | 1.881  | 0.406          | 21.456          | < 0.0001              |            |
| Q 20                                | -0.091 | 0.064          | 2.050           | 0.152                 | 0.913      |
| Q 21                                | -0.081 | 0.067          | 1.448           | 0.229                 | 0.923      |
| Q 22                                | 0.000  | 0.000          |                 |                       |            |
| Q 23                                | 0.000  | 0.000          |                 |                       |            |

The p-value of the Wald Chi-Square for **Q20** is 0.152 and 0.229 for **Q21**. The p-values of the Wald Chi-Square for both variables are more than 0.05. The two variables are therefore not significant predictors of adoption and usage of mobile banking.



**Figure 4.5: Mobile banking risk ROC curve**

The ROC curve shows the predictive ability of the model. The area under the curve for this model is 57.6%, which, like the experience and trial-ability constructs, shows a lower predictive ability compared to the usefulness and ease-of-use constructs.

Based on the statistical tests of individual predictors, goodness-of-fit statistics, logistic odds ratios and the ROC curve, we **accept the null hypothesis** and

reject the alternative hypothesis that perceived risk associated with mobile banking has an impact on the adoption and usage of mobile banking services.

#### **4.8. Results pertaining to Hypothesis 6: Customers' demographics do not have an impact on the likelihood of adoption of mobile banking**

A selection of demographic variables was used to test whether customers' demographics have an impact on the likelihood of adoption and usage of mobile banking. Below is a list of demographic variables selected for analysis:

- Customer age
- Income group
- Length of relationship with the bank
- Gender
- Number of bank accounts
- Internet banking registration
- Account turnover
- Staff indicator

A stepwise binary logistic regression was used to analyse the data. Out of the eight demographic variables used, three were dropped and five were used in the model. The five that were used in the model are: customer age, income group, length of relationship with the bank, number of bank accounts and internet banking registration.

**Table 4.13: Hypothesis 6: Goodness-of-fit statistics**

| Goodness-of-fit statistics (Variable CELL_IND):             |  |             |            |                       |
|-------------------------------------------------------------|--|-------------|------------|-----------------------|
| Statistic                                                   |  | Independent | Full       |                       |
| Observations                                                |  | 7500        | 7500       |                       |
| Sum of weights                                              |  | 7500.000    | 7500.000   |                       |
| DF                                                          |  | 7499        | 7494       |                       |
| -2 Log(Likelihood)                                          |  | 10397.208   | 7686.681   |                       |
| R <sup>2</sup> (McFadden)                                   |  | 0.000       | 0.261      |                       |
| R <sup>2</sup> (Cox and Snell)                              |  | 0.000       | 0.303      |                       |
| R <sup>2</sup> (Nagelkerke)                                 |  | 0.000       | 0.404      |                       |
| AIC                                                         |  | 10399.208   | 7698.681   |                       |
| SBC                                                         |  | 10406.130   | 7740.217   |                       |
| Iterations                                                  |  | 0           | 6          |                       |
| Test of the null hypothesis H0: Y=0.500 (Variable CELL_IND) |  |             |            |                       |
| Statistic                                                   |  | DF          | Chi-square | Pr > Chi <sup>2</sup> |
| -2 Log(Likelihood)                                          |  | 5           | 2710.526   | < 0.0001              |
| Score                                                       |  | 5           | 2413.987   | < 0.0001              |
| Wald                                                        |  | 5           | 1826.938   | < 0.0001              |

The -2 Log(Likelihood) of the model is 7686.7 which, if compared to the independent model, has a difference of 2710.527. Based on the difference between the model with explanatory variables and the independent model without explanatory variables, we conclude that the demographic variables are significant in explaining registration for mobile or cellphone banking.

The model returned the following  $R^2$  scores: 26.1% for MacFadden, 30.3% for Cox and Snell and 40.4% for Nagelkerke. The comparison between the current  $R^2$  and those returned in the previous three models shows that the selected demographics are as important as the first two constructs (ease-of-use and usefulness) in explaining adoption and usage of mobile banking.

**Table 4.14: Hypothesis 6: The model parameters**

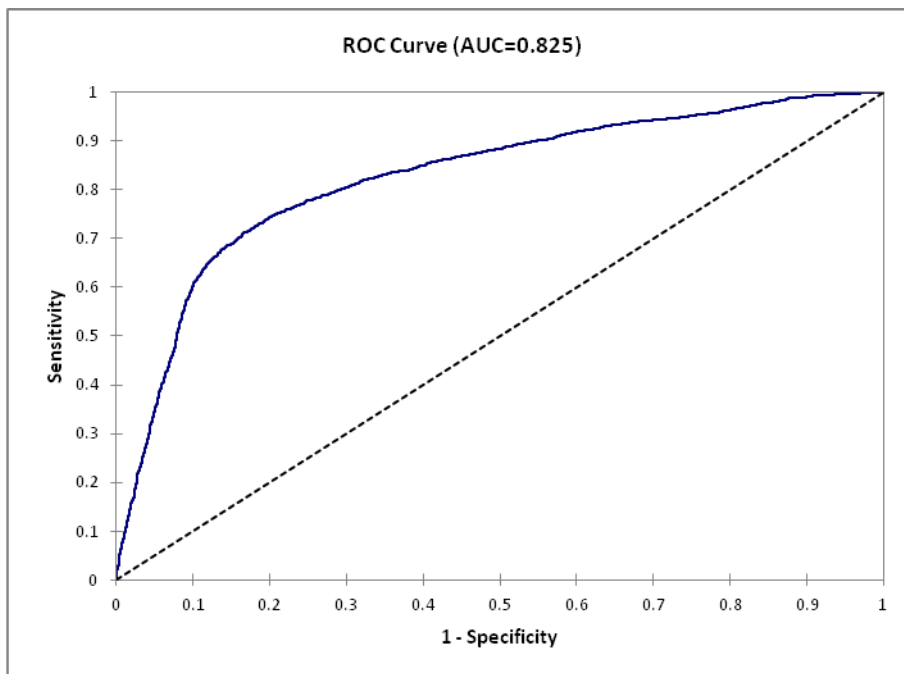
| Model parameters (Variable CELL_IND): |        |                |                       |                       |            |
|---------------------------------------|--------|----------------|-----------------------|-----------------------|------------|
| Source                                | Value  | Standard error | Wald Chi <sup>2</sup> | Pr > Chi <sup>2</sup> | Odds ratio |
| Intercept                             | -1.142 | 0.071          | 257.020               | < 0.0001              |            |
| AGE                                   | -0.012 | 0.002          | 31.359                | < 0.0001              | 0.988      |
| INCOME_GROUP                          | 0.032  | 0.006          | 31.492                | < 0.0001              | 1.033      |
| INT_IND                               | 2.365  | 0.066          | 1268.273              | < 0.0001              | 10.640     |
| REL_LENGTH                            | -0.002 | 0.000          | 29.444                | < 0.0001              | 0.998      |
| SEX_FEMALE                            | 0.000  | 0.000          |                       |                       |            |
| SEX_MALE                              | 0.000  | 0.000          |                       |                       |            |
| TURNOVER                              | 0.000  | 0.000          |                       |                       |            |
| NUMBER_OF_ACCOUNTS                    | 0.330  | 0.022          | 219.501               | < 0.0001              | 1.392      |

The -2 Log(Likelihood), Score and the Wald all have p-values of less than 0.0001, which are well below the 0.05 level of significance. This suggests that the model is significantly different from the null hypothesis model, which does not have predictors.

Table 4.14: Hypothesis 6: The model parameters above shows that the odds of customers adopting and using mobile banking are 1 times higher if customers

are younger compared to older customers. The odds are similar if customers are newer to the bank compared to customers who have a longer relationship with the bank. The odds of a customer adopting and using mobile banking are 1.03 times higher if the customer's income is higher compared to a lower-income customer. The odds are 1.4 higher for customers who have more accounts compared to those who have only one account with the bank. Customers who are registered for internet banking have the highest likelihood of registering for mobile banking services. The model shows that the odds of registering for mobile banking are 10.6 higher if customers are registered for internet banking compared to those who are not registered for internet banking.

The conclusion from the above is that the selected demographic variables have a significant impact on the adoption and usage of mobile banking services with internet banking registration as a leading variable.



**Figure 4.6: The demographics ROC curve**

Figure 4.6: The demographics ROC curve confirms the predictive ability of the model. For the model to be considered predictive, the area under the curve should be at least 50%. The area under the curve in the model is 82.5%, which is a good indicator that demographics do have an influence on the adoption of mobile banking services.

Based on the statistical tests of individual predictors, goodness-of-fit statistics, logistic odds ratios and the ROC curve, **we reject the null hypothesis** and accept the alternative hypothesis that demographic variables have an impact on the adoption of mobile banking services.

## 4.9 Summary of the results

The binary logistic regression analysis found that usefulness of mobile banking, ease-of-use of mobile banking and selected customer demographics are significant in explaining the adoption and usage of mobile banking. The ability to try and observe mobile banking and experience with mobile technology constructs were also found to be significant in explaining the adoption and usage of mobile banking. From the six constructs looked at, only the risk construct was not found to be significant in explaining the adoption and usage of mobile banking. Below is a summary of hypotheses and the outcomes of their analysis:

H0\_1: The perceived usefulness of mobile banking does not affect the likelihood of the adoption of mobile banking. **The null hypothesis is rejected** and the alternative hypothesis that the usefulness of mobile banking affects usage of mobile banking services is accepted.

H0\_2: The perceived ease-of-use of mobile banking does not affect the likelihood of adoption of mobile banking. **The null hypothesis is rejected** and



the alternative hypothesis that ease-of-use has an impact on the adoption and usage of mobile banking services is accepted.

H0\_3: Experience and comfort with mobile technology do not affect the likelihood of adoption of mobile banking. **The null hypothesis is rejected** and the alternative hypothesis that experience with mobile technology has an impact on the adoption and usage of mobile banking services is accepted.

H0\_4: The ability to test and observe mobile banking transactions does not affect the likelihood of adoption of mobile banking. **The null hypothesis is rejected** and the alternative hypothesis that experience with mobile technology affects usage of mobile banking services is accepted.

H0\_5: The risk associated with mobile banking does not have an impact on the likelihood of adoption of the service. **The null hypothesis is accepted** and the alternative hypothesis that experience with mobile technology affects usage of mobile banking services is rejected.

H0\_6: Customer demographics do not have an impact on the likelihood of adoption of mobile banking. **The null hypothesis is rejected** and the alternative hypothesis that customer demographics do have an impact on the adoption and usage of mobile banking services is accepted.

## **CHAPTER 5: DISCUSSION OF THE RESULTS**

### **5.1. Introduction**

The objective of this study was to identify factors that facilitate and inhibit the adoption and use of mobile banking services in South Africa. A binary logistic regression was used to study the effect of constructs identified from literature on the adoption and use of mobile banking. This chapter discusses the results of the study. Each hypothesis is discussed with reference to the literature review and the results of the logistic regression.

### **5.2. Discussion pertaining to Hypothesis 1: Perceived usefulness of mobile banking does not affect the likelihood of adoption**

Based on the results of the logistic regression analysis including goodness-of-fit statistics, logistic odds ratios and the ROC curve, the null hypothesis was rejected and the alternative hypothesis that perceived usefulness has an impact on usage of mobile banking services was accepted. The results are in line with most Technology Acceptance Model (TAM) studies which found that perceived usefulness was one of the main drivers of technology adoption (Davis and Venkatesh, 1995; Venkatesh and Morris, 2000; Venkatesh 2000; Ayyagari, 2006; Pikkarainen et al, 2004; Wang et al, 2003).

Perceived usefulness is the degree to which the user believes that use of the new system or technology function will improve his or her work performance or

banking experience (Davis and Venkatesh, 1995). Usefulness also includes the perception that the alternative technology makes the performance of a function better compared to traditional ways of performing the function. Perceived usefulness is also referred to as relative advantage and defined as the degree to which consumers perceive a new product or service as being different and better compared to its substitutes (Kolodinsky and Hogarth, 2001). For a mobile banking service, advantages include time saving, affordability and the convenience that traditional banking channels like physical branches and ATMs cannot offer. Given this definition, it is not surprising that this study also found that perceived usefulness is a significant construct in explaining the adoption and usage of mobile banking services.

Anything that is not seen as relevant in enhancing the current ways of doing things stands little chance of being considered. Usefulness can therefore be seen as a gatekeeper in the technology adoption process and in particular the adoption and usage of mobile banking services. Adoption in this case must be differentiated from the sale of mobile banking. South African banks have successfully sold mobile banking services without customers adopting the service and this is clear from a very wide gap between the numbers of customers who are registered for mobile banking and those who are using the service regularly for their banking.

In addition, given the percentage of banked customers in the country, one would expect banks to be significant players in the prepaid airtime top-up market as they all offer their customers top-up prepaid airtime using their respective mobile banking services. The dominance of traditional airtime top-up vouchers in the prepaid market is a clear indication that customers do not see the relative advantage of using mobile banking for their airtime top up. Banks still have some ground to cover to ensure that awareness of their mobile banking services is increased and with this increased awareness, the relevance of the service to customers' daily lives.

In conclusion, the usefulness of mobile banking plays a significant role in the adoption of the service. Given its importance, banks should focus on developing mobile banking functions that are useful and they should ensure that their communication campaigns focus on promoting the usefulness and relevance of their services to customers' daily lives.

### **5.3. Discussion pertaining to Hypothesis 2: Perceived ease-of-use of mobile banking does not affect the likelihood of adoption**

The null hypothesis was rejected and the alternative hypothesis that perceived ease-of-use of mobile banking affects the likelihood of adoption of the service was accepted. Like perceived usefulness, perceived ease-of-use was extensively tested in TAM research for a variety of technologies and was found useful in explaining adoption and usage of new technologies. Perceived ease-of-use is defined as an individual's perception of the effort required in the process of using a technology. It is the extent to which a person believes that using a technology will require less effort compared to the traditional way of doing things (Davis and Venkatesh, 1995 and Venkatesh 2000).

The current study confirmed conclusions of studies in the literature survey on technology adoption, which found perceived ease-of-use a significant construct in explaining the adoption and usage of technology. Unlike other constructs in literature that yield different results based on the particular focus of the study, perceived usefulness and perceived ease-of-use have been consistently confirmed as significant in explaining the adoption and usage of technology. The importance of perceived ease-of-use in this study compared to other constructs such as trial-ability, risk and experience is clear from the results of

the statistical analysis. The  $R^2$ s and the ROC curve of the perceived ease-of-use construct both show that the construct explains adoption of mobile banking better than trial-ability, risk and experience.

However useful a technology might be, it has to be easy to use to enjoy broad adoption and usage. For mobile banking service ease-of-use does not only cover the experience of using the service but also the process of registering for, enabling the service and even logging on to the service. All these have to be as easy as possible to enable customers to self-register and use the service without being logged out of the service before completing their transactions.

While logging on to the online banking service is straightforward, logging on to a mobile banking service appears to be just as simple until one considers the fact that a cellphone keypad is much smaller than a computer keyboard and the economy of the keypad demands that each key is used for two functions – keying in a number and keying in a letter. This makes simple things such as keying in a mobile banking service logon PIN code difficult. Many users key in their PIN codes using a letter mode (which is a default mode) instead of using a numeric mode. After a few repeated attempts, the user's mobile banking service is locked for security reasons. For the service to be restored, the customer has to either go to the branch or call their bank's call support centre to unlock the service. This can be attributed to the fact that with most mobile banking services, when a user types a PIN, asterisks instead of the actual PIN appears on the screen and the user will not see the error until they are locked out of the service. The asterisk might be important as a security feature when typing a PIN at the ATM or even with online banking, but it is a security feature that is not necessary in the mobile phone environment where the screen is much smaller and use is not in the public space.

Security considerations meant to protect customers often make simple transactions much more difficult. For example Absa, like other banks, has an innovative way of sending customers one-time passwords to authorise certain transactions done through mobile and online banking. If the customer is using online banking, the password is sent to the customer's registered cellphone number. The same is done if a customer is using the bank's internet-based cellphone banking service. The password is embedded in an SMS, which a customer needs to open and use to logon to the service again. This means that the user has to logoff from the original transactional screen and logon again using the link sent through the SMS. This is a very important security feature that has saved customers and the bank millions in fraudulent transactions but has equally confused users. When first-time customers are asked to logoff, they might end the transaction thinking that they have been forced to logoff because they have done something wrong.

In conclusion, perceived ease-of-use follows perceived usefulness as an important construct to consider in determining factors that facilitate or inhibit usage of mobile banking in South Africa. Banks have a big role to play in simplifying the mobile banking services while balancing simplicity with security risks.

#### **5.4. Discussion pertaining to hypothesis 3: Experience and comfort with mobile technology do not affect the adoption of mobile banking**

The null hypothesis was rejected based on the results of the logistic regression analysis. The alternative hypothesis that experience and comfort with mobile technology affects the adoption of mobile banking was accepted. It was, however, clear from the model's ROC curve and from comparing the model's

$R^2$ s with the  $R^2$ s for the first two constructs, that the construct does not have the same explanatory power as perceived usefulness and perceived ease-of-use.

Several studies found that technology self-efficacy had an overall positive impact on the intention to use a new technology. Confidence in one's technical abilities and knowledge was confirmed as a basis for an individual's judgement about how easy or difficult a new system or online banking functionality would be to use (Venkatesh, 2000 and Wang et al, 2003). The predictive ability of experience and comfort with mobile technology found in the literature could not be found in the current study. Instead, the influence of technology self-efficacy or experience and comfort with technology was found to be marginal.

The influence of technology self-efficacy or experience and comfort with technology on the adoption of technology seems to be strong with new technologies. Mobile technology on the other hand is not new in South Africa. Cellphone ownership among South Africa's economically active population was estimated to be close to 90% (Koenderman, 2010; SAARF AMPS, 2010). Most customers; both mobile banking users and non-users were comfortable with most of the current cellphone banking technologies and this is likely to be the reason why the influence of the construct on usage and non usage of mobile banking was not as strong. The only variable within the construct that was significant was the usage of mobile technology to access the internet. Traditional variables used to test comfort and experience with technology such as the ability to take photos, setting up reminders and playing music using a cellphone could not explain the likelihood of using mobile banking.

In conclusion, comfort and experience with cellphone technology on its own will not drive or inhibit the adoption of mobile banking services. Banks can work within the latest technology offers to create useful and easy-to-use services for their customers.

### **5.5. Discussion pertaining to hypothesis 4: The ability to test and observe mobile banking transactions does not affect mobile banking adoption**

The null hypothesis was rejected based on the results of the analysis. The alternative hypothesis that the ability to test and observe mobile banking transactions affects the adoption of mobile banking was accepted. As with the experience and comfort with technology construct; the impact of trial-ability was not as strong as in other studies in literature.

Rogers (1995) in his diffusion of innovation theory argued that the ability to test and observe new innovations was important in the flow of information about the new innovation and therefore also the adoption and use of the technologies. The ability to test and observe a new innovation or technology is related to perceived ease-of-use and can be used to enhance ease-of-use.

The trial-ability and observability construct indirectly tested the importance of ease-of-use because the ability to try and observe new technologies should assist with making technology easier to use. The lack of clear conclusiveness regarding the construct as can be seen from the results of the analysis compared to the perceived ease-of-use construct, points to a lack of preparedness of customers to actively participate in making mobile banking easy to use. The challenge for banks is to effect mobile banking demonstrations in such ways as do not require extra customer effort. Just like ease-of-use, this factor offers good support to the perceived usefulness construct. The challenge, however, is to find less intrusive and secure ways of demonstrating mobile banking. Unlike other technologies which are public in nature, mobile banking is private and confidential in nature, which makes demonstrating the technology more challenging.



The parallel between mobile banking and the introduction of ATM banking services regarding the importance of the role of trial-ability and observability in the adoption of new technology seems to be not as important as it was hoped it would be. When ATM banking services were introduced, customers did not have other affordable and convenient banking channels they could rely on and they had to avail themselves to learn the new technology as soon as possible or risk paying much more if they continued using branches for their banking. Mobile banking on the other hand was launched and is now growing in an environment where there are multiple banking channels that are equally convenient and affordable. The ATM network and online banking services in South Africa can easily rival those of first world economies and they provide a convenient and affordable alternative to mobile banking.

#### **5.6. Discussion pertaining to hypothesis 5: The risk associated with mobile banking does not have an impact on the likelihood of adoption of the service**

Based on the results of the logistic regression analysis, the null hypothesis was accepted. Risk was identified in literature as one of the factors that inhibit adoption of mobile banking or other new technologies (Rotchanakitumnuai and Speece, 2003, Featherman and Pavlou, 2003). Perceived risk was defined as a felt uncertainty regarding possible negative consequences of using a service. (Featherman and Pavlou, 2003, Wang et al, 2003).

A study by Featherman and Pavlou (2003) found that risk in general had a strong inhibiting influence on both perceived usefulness and perceived ease-of-use and in turn an inhibiting factor on adoption even among the younger and more educated sample. The results of the current study are not as strong as some of the studies reviewed in literature, hence the conclusion to accept the null hypothesis.

Security risk was almost equally a concern between mobile banking users and those who were not users. All customers were equally concerned about security issues and the model could therefore not conclude that the construct is significant in driving usage and non-usage of mobile banking. A look through respondents' responses shows that customers who do not use mobile banking as well as customers who use mobile banking are worried about the security of their transactions and the ability to get proof of their transactions in case something goes wrong.

The main concern for both users and non-users was the responsibility they shoulder when they bank via mobile banking. Unlike assisted transactions such as transferring money to another account at the branch, doing the same thing using mobile banking meant that the customer was fully responsible if something went wrong. If something goes wrong while banking at the branch, the staff member is held partly responsible and the error is more likely to be corrected without the customer suffering any financial loss.

Banks have a responsibility to minimise the fear of something going wrong when customers use mobile banking services. General information on how to bank securely across all banking channels will remain important as banks build trust in their self-service channels.

### **5.7. Discussion pertaining to Hypothesis 6: Customer demographics do not affect the likelihood of mobile banking adoption**

Customer demographics, especially registration for internet banking, were found to significantly explain the adoption and usage of mobile banking services. This was clear from the results of the logistic regression tests including goodness-of-fit statistics, logistic odds ratios and the ROC curve. The results support some of the studies done on the relationship between technology adoption and demographics. Some demographic variables supported by previous studies were, however, not supported in the current study.

Income has received more attention compared to other demographic variables in technology adoption studies that sought to find a relationship between income and the adoption of technology. A study conducted by Kolodinsky and Hogarth (2001), found that income was a strong predictor of online banking usage. This was confirmed by a study conducted by Lassar et al (2005), which also found that income and age had an impact on the adoption of online services.

The study also found that higher-income customers are more likely to adopt and use mobile banking services compared to lower-income customers. Customers with a higher income are more likely to have better mobile technology, better education and a greater need for banking convenience, hence the likelihood of such customers using mobile banking technology. This study also found that customer age and the age of the relationship with the bank had a negative impact on the adoption of mobile banking services. Older customers are already established in their ways of banking and it is not surprising that older customers are less likely to take up and use mobile banking services. The same applies to customers who have a longer banking relationship. Customers who are newer

to banking are more likely to have been sold mobile banking services when they opened their accounts compared to customers who opened their accounts before the introduction of the service.

Income is also linked to the number of bank accounts that a customer has. Customers with a higher income need more accounts to cater for their broader financial services needs. The more the accounts, the more likely it is for the customer to require tools that make it easier to access and manage those accounts and mobile banking and online banking provide an answer to this need. The study found that customers with more accounts are more likely to adopt mobile banking compared to those who do not have as many bank accounts.

From the eight demographic variables analysed, internet banking subscription was the best predictor of adoption and usage of mobile banking services. The model shows that the odds of registering for mobile banking are 10.6 higher if customers are registered for internet banking compared to those who are not registered for internet banking. The high likelihood is due to a number of factors. Internet banking users are likely to be more educated, younger, with higher income and have more bank accounts. All these are positively related to mobile banking adoption and in light of this it is not surprising that internet banking subscription is a positive predictor for mobile banking adoption. The relationship is, however, likely to have been exaggerated by the fact that both cellphone and internet banking are offered free to package customers and likely to be offered to the customer during the sale of the account package.

Gender does not enjoy as much attention as income in technology adoption literature. Venkanesh and Morris (2000) found that men and women differ in their decision-making process regarding technology adoption – men consider perceived usefulness to a greater extent than women when making technology acceptance decisions while women consider ease-of-use, the study however was not conclusive on the role of gender in the difference in likelihood of

adoption between men and women. In the current study, gender was excluded from the model due to its inability to influence the adoption of mobile banking.

In conclusion, income, age, number of bank accounts and internet banking subscription are demographic variables that were found to play a significant role in the adoption of mobile banking services. Banks can use these as part of their take-up likelihood models to focus on customers with the identified demographic profile to boost the success of their marketing campaigns.

## **CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 Introduction**

This chapter summarises the findings of the research and reflects the conclusions drawn from the study. The chapter also makes recommendations regarding that which can be done to assist with faster adoption and usage of mobile banking. The chapter concludes by suggesting other aspects of technology adoption that require further research.

### **6.2 Conclusions of the study**

Mobile banking offers the banking industry an opportunity to not only reduce the cost of serving their customers, but also to improve their service as more and more customers serve themselves through mobile banking and other self-service channels. The availability of mobile phone devices among the economically active population makes mobile banking the banking industry's obvious banking channel to drive down their cost-to-income ratios and improve service on higher value transactions. As set out in the introduction, taking advantage of the growth of the cellphone industry requires knowledge about who is likely to take up mobile banking and equally important, what factors drive customers to adopt and use mobile banking for their day-to-day banking.

This study confirmed what international studies have identified as the main factors that drive adoption of technology in general and banking technology in particular. The study confirmed that usefulness and ease-of-use are central in

the adoption of mobile banking services in South Africa. Given the importance of usefulness, the first thing that banks should ask about their mobile banking services is whether their mobile banking services fulfil a useful banking or financial function to their customers. Creating a useful service is not enough if the market does not see the usefulness of the service.

The challenge lies in making sure that customers see the service as relevant in their day-to-day banking and financial lives. Without creating this relevance, very useful services will remain unused and their importance ignored. While banks are clear on what they stand to benefit from the adoption of mobile banking by their customers, their customers do not always see the benefit of the service in their daily lives. Promoting mobile banking services should go beyond listing the many features that mobile banking services now offer and offering prizes for registering or using the service, to making a compelling case that shows the relevance of the service on a selected set of features.

Equally important is the challenge of making sure that mobile banking is as easy to use as possible. This is very important considering that literacy levels in South Africa remain low. The challenge with current mobile banking offers is that they try offering a comprehensive set of banking services, some of which are not suitable for the smaller handsets that the majority of customers have access to. These high-end services are offered to the broad customer base but appeal to only a fraction of that customer base.

Ease-of-use is not only about using the service to conduct banking transactions but also about ensuring that registering for the service and login onto the service is easy. This has to be balanced against ensuring the security of the service. It has to be acknowledged that not every aspect or function of the service will be as intuitive and as easy to use as customers would like, but it is incumbent upon banks to ensure that all opportunities to showcase the service and how it works are used. There is a need to drive ease-of-use across all mobile banking functions without putting customers' transactions at risk.

Even though the ability to try out and observe mobile banking was not as strong as usefulness and ease-of-use, the extent to which it aids ease-of-use, makes it an important factor to consider when driving take-up and use of mobile banking. It is clear that everything that needs to be done to aid service trials and observations has to involve as little extra effort from the customer's point of view as possible. The best opportunities present themselves at bank branches when customers do not have as much to do. The contradiction however is that South African banks do not allow their customers to switch their cellphones on inside while their branches. With this security precaution, thousands of opportunities to show customers how to do their banking via their phones as opposed to coming to branches are lost.

Experience with mobile technology was not a strong predictor of mobile banking usage. This, however, does not mean that banks do not have a part to play to increase experience of mobile technology that relates to their mobile banking offers. Keeping mobile banking services easier to use and less technically challenging needs to be a joint effort between banks, cellular network service providers and handset manufactures. Security risks are a concern for both users and non users. These concerns however, need to be evaluated carefully to make sure that security enhancements do not compromise the service by making it difficult to use especially for the less technology literate customers.

Income, age, number of bank accounts and internet banking subscription were found to play a significant role in the adoption of mobile banking services. With a basis of a service that is seen to be useful and easy to use, these demographic variables should be used to select a target base of customers for campaigns to acquire new mobile banking users.



## 6.3 Recommendations

The following are recommendations that can be drawn from the study:

- All mobile banking functions should be evaluated for their ease-of-use before they are launched. An audit of usage levels of mobile banking functions should be conducted to see which ones are used often and which ones are less frequently used. Those less frequently used should be discontinued to make sure that only easy-to-use functions are retained.
- Communication to customers about mobile banking should be evaluated for their effectiveness in communicating the usefulness of the service and its relevance to customers' lives. Communications that do not support the building of a usefulness image for mobile banking services should not be used as it serves little purpose. Promotions that come with prizes should also have an aspect that enhances the service's usefulness as a basis.
- Branches offer banks countless opportunities to educate customers about the ease of using the service and also ensure that customers know how to use mobile banking securely at all times. Branches should therefore be used to drive registration for mobile banking.
- Banks should allow customers to switch their cellphones on inside the branch and actively encourage them to do their basic banking as they wait to be served on more complex financial requirements. This way any difficulty with the service can be addressed as soon as customers raise the difficulty.
- Due to small cellphone screens, banks should consider removing asterisks when customers key in their PIN codes. Using asterisks does not enhance security for mobile banking users but instead makes simple tasks more complex without an additional security benefit.

## **6.4 Suggestions for further research**

Despite the increasing use of self-service channels like ATMs, mobile banking, telephone banking and online banking, branches remain popular as a banking channel. The branch is the most trusted banking channel because it offers human interaction in the conclusion of a banking transaction. Self-service channels like mobile banking, on the other hand, are not as trusted partly due to the fact that they do not offer human interaction during the transaction.

Telephone banking as a banking channel is seen by many as a dying channel but it does offer a combination of the trusted human interaction and the convenience of self-service banking. The channel therefore offers the trust that branches enjoy and the convenience of mobile banking in one package. Further research could focus on the suitability of telephone banking as a transitional channel between branches and mobile banking.

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## APPENDIX A: QUESTIONNAIRE

| Section A: Personal Information                                         |                |               |                 |                |                    |                 |                   |
|-------------------------------------------------------------------------|----------------|---------------|-----------------|----------------|--------------------|-----------------|-------------------|
| Age group                                                               | 18 - 25        | 26 - 30       | 31 - 35         | 36-40          | 41-50              | 51-60           | 61+               |
|                                                                         |                |               |                 |                |                    |                 |                   |
| Gender                                                                  | Male           |               |                 |                |                    |                 | Female            |
|                                                                         |                |               |                 |                |                    |                 |                   |
| Highest educational level                                               | 0 - Primary    | Secondary     | Matric          | Certificate    | Diploma            | Degree          | Degree+           |
|                                                                         |                |               |                 |                |                    |                 |                   |
| Income before deductions per month in Rands                             | 0 - 1 000      | 1 000 - 3 000 | 3 000 - 6 000   | 6 000 - 10 000 | 10 000 - 15 000    | 15 000 - 20 000 | 20 000+           |
|                                                                         |                |               |                 |                |                    |                 |                   |
| Section B: Questionnaire                                                |                |               |                 |                |                    |                 |                   |
|                                                                         | Strongly agree | Agree         | Some-what Agree | Not sure       | Some-what Disagree | Disagree        | Strongly disagree |
| Usage and intention to use                                              | 7              | 6             | 5               | 4              | 3                  | 2               | 1                 |
| I use Cellphone banking for some of my banking                          |                |               |                 |                |                    |                 |                   |
| I would like to start/continue using Cellphone banking for banking      |                |               |                 |                |                    |                 |                   |
| Cellphone banking is or will be a better way to bank                    |                |               |                 |                |                    |                 |                   |
| Mobile banking usefulness                                               | 7              | 6             | 5               | 4              | 3                  | 2               | 1                 |
| Cellphone banking makes it easier to bank from anywhere                 |                |               |                 |                |                    |                 |                   |
| With Cellphone banking one can buy prepaid airtime anytime              |                |               |                 |                |                    |                 |                   |
| Cellphone banking users do not have to visit branches everytime to bank |                |               |                 |                |                    |                 |                   |
| It is cheaper to use Cellphone banking than going to the branch         |                |               |                 |                |                    |                 |                   |
|                                                                         |                |               |                 |                |                    |                 |                   |
| Mobile banking ease of use                                              | 7              | 6             | 5               | 4              | 3                  | 2               | 1                 |
| I think that it is easy to use Cellphone banking                        |                |               |                 |                |                    |                 |                   |
| It does not take long to learn how Cellphone                            |                |               |                 |                |                    |                 |                   |

|                                                                                          |          |          |          |          |          |          |          |
|------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|
| banking works                                                                            |          |          |          |          |          |          |          |
| Banks give customers enough information on how to use Cellphone banking                  |          |          |          |          |          |          |          |
| Information on how to use Cellphone banking is easy to understand                        |          |          |          |          |          |          |          |
|                                                                                          |          |          |          |          |          |          |          |
| <b>Experience and comfort with mobile technology</b>                                     | <b>7</b> | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> |
| I like trying out new technology and new ways of doing things                            |          |          |          |          |          |          |          |
| I can play music/radio and take photos using a cellphone                                 |          |          |          |          |          |          |          |
| I use a cellphone to visit Internet websites sometimes                                   |          |          |          |          |          |          |          |
| I can set up birthday or meeting reminders on cellphone                                  |          |          |          |          |          |          |          |
|                                                                                          |          |          |          |          |          |          |          |
| <b>Trial-ability of mobile banking</b>                                                   | <b>7</b> | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> |
| I learn new things by trying them out                                                    |          |          |          |          |          |          |          |
| Banks must show and teach customers how to bank using cellphones                         |          |          |          |          |          |          |          |
| Banks must have a place where customers can learn how to use Cellphone banking           |          |          |          |          |          |          |          |
| I would like to attend a demonstration on how to use Cellphone banking                   |          |          |          |          |          |          |          |
|                                                                                          |          |          |          |          |          |          |          |
| <b>Perceived risk of using cellphone banking</b>                                         | <b>7</b> | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> |
| Losing the cellphone I use for Cellphone banking will put my bank account at risk        |          |          |          |          |          |          |          |
| Using Cellphone banking is not as secure as using the ATM or banking inside the branch   |          |          |          |          |          |          |          |
| If I make a mistake when using Cellphone banking, the bank will not take responsibility  |          |          |          |          |          |          |          |
| Cellphone banking does not give proof of banking transactions like the ATM or the branch |          |          |          |          |          |          |          |
| Thank you for taking your time to complete the survey questionnaire                      |          |          |          |          |          |          |          |

## APPENDIX B: CONSISTENCY MATRIX

| <b>Research problem:</b> To identify the factors that facilitate and inhibit the adoption and use of online banking services.                                                                                                                                         |                                                                                                             |                      |              |                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------------------|--------------|---------------------|
| Literature Review                                                                                                                                                                                                                                                     | Hypotheses or Propositions or Research questions                                                            | Source of data       | Type of data | Analysis            |
| <ul style="list-style-type: none"> <li>• Davis and Venkatesh (1995)</li> <li>• Venkatesh and Morris (2000)</li> <li>• Venkatesh (2000)</li> <li>• Davis (1989)</li> <li>• Ayyagari (2006)</li> <li>• Pikkarainen et al (2004)</li> <li>• Wang et al (2003)</li> </ul> | H0_1: Perceived usefulness of mobile banking does not affect the likelihood of adoption of mobile banking.  | Survey questionnaire | Ordinal      | Logistic regression |
| <ul style="list-style-type: none"> <li>• Davis and Venkatesh (1995)</li> <li>• Venkatesh and Morris (2000)</li> <li>• Venkatesh (2000)</li> <li>• Davis (1989)</li> <li>• Ayyagari (2006)</li> <li>• Pikkarainen et al (2004)</li> <li>• Wang et al (2003)</li> </ul> | H0_2: Perceived ease-of-use of mobile banking does not affect the likelihood of adoption of mobile banking. | Survey questionnaire | Ordinal      | Logistic regression |

**Research problem:** To identify the factors that facilitate and inhibit the adoption and use of online banking services.

| Literature Review                                                                                                                                                                                                                               | Hypotheses or Propositions or Research questions                                                                                 | Source of data       | Type of data | Analysis            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------|---------------------|
| <ul style="list-style-type: none"> <li>• Ayyagari (2006)</li> <li>• Venkatesh (2000)</li> <li>• Sutton (2002).</li> <li>• Venkatesh (2000)</li> <li>• Lassar et al (2005)</li> <li>• Rose and Fogarty (2006)</li> <li>• Ajzen (1991)</li> </ul> | H0_3: Experience and comfort with mobile technology does not affect the likelihood of adoption of mobile banking.                | Survey questionnaire | Ordinal      | Logistic regression |
| <ul style="list-style-type: none"> <li>• Pikkarainen et al (2004)</li> <li>• Ayyagari (2006)</li> <li>• To et al (2007)</li> <li>• Rogers (1995)</li> <li>• Kolodinsky and Hogarth (2001)</li> <li>• Lobenhofer et al (2003)</li> </ul>         | H0_4: The ability to test and observe a mobile banking transaction does not affect the likelihood of adoption of mobile banking. | Survey questionnaire | Ordinal      | Logistic regression |

| <b>Research problem:</b> To identify the factors that facilitate and inhibit the adoption and use of online banking services.                                                                                                    |                                                                                                                                    |                                                     |              |                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------|---------------------|
| Literature Review                                                                                                                                                                                                                | Hypotheses or Propositions or Research questions                                                                                   | Source of data                                      | Type of data | Analysis            |
| <ul style="list-style-type: none"> <li>• Featherman and Pavlou, (2003)</li> <li>• Rotchanakitumnuai and Speece (2003)</li> <li>• Bauer (1967)</li> <li>• Curran and Meiter (2005)</li> <li>• Pikkarainen et al (2004)</li> </ul> | H0_5: The risk associated with mobile banking does not have an impact on the likelihood of adoption of the mobile banking service. | Survey questionnaire                                | Ordinal      | Logistic regression |
| <ul style="list-style-type: none"> <li>• Venkanesh and Morris (2000)</li> <li>• Kolodinsky and Hogarth (2001)</li> <li>• Lassar et al (2005)</li> <li>• Lee and Lee (2000)</li> </ul>                                            | H0_6: Customer demographics do not have an impact on the likelihood of adoption of mobile banking.                                 | A customer database of customers with bank accounts | Interval     | Logistic regression |



## **APPENDIX C: RESEARCH INSTRUMENT**