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Cellphone banking adoption and its impact on

the transactional behaviour of low income

consumers

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Abstract

This aim of this study was to establish if individual characteristics have an impact on the adoption of cellphone banking amongst low-income (Mzansi) consumers. The second component of the study then set out to assess the impact that cellphone banking adoption has on the financial behaviour of these consumers.

This data was obtained using the data mining technique. Data from one of the local banks was extracted and analysed. In addition to using descriptive statistics, the ANOVA was used. The ANOVA is an inferential statistical method. It establishes whether there is a relationship with the defined variable and the adoption of cellphone banking. Race, age, income, gender, number of bank products and channel of registration where the variables that were analysed.

With the exception of age, no other variable had an impact on adoption for both Mzansi customers as well as the entire base. The subsequent post adoption behaviour analysis that was conducted identified some key behaviour changes. Consumers who adopted cellphone banking significantly increased (>300%) their demand of prepaid products. Secondly, the demand for cash amongst adopters was lower than the demand from non-adopters which could signal a shift towards cashless solutions. And finally, the cellphone banking adopters were found to perform more transactions prior to adoption when compared to non adopters thereby demonstrating a higher need for a mobile banking solution.

Keywords

Mobile banking, cellphone banking, technology adoption, demographics, consumer behaviour.

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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To my little angels Lesedi and Liwa, daddy is finally coming home.

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1   Introduction to Research Problem

1.1   Research Title

Cellphone banking adoption and its impact on the transactional behaviour of low income consumers.

1.2   Research Problem

In order to address the economic inequalities that existed in the country and in response to government pressure, the financial sector in South Africa formulated the Financial Services Charter (Financial Sector Charter, 2004). One of the objectives of the charter is to provide effective access means to first-order retail financial services to individuals who fall into the All Media Product Survey (AMPS) categories of LSM 1-5 (Financial Sector Charter, 2004). These financial services need to be appropriate and affordable for the target segments. The products also need to be designed for simplicity and ease of use.

A large number of South Africa's poor have settled in rural areas that are located far away from economic hubs. This is mainly as a result of the Group Areas Act of 1950 which resulted in settlements that have been reserved for non-whites being located away from economically developed areas. The rural areas are geographically sparsely located. As a result of this sparse distribution of rural areas in South Africa, and the high cost associated with Branch infrastructure (Walsh *et.al*, 2010), financial institutions are looking to m-commerce to assist with meeting the Financial Sector Charter objectives. One of the Charter objectives is to provide appropriate and affordable financial services to the AMPS LSM 1-5 segment. The implementation of

cellphone banking infrastructure does however require initial capital outlay. To justify the investment that needs to be made to design, develop and maintain the cellphone banking application, institutions need to ensure that: 1) they acquire customers; and 2) get the customers to adopt the new technology.

Acquiring new customers is consistently being quoted as being higher (as much as five times) than the cost associated with retaining customers (Bhattacherjee, 2001; Rust and Zahorik, 1993). Acquisition costs are high because of the added burdens of locating potential customers, the administrative costs associated with setting up of the new accounts and the costs involved in educating/initiating the customer to the new application (Bhattacherjee, 2001). In order to manage these costs, businesses have a significant interest in knowing what factors determine customer adoption of cellphone banking and its usage.

A number of models exist that can be used to determine the adoption of information systems. The literature however does not seem to address the influence that individual characteristics have on the adoption of cellphone banking in South Africa.

1.3   Research Objective

The objective of this research is twofold:

✓ to determine the influence of individual characteristics on the adoption of cellphone banking in South Africa with an emphasis on low income consumers;
✓ to determine if there are differences in the transactional behaviour pre and post the adoption of cellphone banking for low income consumers.

2   Literature Review

After the attainment of democracy in 1994, South Africa has been in the process of transformation in order to address the inequalities of the past. In an attempt to redress inequalities, Government introduced the Black Economic Empowerment (BEE) legislation (Act 53, 2003). The aim of the policy is to reduce the unequal access that existed in economic opportunities.

Although South Africa resides within the middle income band in terms of global standards, based on the per capita gross national income, the country is plagued with massive income inequalities (Baumann, 2004). South Africa's Gini coefficient makes it a highly unequal society. As a result of this disparity, the country has a dual economy that consists of a formal and an informal sector.

According to Fourati (2009), the phenomenon of poverty is multidimensional and is exacerbated by restrictions on access to information.

2.1   Economic Development

In order for business to be conducted with the base of the pyramid (BoP) segment, three fundamental issues need to be addressed: 1) the provision of a finance system to the segment; 2) leveraging of technology for the enablement of process efficiency and; 3) the modification of products to meet the needs of the segment (Martinez and Carbonell, 2007).

2.2 Bottom of the Pyramid (BoP)

2.2.1 Defining BoP

The world currently consists of approximately four billion people who live in poverty (Subrahmanyan & Gomez-Arias, 2008). These individuals are considered to be economically at the base of the pyramid (BoP). BoP markets are primarily rural and are located in Latin America, South Asia, Eastern Europe, Caribbean and Africa (Subrahmanyan & Gomez-Arias, 2008). Individuals within this segment rely on the informal economy which is prone to inefficiency, often characterised by low quality products which are accompanied by poor distribution and higher prices (Subrahmanyan & Gomez-Arias, 2008). The segment lacks structure and has uncertainty in terms of jobs and income.

2.2.2 Financial Services Measure

A series of measures have been formulated in order to assist in the identification and/or quantification and/or segmentation of people into different categories in order to understand the different characteristics and behaviours of these groups. The Living Standards Measures (LSM) is the segmentation of people based on demographics and living standards (The South African Advertising Foundation, 2004). The financial Sector Charter classifies low income people as belonging to the LSM 1-5 segment (Financial Sector Charter, 2004).

The Financial Services Measure (FSM) is based on categorising people according to a combination of four components (FinMark Trust, 2004):

✓ Physical accessibility to banks;

✓ Optimism and connectedness;

✓ Financial knowledge, control and discipline; and

✓ Extent of financial services uptake

The FSM was formulated because of the inability of LSM to accurately describe an individual in terms of their financial situation. Although LSM is linked to an individual's finances and ownership of products, it does not articulate an individual's attitude towards their finances. In spite of this weakness in the measure, it is popular and is highly used when segmenting people.

The comparison of the two measures is illustrated in the figure below:

Figure 1: Comparison of the LSM and FSM Measures (Source: FinMark Trust, 2004)
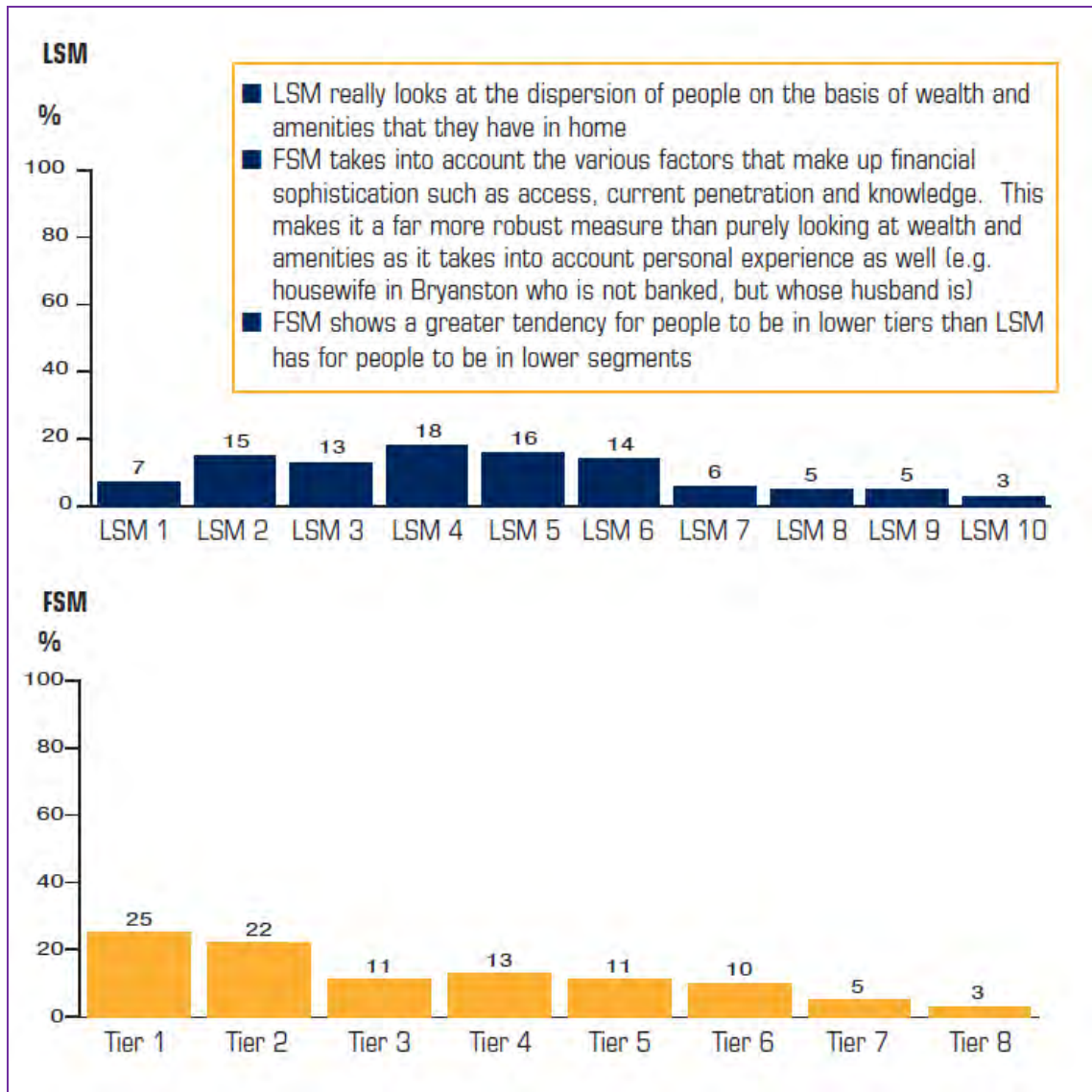
Although FSM is recommended as the measure when assessing financial markets (FinMark Trust, 2004), in this study the LSM rating has been adopted. This is because the Mzansi account positioning (LSM 1 – 5) is based on the LSM measure.

Martinez and Carbonell (2007, pp 52) argue that for a company to conduct business with BoP customers, the corporate will need to appreciate the "*uniqueness of doing business with BoP customers*". This entails assessing affordability, education on product usage and an appreciation of the dynamism of this segment. They further postulate that adequate distribution will increase the capacity for consumption.

Affordability, availability and access are identified as the key factors that will influence the ability to conduct business with this segment.

2.3 Financial Needs of the Poor

A study (The Financial Diaries, 2005) regarding the financial needs of the poor, discovered that the number of financial instruments that is used by poor households is comparable to urban households. Because of the low income of the mainstream market, an inappropriate conclusion that few financial instruments are required by these customers is usually reached. The study identified the following (The Financial Diaries, 2005):

✓ Poor households actively manage the little money that they have;

✓ Poor households on average use 17 different financial instruments;

✓ The households utilise 30% formal and 70% informal financial instruments; and

✓ The majority of households that have bank savings accounts utilise these for transactions illustrating the demand for transactional products.

In a study conducted by the FinMark Trust (2008a) it was discovered that although basic literacy levels are relatively high at 88% in South Africa, knowledge of financial terms amongst the poor is relatively low. As a result, these customers are unaware of the implications of using debt products and the consequences that can arise when they fail to honour their agreements with financial institutions. The need to have more education provided to this segment is consistent with the recommendation by Martinez and Carbonell (2007, pp 52) in terms of what is required to service this customer segment. This situation therefore raises challenges for the financial services sector in South Africa.

2.4 Financial Services in South Africa

2.4.1 Background

The financial sector has identified the need to provide formal financial products as an enabler of BEE. In order to demonstrate the sector's commitment to transformation, the Financial Sector Charter was introduced in 2004 (Financial Sector Charter, 2004). The aim of the charter is to ensure that the benefits that are realised as a result of access to financial services, are made available to the larger population of South Africa (FinMark Trust, 2008b). The charter has set one of the targets as providing 80% of people in LSM segment 1-5 access to first-order retail banking. One of the outcomes of the charter has been the introduction of a basic and affordable banking product, the Mzansi account (Bankable Frontier Associates LLC, 2009). The aim of the Mzansi account is to draw previously unbanked people to the banking sector. In order to demonstrate commitment to the charter, the "Big 4" retail banks agreed on targets based on their retail market share (see Table 1). Targets for the larger retail banks where however negotiated lower than actual market share. By December 2008, in excess of 6 million accounts have been opened (Bankable Frontier Associates LLC, 2009).

Table 1: Mzansi account target allocation for the Big Four banks based on retail market share (source: Bankable Frontier Associates LLC, 2009)

	Standard	ABSA	FNB	Ned-bank
Retail Market Share 2004	35%	35%	17%	13%
Mzansi target allocation	30%	30%	22%	18%

The latest FinScope report (2009) indicates that 36% of South Africans are currently not being serviced by the formal financial sector. 10% of the excluded customers are currently relying on the informal sector for financial services (FinScope, 2009). What is however of concern, is the increase in the number of unbanked as illustrated in Figure 2. This may however be linked to increased unemployment as a result of the recent financial crisis.

Figure 2: Access to Banking in South Africa (Source: FinScope, 2009)
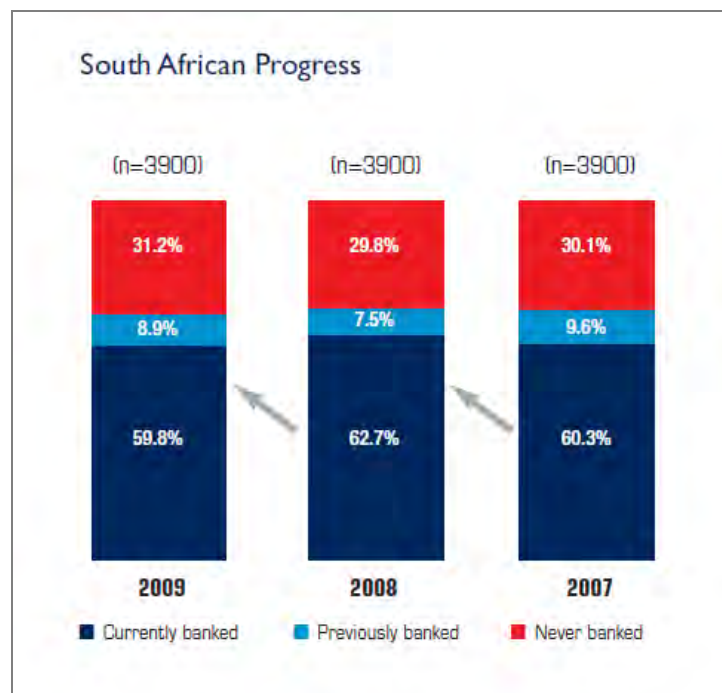
When a closer review of the type of products required by mainstream customers was conducted, the demand in South Africa was found to be high for transaction oriented products as illustrated in Figure 3.

Figure 3: Demand for Financial Products (Source: FinScope South Africa)
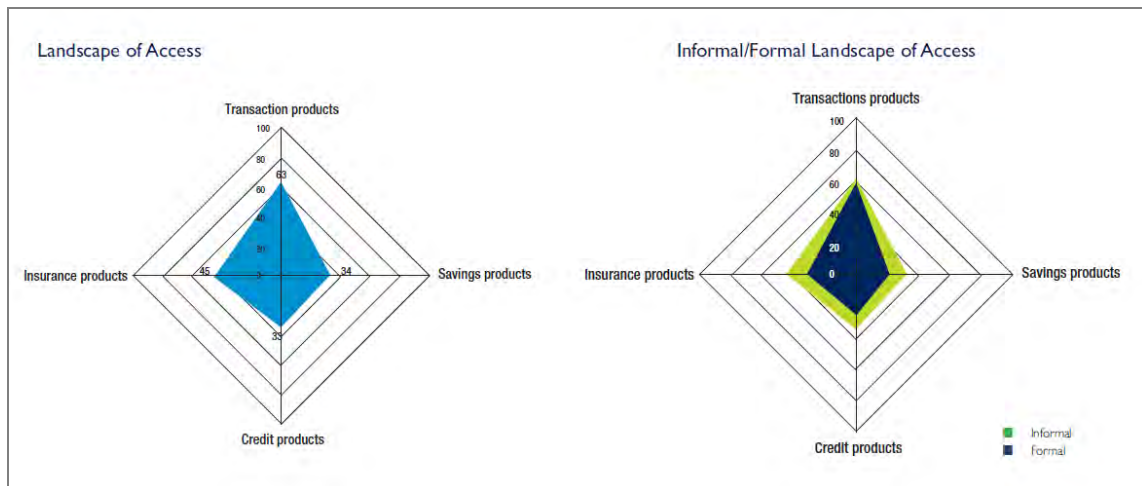
In order for customers to access all the features that their financial product provides and actively manage their financial affairs, they need to have access. The traditional banking channel, that is, branch is very expensive infrastructure (Walsh *et.al*, 2010) and the current low internet usage in South Africa of 8.6 per 100 people (The World Bank, 2008) makes the internet channel uneconomical for servicing the mainstream market. The ability of developing countries to take advantage of technologies for development is usually hindered by low penetration levels (Kannabiran & Narayan, 2005). The high cellphone adoption of 92.2 mobile cellular subscriptions per 100 people (as at 2008) in South Africa (The World Bank, 2008) has created an opportunity for Banks to service customers using the technology.

2.4.2 Need for Profitability

Service providers are currently faced with a major challenge of ensuring that their customers remain loyal (Chea and Luo, 2008). Company profitability is influenced by

long term customer relationships. This is as a result of loyal customers using more complementary products and services and also the lower costs that are associated with retaining them (Chea and Luo, 2008). A study conducted by Carter (2008) found that existing customers contributed a larger portion of a firm's annual revenues. The relationship between customer retention and customer satisfaction therefore has significant implications for businesses.

2.5 eCommerce as an Enabler

The access to information technology is one of the factors that has been identified as an enabler for growth in developing countries (Gerster Consulting, 2008). The International Telecommunication Union (ITU, 2006) supports the view that ICT can contribute to the alleviation of poverty. These arguments are based on the principle that market imperfections are a source of inefficiency and are therefore a hindrance to growth. One such imperfection that is overcome by ICT, is the lack of access to information (Klonner *et.al*., 2008). According to Klonner et.al. (2008), no solid evidence has been found regarding the economy wide impact of ICT.

According to Molla and Heeks (2007), there are numerous critics to the view that e-commerce will provide growth opportunities for developing countries. The debate is based on the fact that most of the arguments presented are purely conceptual and lack the support of an empirical base. Most of the arguments put forth base their views on the assumption that e-commerce will enable the developing countries to easily integrate into the global supply chains, which will lead to cost savings and will enable increased access to international markets (Molla & Heeks, 2007). According to Klonner *et.al*.(2008), the study by Hahn (2008) found that mobile phones promoted consumption as opposed to being utilised for productivity purposes. According to

Molla and Heeks (2007), critics are mainly basing their arguments on the fact that most of the presented papers are not taking local realities into account which include amongst others, culture, resources and infrastructure. The study conducted by Molla and Heeks (2007) regarding the benefits of e-commerce for businesses within South Africa, concluded that the benefits of e-commerce are not being realised.

Anckar and D'Incau (2002) have questioned whether e-business would not benefit as a result of the increased customer base due to older people, emerging market participation as well as the overcoming of the cost barrier associated with PCs, which are potential outcomes of m-commerce.

Keeling *et al.* (2007), express concern that technological exclusion will lead to a widening of the political, educational, social and cultural inequalities, as a result of limitations of access to information and services. E-commerce is seen as playing a pivotal role in the provision of goods and services to disadvantaged communities (Keeling *et al.*, 2007). They further state that because of geography, costs, transportation and regional economic decline, the disadvantaged communities are physically excluded. E-commerce is therefore seen as the mechanism through which the imbalances can be redressed, thereby enabling access to products and services, reduced prices by providing access to information and the lowering of transport related costs.

2.6   m-Commerce Value Proposition

Because of the inability of eCommerce to reach the growth forecasts that were predicted in the mid-1990s, there was a change in focus by academia and industry players to assess the growth potential that existed with mobile commerce (m-

commerce) (Anckar & D'Incau, 2002). The debate presented itself as a mobilephile vs. mobilephobe issue. A key argument that surfaced was the fact that m-commerce success could not be a foregone conclusion based on the penetration levels of mobile phones (Anckar & D'Incau, 2002). Mobile phone penetration was argued to be a prerequisite for m-commerce success, but not a determinant. The two major reasons that have been cited for the lack of performance of e-commerce are the significant PC investment that is required and the necessary proficiency in PC-based e-commerce (Anckar & D'Incau, 2002).

 "The challenge, therefore, is to develop ICT solutions that promote e-inclusion and open up avenues for those at risk of e-exclusion to participate in and reap the benefits of e-commerce" (Keeling *et al.*, p546).

In order to assess the value that m-commerce delivers, the analytical framework developed by Anckar & D'Incau (2002) is presented. This model was formulated in order to provide guidance to the value that mobility could deliver. The model can be utilised to assess the suitability of a service/application to m-commerce. The framework distinguishes between wireless value and mobile value. Wireless value is the value that is created by the usage of any wireless devise, irrespective of the application. Mobile value on the other hand is created through specific types of services/applications.

Figure 4: The Value Analysis Framework (Source: Anckar & D'Incau, 2002)
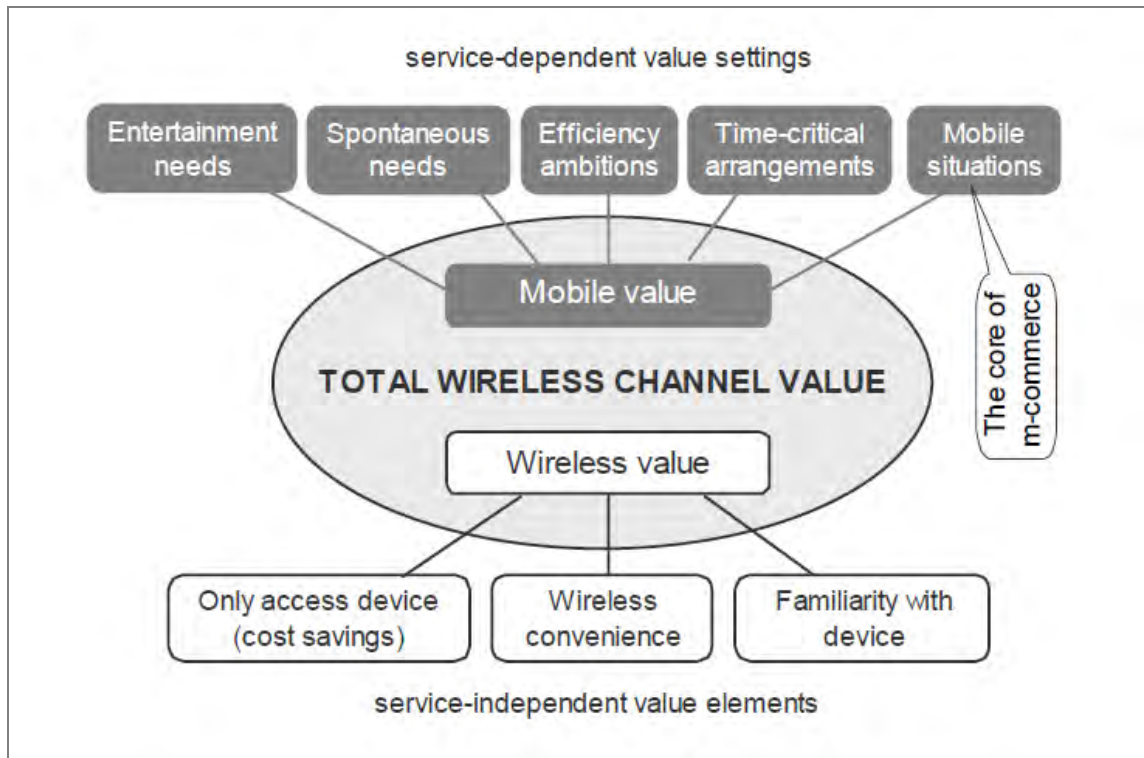
Logic will dictate that the higher the mobile value of a service, the higher the level of adoption that must be observed. The mobile value components are classified as follows (Anckar & D'Incau, 2002):

Time critical arrangements: Are driven by external events which necessitate immediate action.

Spontaneous decisions and needs: Are internally initiated and are characterised by being straightforward decisions.

Entertainment Needs: Linked to fun and utilising free time. .

Efficiency ambitions: Is associated with being able to utilise time more efficiently especially for time-pressured individuals.

Mobile Situation: Benefits that arise as a result of being mobile, that is, being away from home or while commuting.

2.7   Technology Adoption Theory

According to Bhattacherjee (2001), the continued usage of any information system (IS) determines its successes as opposed to the initial or once of usage. Bhattacherjee (2001) further postulates that the long term survival of many businesses of consumer electronic firms is dependent on the IS continuance. Internet service providers (ISPs), online retailers, online banks, online brokerages and online travel agencies are some of the electronic firms that are identified to be dependent on initial adopters and also the continued users (subscription renewals).   The firms' revenues are therefore affected by the continued use by consumers.

One of the key reasons that has been cited for the failure of e-commerce ventures and investments, is as a result of the technology focus within these businesses which subsequently leads to customer orientation and other factors which have an impact on the customer's purchase behaviour (Anckar & D'Incau, 2002) being ignored.

The prediction of adoption of ICTs by consumers is an area that has been researched extensively to date (Bhattacherjee, 2001; Siyal *et.al*, 2006; Amoako-Gyampah, 2007; Chea, Gu *et.al*, 2009 and Lou, 2008). The two dominant models that have been used are: the technology acceptance model (TAM); and the expectation confirmation theory (ECT). Variations of the two models have also been formulated (Luarn & Lin, 2005) and in some instances the two models have been merged with the authors concluding that the combined model has superior predicting capabilities (Liao et.al., 2009). An overview of the two models is presented next.

2.7.1 Technology Acceptance Model (TAM)

The TAM is based on the theory of reasoned action. It argues that an information systems usage is influenced by an individual's behavioural intention to use the system. The behavioural intention is however determined by the individual's attitude (Gu *et al*, 2009).

Figure 5: Technology Acceptance Model (Source: Liao *et al*., 2009)
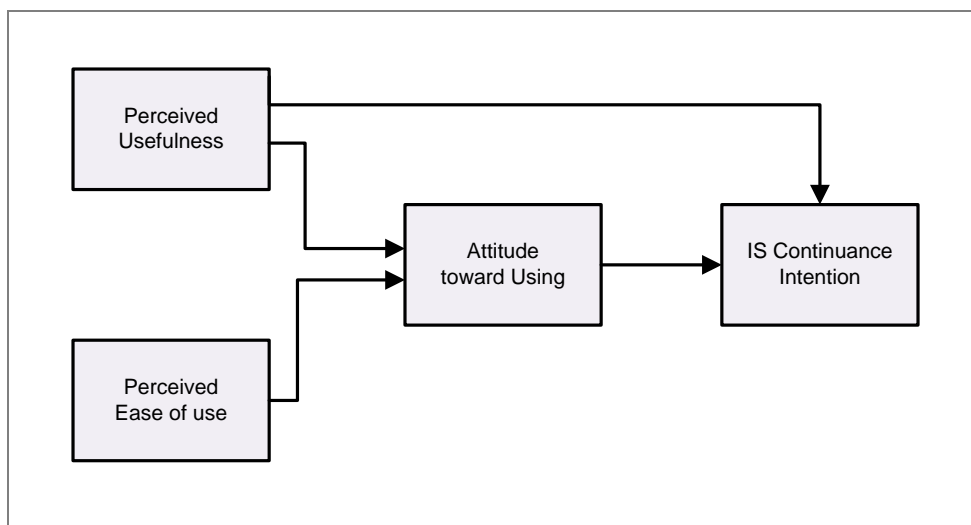
The two internal variables are influenced by two external variables that are a function of the design characteristics of the system: perceived usefulness and perceived ease of use. Although the model is geared more towards assessing initial acceptance of an IS, it has been used to examine post adoption behaviour (Liao *et al*., 2009). The popularity of the model is as a result of its robustness in different contexts.

2.7.2 Expectancy Confirmation Theory (ECT)

Expectation-confirmation theory (ECT) is a well researched and applied theory that explains post purchase behaviour (that is, the repurchase or complaining) of consumers. The model's ability to predict consumer behaviour has been illustrated

over a broad range of product repurchase and service continuance contexts (Bhattacherjee, 2001).

Figure 6: Expectation Confirmation Model (Source: Liao *et al.*, 2009)
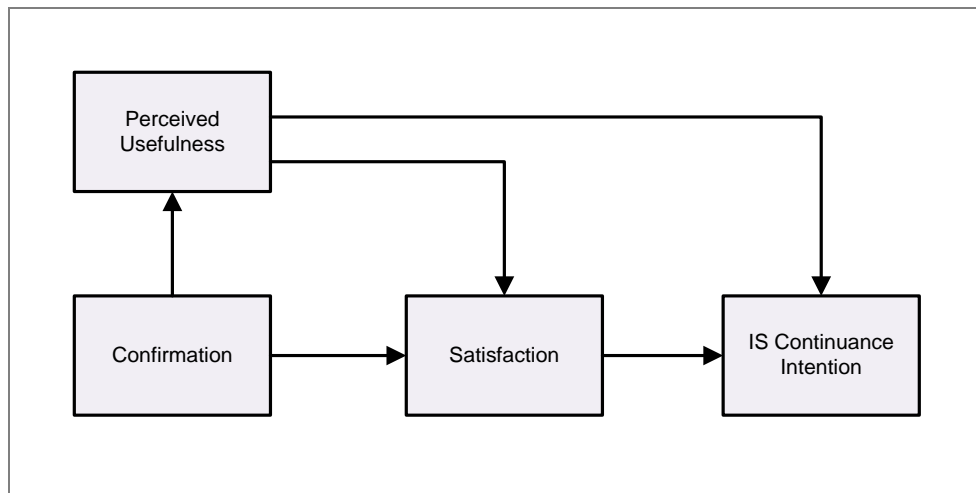
The application of the theory is as follows: An initial expectation prior to purchase is formulated. Product or service is then subsequently utilised. After a period of usage, a perception about the product's/service's performance is formulated. This perceived performance is then compared to original expectation to determine confirmation. Satisfaction is formed based on the expectation and confirmation level. A consumer then decides on continued usage or discontinuation (Bhattacherjee, 2001).

Because self-report studies have no perceived risk or financial implications, responses tend to be overestimated (Zhang, 2009). Therefore neither model will be utilised to assess adoption. The investigation has provided an opportunity to assess actual data, which will therefore provide a more accurate outcome as the results are based on reality. Therefore, an individual characteristics view will be adopted to assess if these can be used for determining adoption. This approach immediately enables the researchers to identify which individual determinants impact adoption.

2.7.3 Hubs and their Impact on Adoption

Another view that can be used to assess the diffusion of technology, which is different from the above stated theories, is the theory of hubs and the role that they play. TAMS and ECT are centred around the individuals and their personal experiences in determining the likelihood of adoption. Hubs on the other hand focus on specific influential individuals in a network or community and the role that they have in adoption within that network. According to Goldenberg *et al.* (2009), hubs are individuals who have "an exceptionally large number of social ties". Their study identifies two types of hubs which have fundamentally different impacts on the diffusion of technology. Innovative hubs have been noted to impact the speed of adoption while follower hubs will determine the market size.

2.7.4 Individual Characteristics

According to Rao and Troshani (2007), researchers have explained mobile services adoption behaviour patterns using demographic variables. In their study of mobile banking adoption in Ghana, Crabbe et.al (2009) found that demographic factors (age, gender and education) have a significant impact on individuals' attitudes towards their intentions to use a technology. These have therefore been included in the individual characteristics that will be utilised to assess the impact on adoption.

According to Sheth et al (1999), gender is a group trait which results in the formation of two groups, females and males. The trait has an impact on preferences and values and remains constant throughout a person's life.

Race is an individual's genetic heritage. This is a trait that people share with their relatives (Sheth *et al.*, 1999). According to Dupagne and Salwen (2005), earlier studies

that examined the impact of race or ethnicity on the adoption of communication technology, produced mixed results. This led to them insinuating that adoption may be technology dependent.   Explaining the relationship between ethnicity and the adoption of communication technology, has proven to be a challenge for researchers (Dupagne & Salwen, 2005).

A person's behaviour is significantly influenced by their age. Age is determined by assessing the time that has lapsed since a person was born. It leads to the formation of different groups, for example youth, teenagers, adults and seniors (Sheth *et al.*, 1999).

Crabbe et.al (2009) cite Lu et.al (2003) as stating that prior experience is a factor that influences technology acceptance by individuals. For this study, prior experience will be linked to having a prior relationship with the bank.

2.8   Cellphone Banking

"Due to the increasing penetration of mobile phones, even in poor communities, mobile-phone-enabled banking (m-banking) services are being increasingly targeted at the "unbanked" to bring formal financial services to the poor" (Medhi *et al.*, 2009, pp 485).

Banks in Europe, Asia and the United States have started providing mobile access to financial information (Gu *et al.*, 2009). "Mobile banking (m-banking) involves the use of a mobile phone or another mobile device to undertake financial transactions linked to a client's account" (Anderson, 2010). Mobile banking (also known as cellphone banking in South Africa) has the potential to enable transactional banking for the mass market in developing economies (Anderson, 2010). Although cellphone banking will

provide socio-economic benefits for the mass market, the sustainability of the service offering will be driven mainly by the institutions ability to achieve critical mass in terms of adoption and usage. According to Wang et al. (2006), mass adoption is a necessary condition for sustainability because the applications design characteristics and business models become irrelevant if mass adoption is not achieved.

The post adoption behaviour of users is therefore a critical issue for financial institutions to enable them to provide services that will be adopted and utilised on an ongoing basis. Cellphone banking presents a significant potential for the banking industry (Gu *et al*., 2009). According to Gu et al. (2009) Banks have the platform to retain existing customers by providing mobile banking and thereby converting cellphone users into banking customers. Gu *el al*. (2009) further states that the retention of mobile banking users and the attraction of new users is however not a mundane matter and therefore necessitates that factors that contribute of customer intention to use mobile banking, need to be understood.

In spite of the availability of mobile services, mobile commerce research suggests that the adoption of the services by consumers may not occur (Wang *et al*., 2006). In a study conducted in Taiwan, the adoption of m-services has not been forthcoming in spite of the improvements in development and efficiencies (Wang *et al*., 2006).

3   Research Hypotheses

3.1   Introduction

The existing literature on innovation adoption currently postulates that the adoption of e-commerce can be linked to socio-economic characteristics (Siyal *et.al.*, 2006). The investigation into adoption and usage of cellphone banking was conducted in two parts. The first section tested the validity of using individual characteristics as determinants for adoption in an emerging market context to predict adoption of cellphone banking by Mzansi account holding consumers. Section two focussed on analysing the financial behaviour of Mzansi account holding consumers who have adopted cellphone banking. The pre-cellphone banking adoption transaction behaviour was compared to the post-cellphone banking adoption transaction behaviour.

3.2   Section 1 : Hypothesis Formulation

Hypothesis 1: The null hypothesis states that gender does not have an impact on the level of cellphone banking adoption (CBA). The alternative hypothesis states that gender does influence the level of adoption of cellphone banking.

$H1_O$: $CBA_{Male} = CBA_{Female}$

$H1_A$: $CBA_{Male} \neq CBA_{Female}$

Hypothesis 2: The null hypothesis states that age does not have an impact on the level of cellphone banking adoption (CBA). The alternative hypothesis states that age does influence the level of adoption of cellphone banking.

$H2_O$: $CBA_{Age1} = CBA_{Age2} = CBA_{Age3}$

$H2_A$: $CBA_{Age1} \neq CBA_{Age2}$ or $CBA_{Age1} \neq CBA_{Age3}$ or $CBA_{Age3} \neq CBA_{Age2}$.

Hypothesis 3: The null hypothesis states that race does not have an impact on the level of cellphone banking adoption (CBA). The alternative hypothesis states that race does influence the level of adoption of cellphone banking.

$H3_O$: $CBA_{Blacks} = CBA_{Other}$

$H3_A$: $CBA_{Blacks} \neq CBA_{Other}$.

Hypothesis 4: The null hypothesis states that income does not have an impact on the level of cellphone banking adoption (CBA). The alternative hypothesis states that income does influence the level of adoption of cellphone banking.

$H4_O$: $CBA_{Income1} = CBA_{Income2} = CBA_{Income3}$

$H4_A$: $CBA_{Income1} \neq CBA_{Income2}$ or $CBA_{Income1} \neq CBA_{Income3}$ or $CBA_{Income3} \neq CBA_{Income2}$.

Hypothesis 5: The null hypothesis states that the channel of registration does not have an impact on the level of cellphone banking adoption (CBA). The alternative hypothesis states that the channel of registration does influence the level of adoption of cellphone banking.

$H5_O$: $CBA_{ATM} = CBA_{Internet} = CBA_{Handset}$

$H5_A$: $CBA_{ATM} \neq CBA_{Internet}$ or $CBA_{ATM} \neq CBA_{Handset}$ or $CBA_{Internet} \neq CBA_{Handset}$.

Hypothesis 6: The null hypothesis states that the number of products with the bank does not have an impact on the level of cellphone banking adoption (CBA). The alternative hypothesis states that the number of products with the bank does influence the level of adoption of cellphone banking.

$H6_O$: $CBA_{1product} = CBA_{>1product}$

$H6_A$: $CBA_{1product} \neq CBA_{>1product}$.

3.3 Section 2 : Research Question

The second component of the study focussed on the transactional behaviour of customers with Mzansi accounts that have adopted cellphone banking. The research objective was to determine if there are differences in transactional behaviour pre- and post the adoption of cellphone banking by consumers with Mzansi accounts. The following research questions will be assessed:

Question 1: Are there observable transaction behaviour changes of cellphone banking adopters post the adoption of cellphone banking?

4 Research Methodology

4.1 Introduction

Most of the studies that have been reviewed, assess mobile banking adoption from a behavioural dimension (ECT) or from a product attribute angle (TAM). This research has taken a step back to assess whether adoption can be predicted based on individuals characteristics. The main reason for conducting business research is to reduce the level of uncertainty in decision making (Zikmund, 2003, p54). This study investigated cellphone banking adoption and the impact that it has on transaction behaviour of low income consumers. The research was conducted in two phases.

Phase one intended to determine if individual characteristics impact on the probability of cellphone banking adoption by consumers.   Inferential statistics were used to complete this study. Phase two then focussed on analysing the financial transactional behaviour of low income consumers pre- and post cellphone banking adoption to identify behaviour changes.   Descriptive non-inferential statistics were used. According to Zikmund (2003, p56) exploratory and descriptive research will typically precede causal studies. Because the study only looks at a limited number of variables that impact customer adoption, a causal study will not be conducted.

4.2 Research Design

The research was conducted using secondary data that was made available by one of the local banks in South Africa. The institution that was utilised in the assessment is one of the "Big Four" banks in South Africa. Although the study was conducted within

the South African context, the learnings from this study are applicable to other developing markets. The information obtained is representative of consumers who are formally banked.

The financial services sector in South Africa is highly regulated and legislation requires that financial institutions ensure that their information is very accurate. The information used is therefore expected to have very low data error rates.

4.3   Unit of Analysis

The unit of analysis was a customer who registered for Cellphone Banking. In order for a customer to qualify for cellphone banking (in the institution of study), the customer must possess a transactional account. Therefore, all the individuals in the study have an active transactional account as at the date that will be utilised to assess adoption.

4.4   Population

The population are consumers who have a transactional account with the Bank and have registered for cellphone banking. The individuals will be a combination of consumers who have adopted cellphone banking and those who have not.

4.5   Data Size

In access of 280,000 records of data where extracted. Approximately 150,000 records were for the whole period of January 2010.

4.6 Data Extraction

Data mining was used to extract the data that was required for the analysis. Data mining is a known data collection technique that is used to process large volumes of existing data (Wegner, 2007). The data used for this project is secondary data with a low margin of error guaranteed due to stringent regulatory requirements for accurate financial data and records. According to Zikmund (2003), secondary data is data that was collected for another purpose and not for the current study. The data has been provided by one of the leading financial institutions in South Africa. No additional data will be collected from consumers. This technique has been adopted because the information is readily available and it enables analysis to be done on actual data. Because of the nature of work conducted by financial institutions and regulatory requirements, a significant effort is applied by these institutions to ensure that their data is not error prone. The month of analysis is January 2010. The behaviour and trends between the different months was similar and therefore any month would suffice for the analysis. All the registrations for the month have been included in the analysis. To cater for any externalities that may influence the data, the data was extracted for a specific month over a two year period.

4.7 Data Cleansing and Enrichment

Data is the basis for statistical analysis and as such, significant effort needs to be applied to ensure that the data is relevant, clean and in the correct format for statistical analysis (Wegner, 2007). Although significant effort has been applied by the financial institute in question to have error free data, a few incomplete data points where discovered totalling 4,552 that is 2.8% of the data. The following data cleansing techniques have been applied:

- In instances where information was missing, these records were omitted from the analysis. In instances where information is missing, the percentage of impacted records needs to be stated in order to assess the potential impact on the overall results (Wegner, 2007).

- All outliers were replaced with the average of that field. If outliers are left unprocessed, they can potentially distort the finding of inferential tests. For inferential statistics, outliers must be identified, removed or replaced with the average value for the related variable (Wegner, 2007).

In order to achieve more meaningful results, it is sometimes necessary to transform data (Wegner, 2007). In order to achieve meaningful results for this research, age categories were combined. The similar treatment was applied to income.

4.8 Data Analysis

4.8.1 Hypothesis Testing

The first component of the study was to assess cellphone banking adoption based on specific individual characteristics for the entire bank's cellphone banking consumer base and subsequently for Mzansi consumers. The entire banks data has been analysed in order to form a basis against which the Mzansi results will be compared. In order to conduct descriptive and inferential statistics, the ordinal variables are coded and frequency tables including histograms are compiled. The primary statistical technique that has been used is the ANOVA (analysis of variance). The ANOVA is an inferential statistical technique that is applied to test hypothesis about multiple population means. The technique is an extension of the t-test or z-test. The test is used to conclude that an influencing factor as opposed to chance is responsible for

significant differences between sample means (Wegner, 2007). The ANOVA establishes whether there is a relationship with the defined variable and the adoption of cellphone banking. The test determined if there is a relationship between a variable and the adoption of cellphone banking. The cellphone banking registration figures of Jan 2009 and Jan 2010 are stated for comparison. Descriptive statistics were however used for this exercise. The aim was to determine if there has been any notable change in the consumer registrations between the two years. The ANOVA is however only conducted on the Jan 2010 data. The two year comparison will assist in identifying any data anomalies that may exist in the 2010 data. The breakdown of the analysis is illustrated in the figure below:

Figure 7: Entire Consumer Base Analysis Breakdown
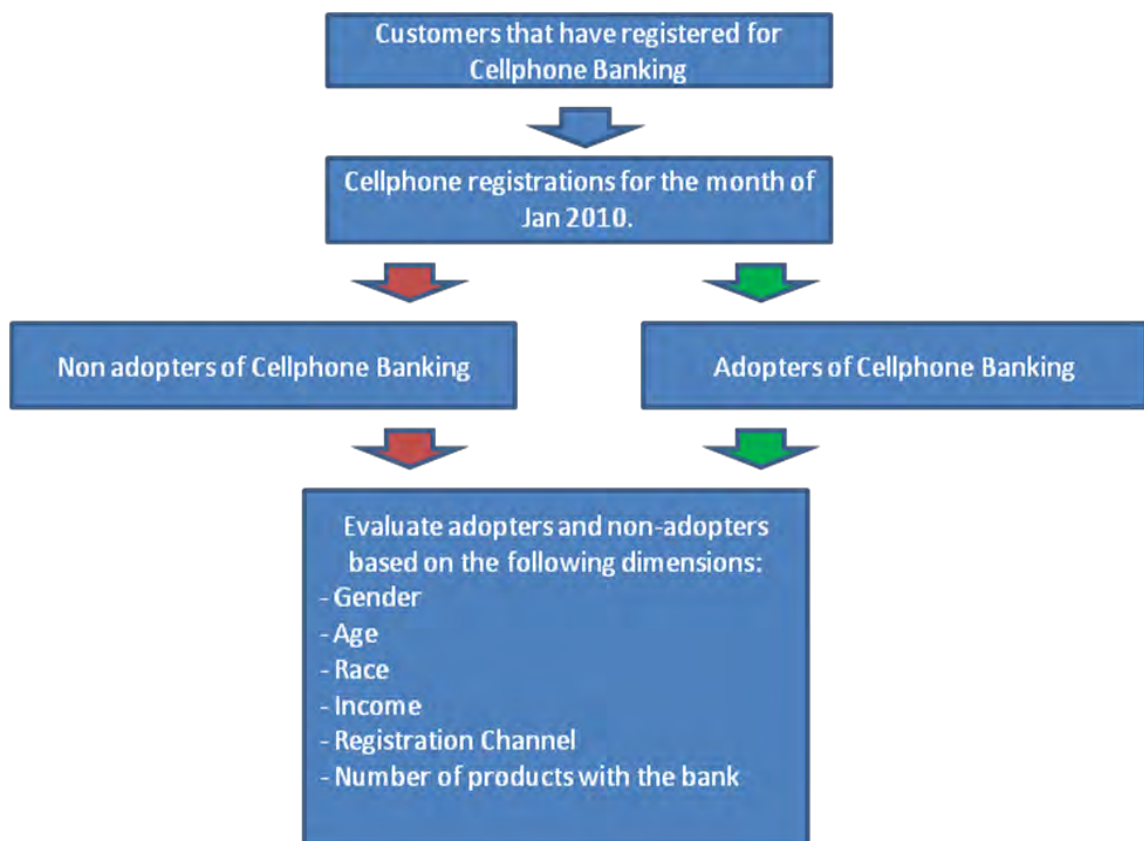
The second set of analysis focussed on the Mzansi account customer base as illustrated below.

Figure 8: Mzansi Account Consumer Base Analysis
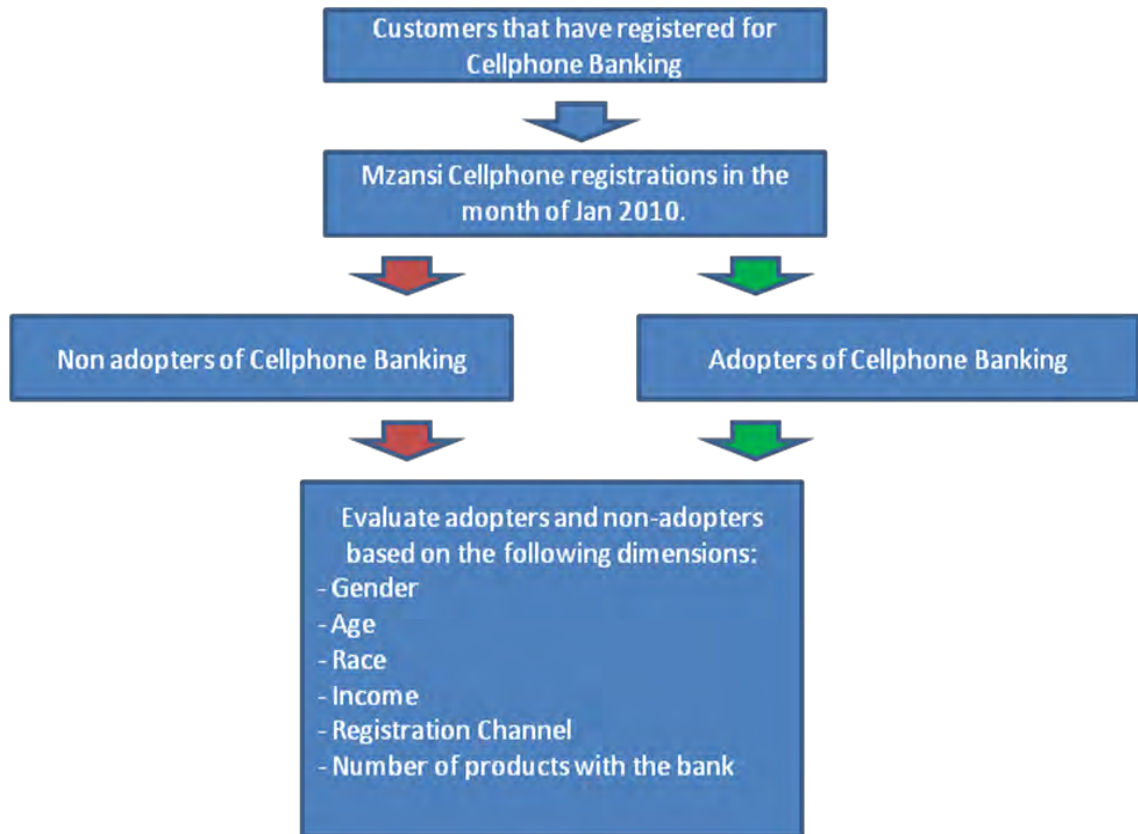
The findings from the Mzansi consumer base were subsequently compared to the findings of the comparative sample conducted first. The different tests that have been conducted are stated below.

H1: Gender: The comparison was of means of multiple independent data sets. The recommended statistical technique for performing the assessment is the analysis of variance (ANOVA) (Zikmund, 2003, p529). The outcome of an ANOVA when analysing only two data sets is equivalent to the outcome of the T-Test.

H2: Age: The comparison was of means of multiple independent data sets. The recommended statistical technique for performing the assessment is the analysis of variance (ANOVA) (Zikmund, 2003, p529)

H3: Race: The comparison was of means of multiple independent data sets. The recommended statistical technique for performing the assessment is the analysis of variance (ANOVA) (Zikmund, 2003, p529). The outcome of an ANOVA when analysing only two data sets is equivalent to the outcome of the T-Test.

H4: Income level: The comparison was of means of multiple independent data sets. The recommended statistical technique for performing the assessment is the analysis of variance (ANOVA) (Zikmund, 2003, p529)

H5: Registration Channel: The comparison will be of means of multiple independent data sets. The recommended statistical technique for performing the assessment is the analysis of variance (ANOVA) (Zikmund, 2003, p529)

H6: Number of products with the bank: The comparison will be of means of multiple independent data sets. The recommended statistical technique for performing the assessment is the analysis of variance (ANOVA) (Zikmund, 2003, p529)

4.8.2 Research Question Evaluation

The second component of the study was the analysis of the transactional behaviour of Mzansi account holding customers. The customer transactional behaviour was analysed using only descriptive statistics. No inferential statistics were applied as no hypothesis was formulated regarding the customer transactional behaviour for pre- and post adoption. The analysis was conducted as follows:

All Mzansi consumers who registered for cellphone banking in January 2010 were identified. The customers were classified into adopters and non adopters of cellphone banking. Certain financial transactions over a period of 6 months (July 2009 to

December 2009) leading up to the month of registration were extracted. These constituted the pre registration transactions. Subsequently, the post registration transactions for 6 months (January 2010 to June 2010) were extracted. A comparison of these two periods between the Mzansi adopters and Mzansi non adopters was then conducted.

4.9   Research Limitations

The findings of this study have applicability for developing markets that have similar environmental conditions to South Africa.

5   Research Findings

5.1   Introduction

The findings of this research are presented in this chapter. The research wants to establish the relationship between individual characteristics and the adoption of cellphone banking, primarily within the lower income populace. The Mzansi account is used as the identifier of the lower income populace. The research also establishes whether there is a difference in the financial behaviour of customers after they have adopted cellphone banking.

The findings are presented per hypothesis and are briefly discussed. The implications of the findings are then discussed in more detail in chapter 6. The ANOVA (analysis of variance) is an inferential statistical technique that is applied to test hypothesis about multiple population means. The technique is an extension of the t-test or z-test. The test is used to conclude that an influencing factor as opposed to chance is responsible for significant differences between sample means (Wegner, 2007). The ANOVA will establish whether there is a relationship with the defined variable and the adoption of cellphone banking. The test seeks to determine if there is a relationship between a variable and the adoption of Cellphone banking. The base figures of Jan 2009 and Jan 2010 are displayed where possible. The aim is to determine if there has been any notable change in the base as per the tested variable. The ANOVA is however only conducted on the Jan 2010 data.

5.2 Individual Characteristics and their impact on the adoption of cellphone banking for the entire consumer base

5.2.1 Impact of gender on the adoption of cellphone banking

Hypothesis 1: The null hypothesis states that gender does not have an impact on the level of cellphone banking adoption. The alternative hypothesis states that gender does influence the level of adoption of cellphone banking.

$H1_O$: $CBA_{Male} = CBA_{Female}$

$H1_A$: $CBA_{Male} \neq CBA_{Female}$

Figure 9: Cellphone banking registration numbers split according to gender over two years

Based on the graph above, the cellphone banking registration split between males and females for Jan 2009 and Jan 2010 is consistent with no observable differences in the gender composition.

Figure 10: Gender distribution of cellphone banking registrations (Jan 2010, n = 158,426)
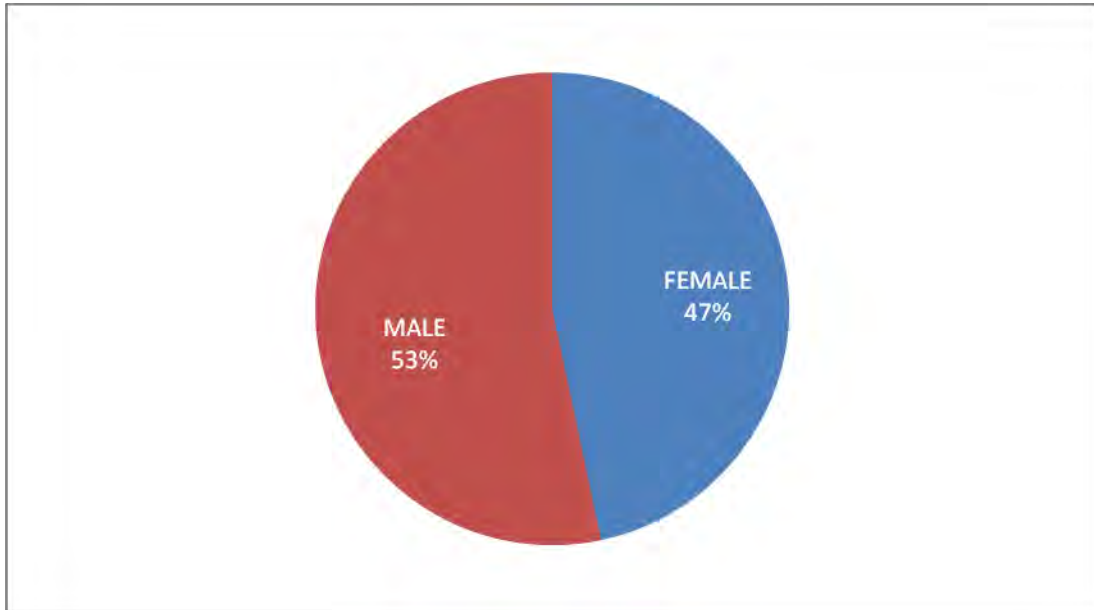
The representation of males and females for cellphone banking registrations in Jan 2010 is almost equal.   Males account for 53% of the total base and females the remaining 47%. The split in adoption by gender is illustrated below.

Figure 11: Cellphone banking adoption as a function of gender (Jan 2010)
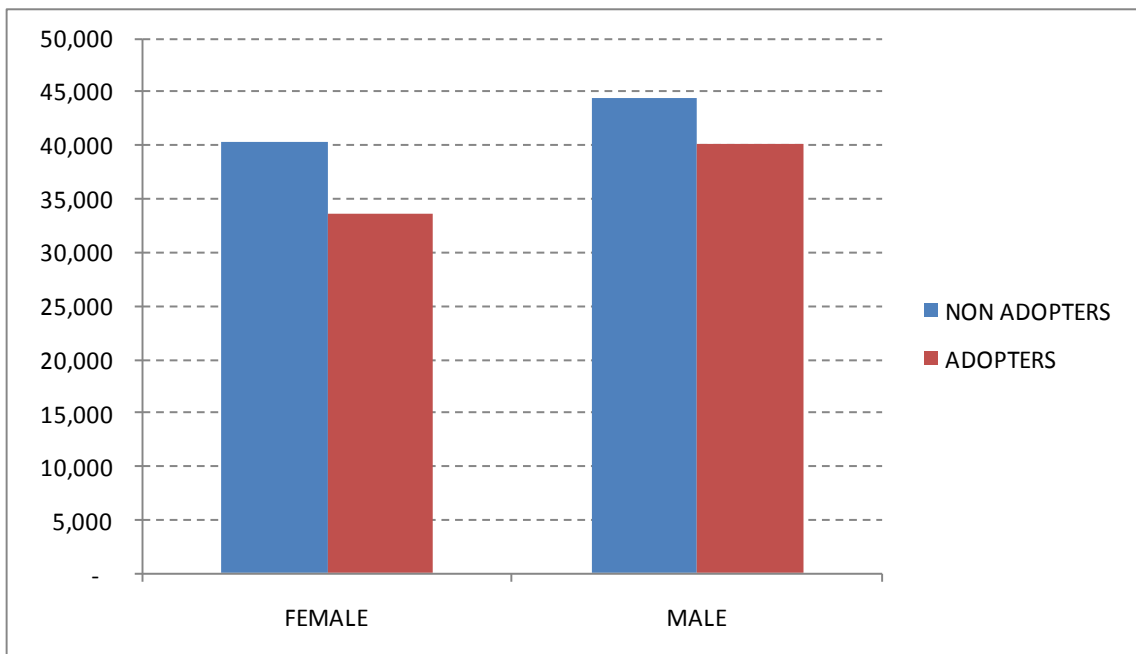
The F-statistic was used to test the hypothesis.

Table 2: ANOVA (Gender)

Source of Variation	F crit	P-value
Columns	161.448	0.14

The null hypothesis cannot be rejected in favour of the alternative hypothesis because the p-value is larger than the significance level of 5%.

5.2.2 Impact of age on the adoption of cellphone banking

Hypothesis 2: The null hypothesis states that age does not have an impact on the level of cellphone banking adoption. The alternative hypothesis states that age does influence the level of adoption of cellphone banking.

$H2_O$: CBA_{Age1} = CBA_{Age2} = CBA_{Age3}

$H2_A$: CBA_{Age1} ≠ CBA_{Age2} or CBA_{Age1}≠ CBA_{Age3} or CBA_{Age3}≠ CBA_{Age2}.

Figure 12: Cellphone banking registration composition by age over two years
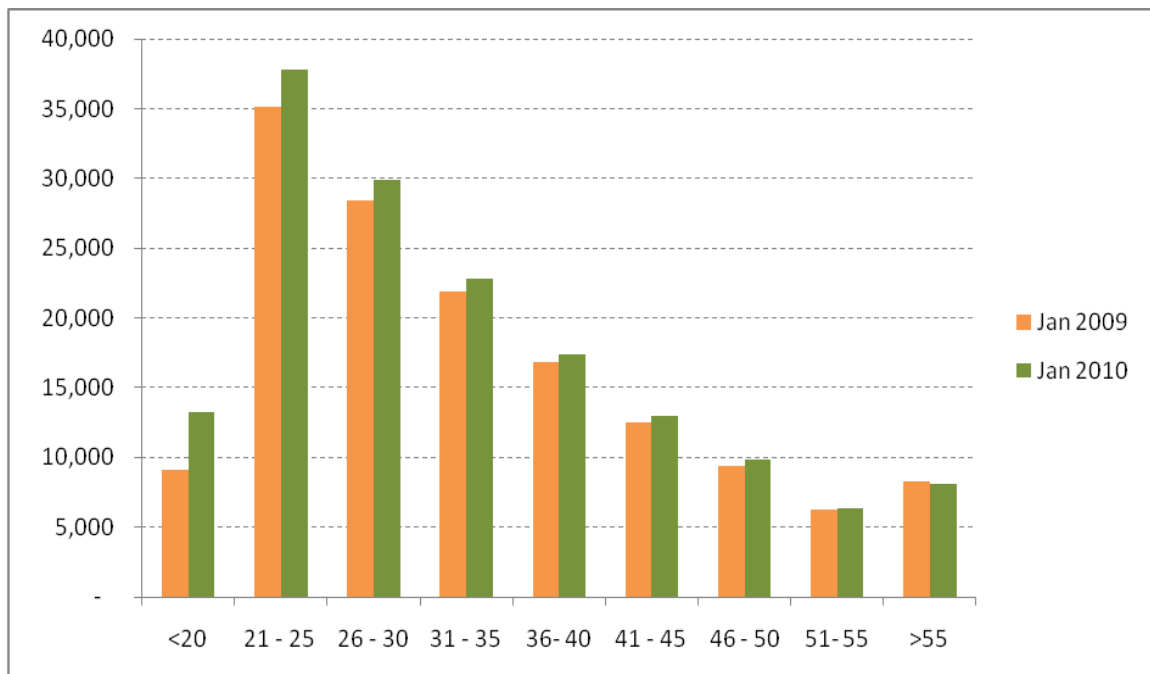
The distribution of the registrations in Jan 2009 is consistent with those in Jan 2010. The 21 - 25 year age group is the most populated with 37 000 registrations in January

2010. The next biggest group is the 26 - 30 year age group with 30 000 registrations in

2010.

Figure 13: Cellphone banking adoption breakdown as a function of age (Jan 2010)
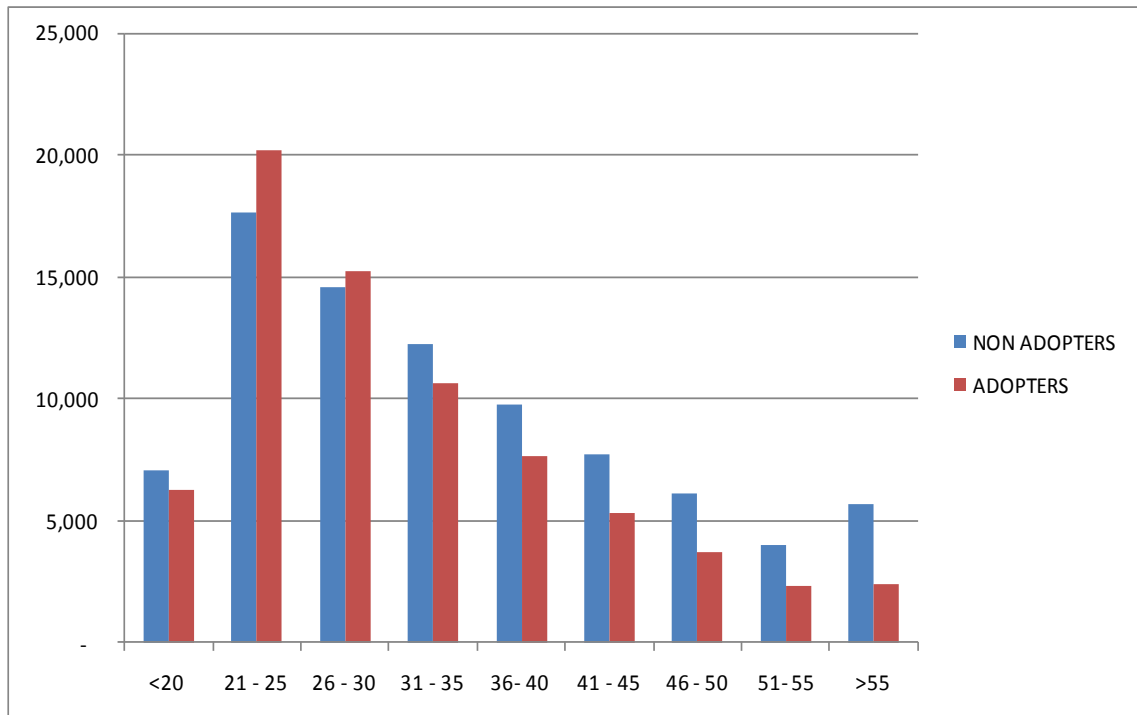
The number of individuals who adopted cellphone banking for age 21 - 30 years is

more than those that did not. For all the other age groups, more customers did not

adopt the service.

Figure 14: Cellphone banking adoption rate as a function of age (Jan 2010)
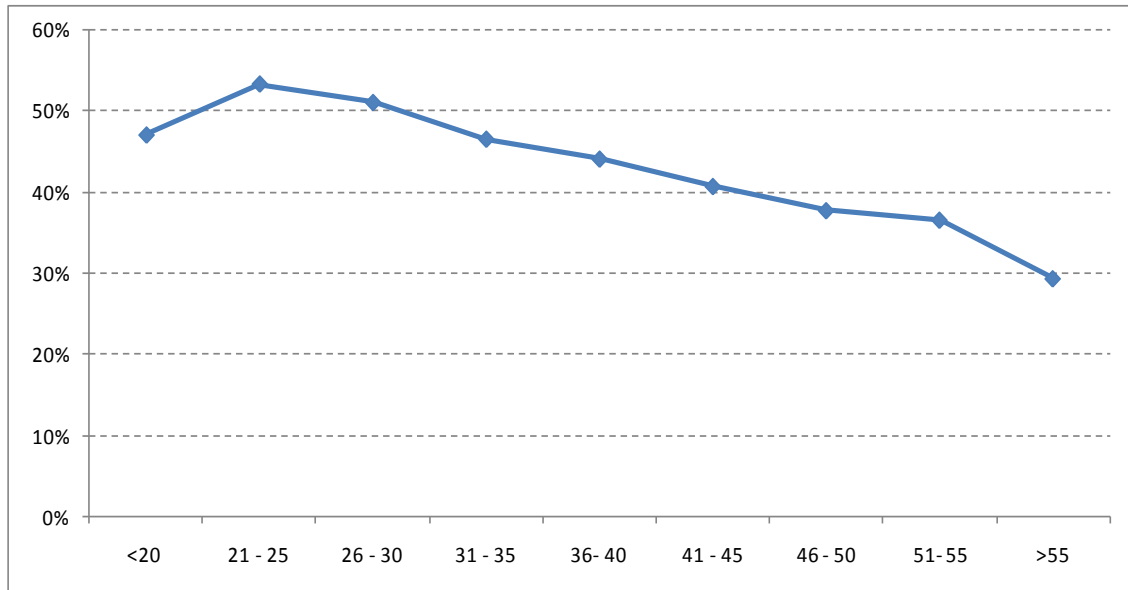
Based on the adoption rate (which is the ratio of customers who adopted versus total number of customers in that age group) the adoption rate decreases with increasing age with the anomaly of the younger than 20 year age group.

The F-statistic was used to test the hypothesis.

Table 3: ANOVA (Age)

Source of Variation	F crit	P-value
Columns	5.318	0.07

The null hypothesis cannot be rejected in favour of the alternative hypothesis because the p-value is larger than the significance level of 5%. For a confidence level of 10% however, the null hypothesis can be rejected.

5.2.3 Impact of race on the adoption of cellphone banking

Hypothesis 3: The null hypothesis states that race does not have an impact on the level of cellphone banking adoption. The alternative hypothesis states that race does influence the level of adoption of cellphone banking.

$H3_O$: $CBA_{Blacks} = CBA_{Other}$

$H3_A$: $CBA_{Blacks} \neq CBA_{Other}$.

To enable a statistical analysis to be conducted, all the other non Black races have been merged into one group called Other. These groups, that is, Indian, Coloured and White, are too small when analysed independently.

Figure 15: Customer cellphone banking registrations by race over two years
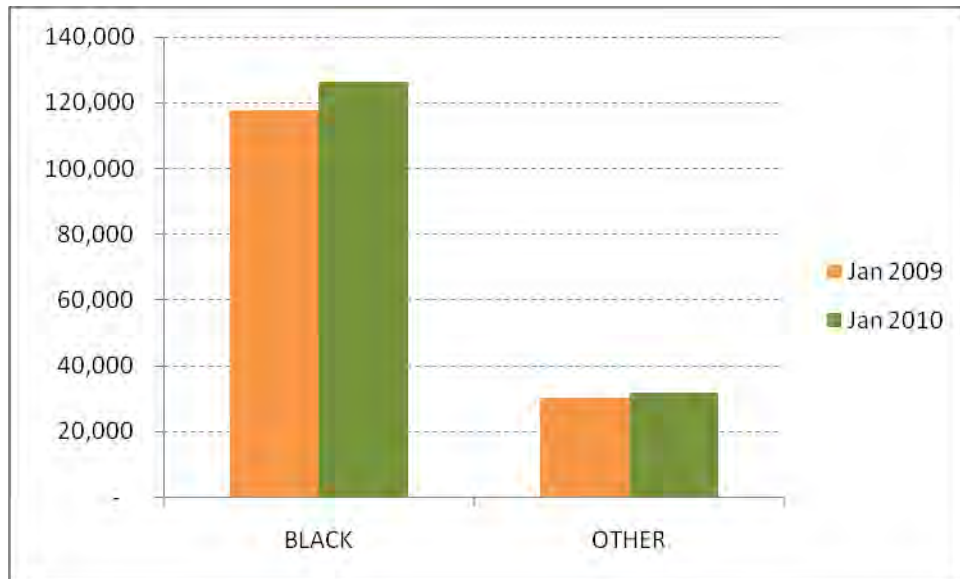
Blacks have a notable increase in numbers from Jan 2009 to Jan 2010. Black account holders are the majority in the sample as they occur in significantly greater number than the other races in the general population of South Africa.

Figure 16: Cellphone banking registration distribution based on race in Jan 2010
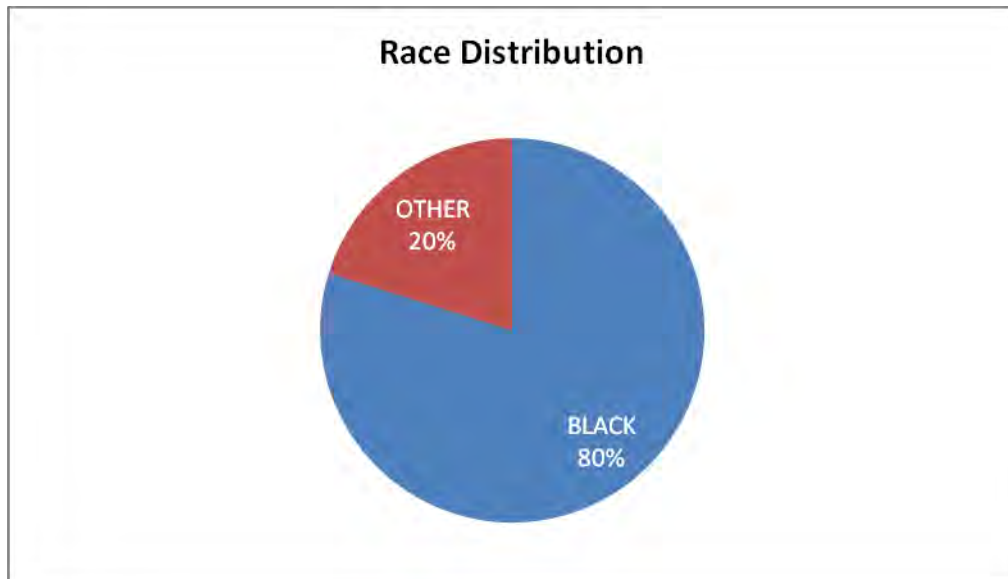
Blacks account for 80% of the registrations in Jan 2010.

Figure 17: Cellphone banking adoption breakdown as a function of race for Jan 2010
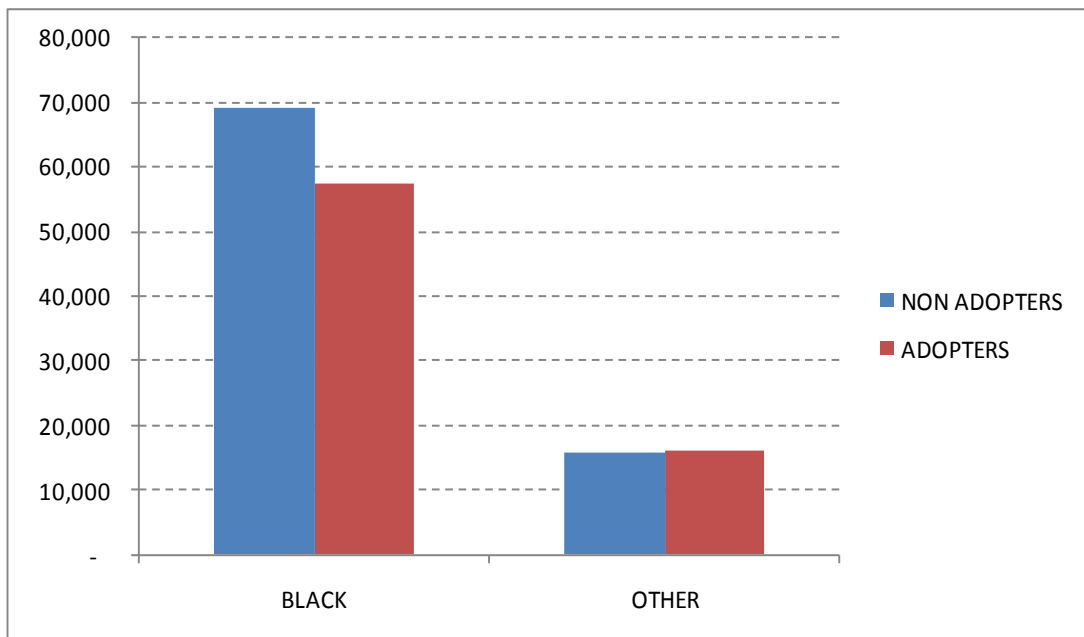
From the graph above, Blacks have a slightly lower adoption level of approximately 45% when compared to the other race groups which have acceptance of 50%.

The F-statistic was used to test the hypothesis for the entire consumer base:

Table 4: ANOVA (Race)

Source of Variation	F crit	P-value
Columns	161.448	0.530

The null hypothesis cannot be rejected in favour of the alternative hypothesis because the p-value is larger than the significance level of 5%.

5.2.4 Impact of income on the adoption of cellphone banking

Hypothesis 4: The null hypothesis states that income does not have an impact on the level of cellphone banking adoption. The alternative hypothesis states that income does influence the level of adoption of cellphone banking.

$H4_O$: $CBA_{Income1} = CBA_{Income2} = CBA_{Income3}$

$H4_A$: $CBA_{Income1} \neq CBA_{Income2}$ or $CBA_{Income1} \neq CBA_{Income3}$ or $CBA_{Income3} \neq CBA_{Income2}$.

Figure 18: Customer cellphone banking registrations by income over two years
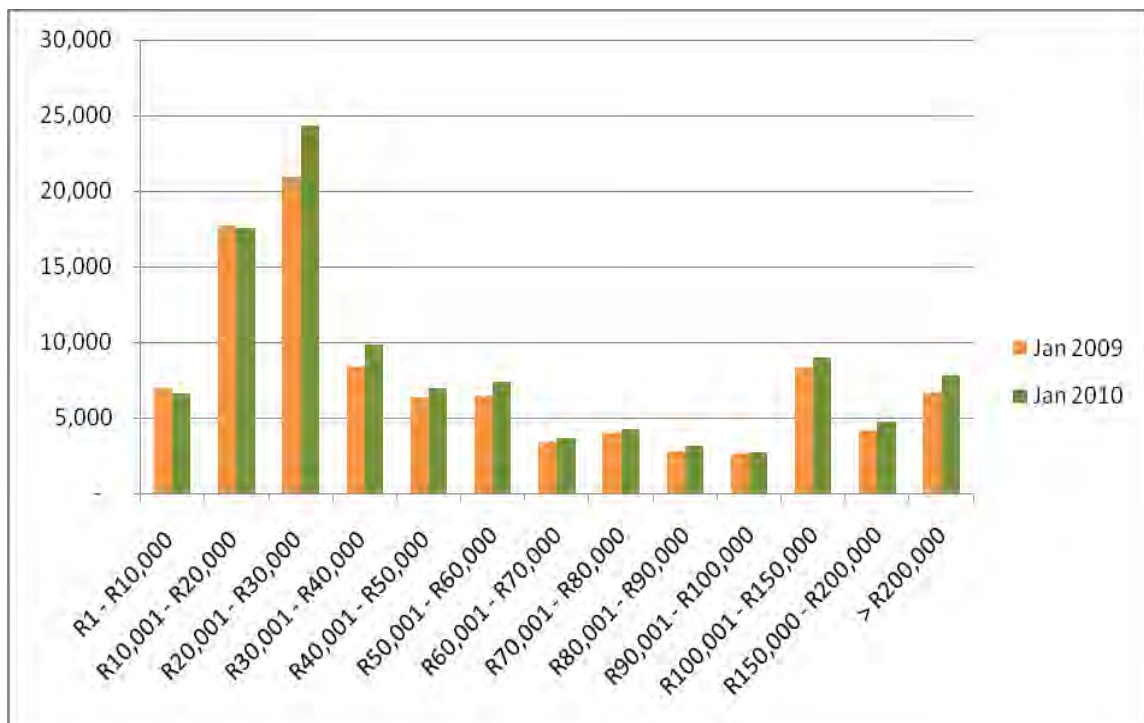
The customer registrations distribution as a function of annual income has remained consistent over the 2 years. The R20,000 - R30,000 income group has the most registrations with almost 25,000 registrations followed by the R10,000 - R20,000 income group.

Figure 19: Cellphone banking registration breakdown by income (Jan 2010)
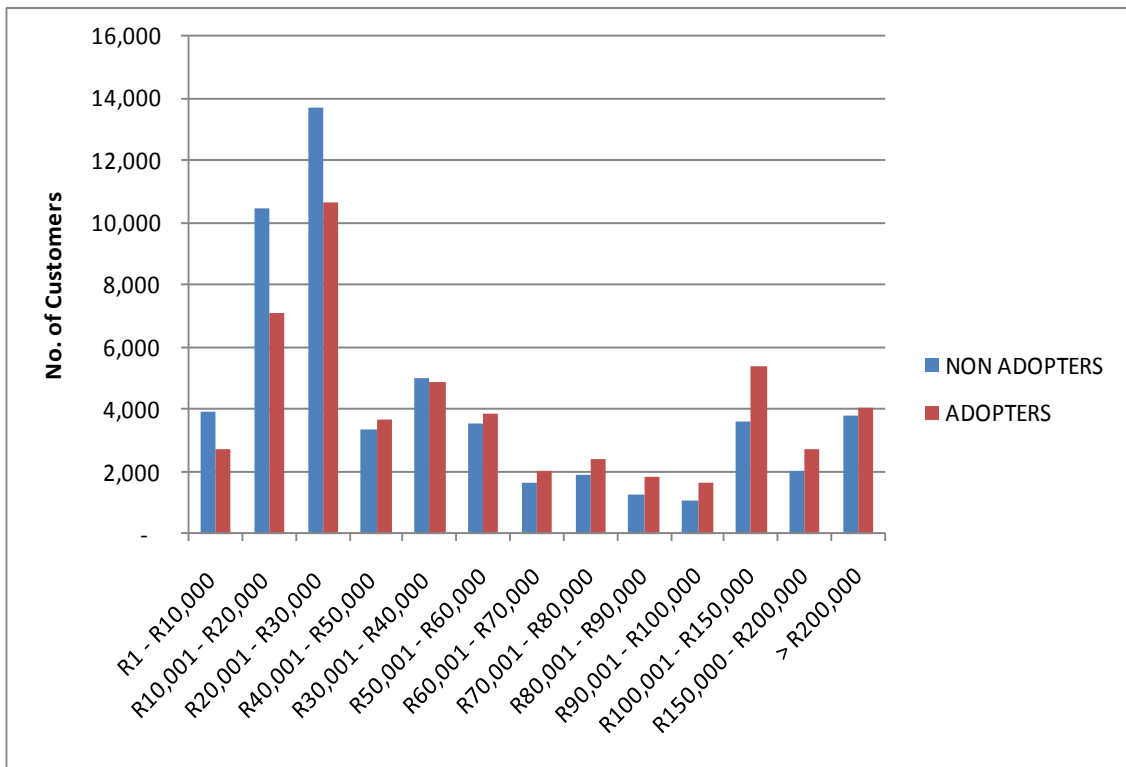
Figure 20: Cellphone banking adoption rate as a function of Income (Jan 2010)
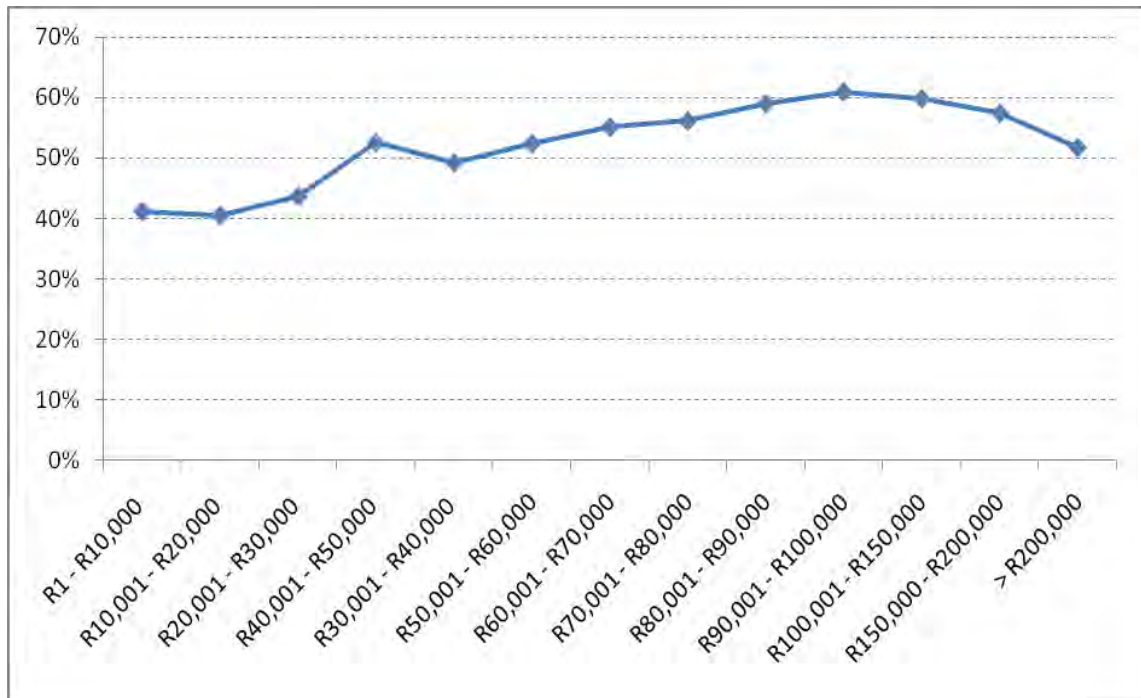
Based on the graph above, adoption rate (which is the of ratio customers who adopted versus total number of customers in that income group) has a direct relationship with income up until a certain point where it then becomes an inverse relationship.

The F-statistic was used to test the hypothesis.

Table 5: ANOVA (Income)

Source of Variation	F crit	P-value
Columns	4.747	0.686

The null hypothesis cannot be rejected in favour of the alternative hypothesis because the p-value is larger than the significance level of 5%.

### 5.2.5 Impact of the channel of registration on the adoption of cellphone banking

Hypothesis 5: The null hypothesis states that the channel of registration does not have an impact on the level of cellphone banking adoption. The alternative hypothesis

states that the channel of registration does influence the level of adoption of cellphone banking.

$H5_O$: $CBA_{ATM} = CBA_{Internet} = CBA_{Handset}$

$H5_A$: $CBA_{ATM} \neq CBA_{Internet}$ or $CBA_{ATM} \neq CBA_{Handset}$ or $CBA_{Internet} \neq CBA_{Handset}$.

Figure 21: Customer cellphone banking registrations per channel over two years
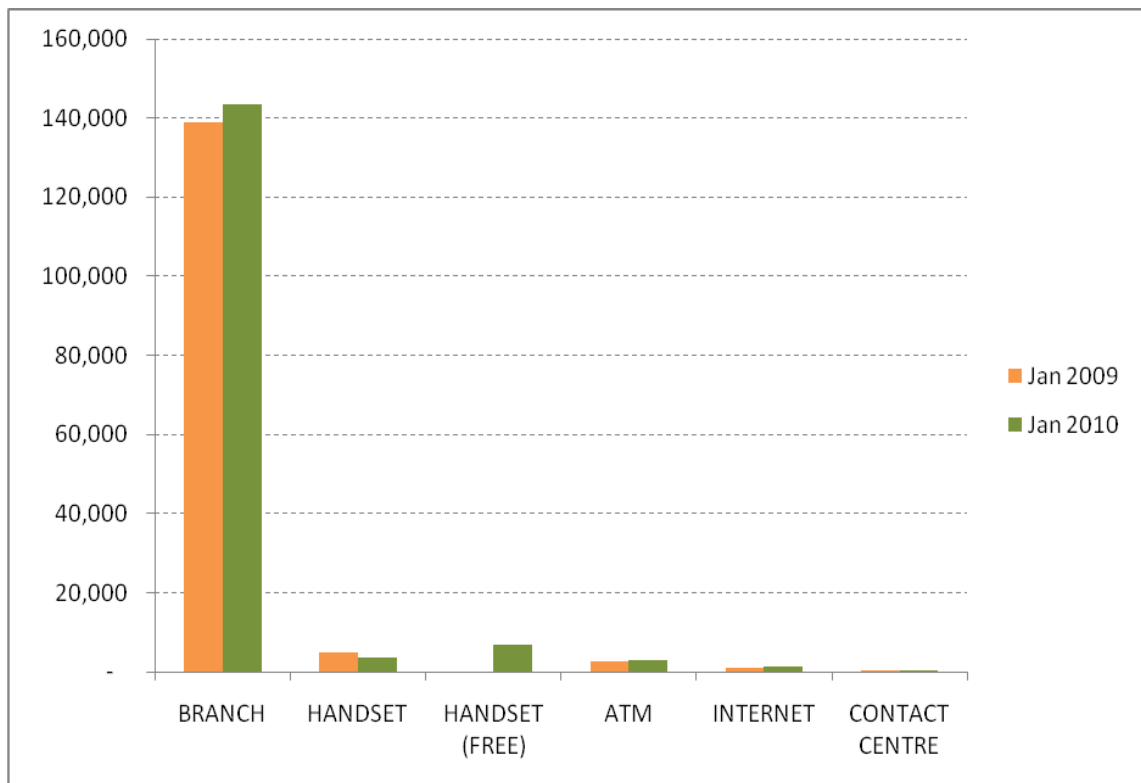
Customers can register for cellphone banking via different channels. Registering via branch currently accounts for the majority of registrations. Branch and Contact Centre registrations are driven mainly by the bank's consultants. The channel analysis is focussed on the electronic channels (e-channels), that is, where the customer has initiated the registration.

Figure 22: Customer cellphone banking registration by e-channel over two years
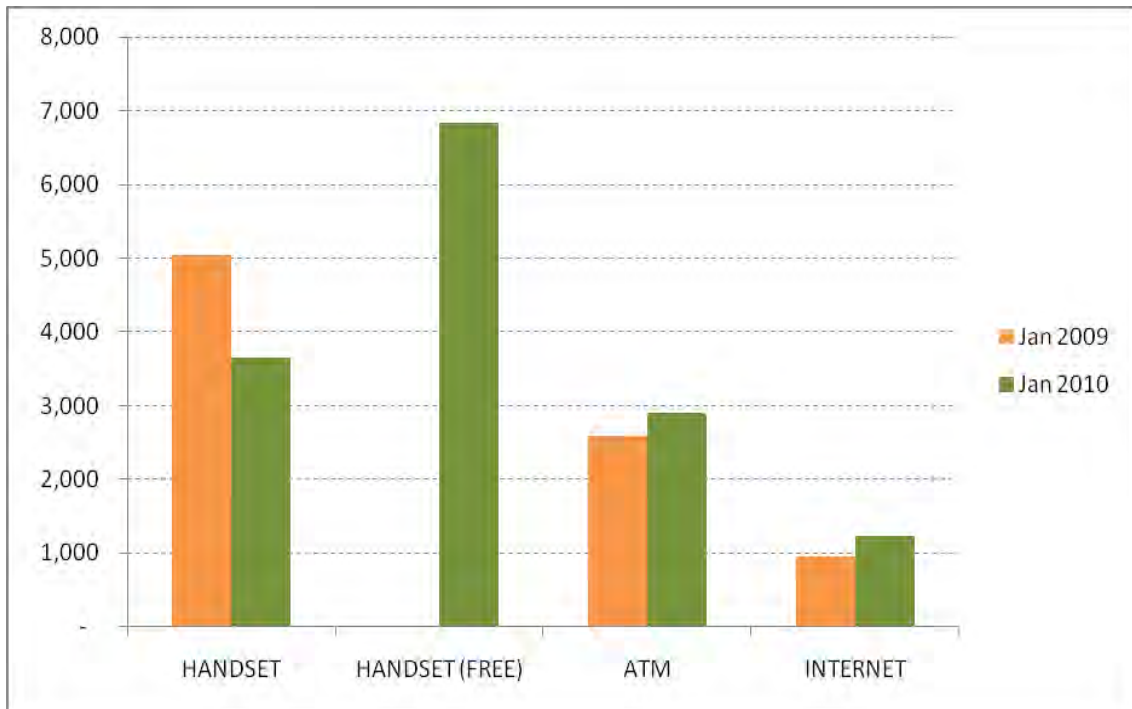
Menu driven banking which is available on the handset provides two options, a free channel and a pay per use channel. The charge is determined by the relevant network operator. The free channel option was however not available in Jan 2009 as indicated by the absence of registrations in that period.

Figure 23: Cellphone banking registration breakdown by e-channel (Jan 2010)
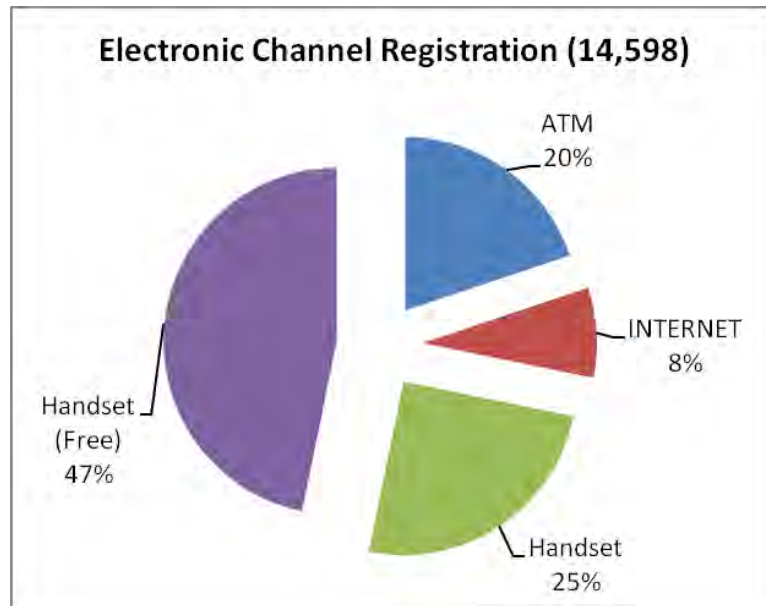
The majority of e-channel registrations are initiated via the free handset option. The least registrations are initiated via the internet.

Figure 24: Cellphone banking Adoption breakdown as a function of electronic channel registration (Jan 2010)
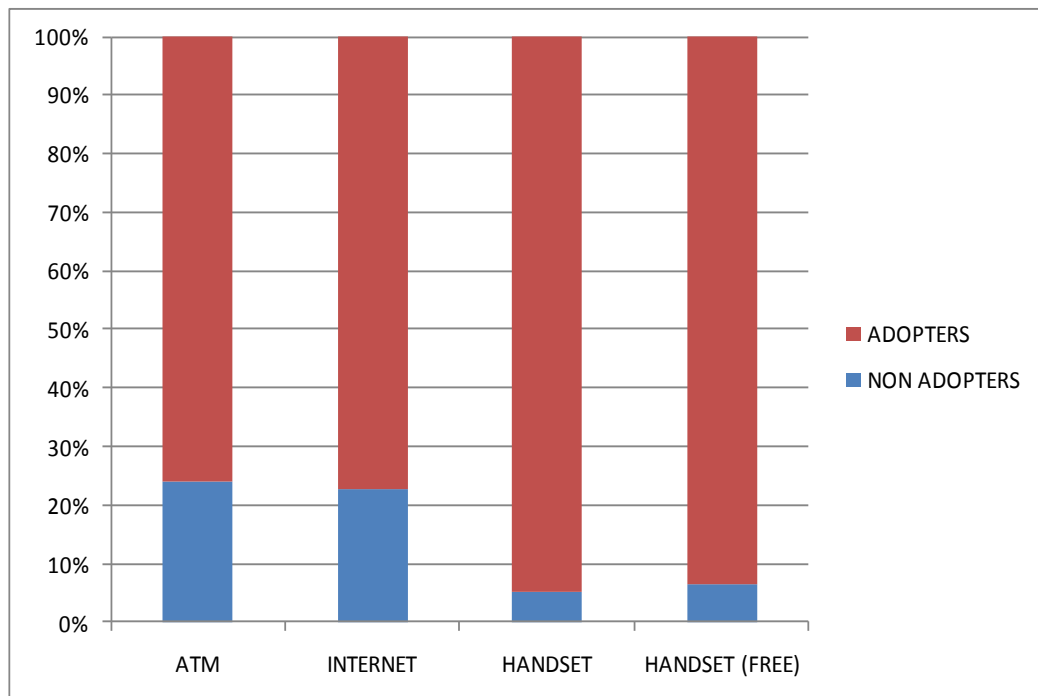
The adoption levels for the handset initiated cellphone banking registrations are higher than those initiated via the ATM or the internet.

The F-statistic was used to test the hypothesis:

Table 6: ANOVA (eChannel Registration)

Source of Variation	P-value	F crit
Columns	0.09	10

The null hypothesis cannot be rejected in favour of the alternative hypothesis because the p-value is larger than the significance level of 5%. However, at a confidence level of 10%, there is sufficient evidence to reject the equal means hypothesis in favour of the alternative hypothesis.

5.2.6 Impact of the number of products on the adoption of cellphone banking

Hypothesis 6: The null hypothesis states that the number of products with the bank does not have an impact on the level of cellphone banking (CBA) adoption. The alternative hypothesis states that the number of products with the bank does influence the level of adoption of cellphone banking.

$H6_O$: $CBA_{1product} = CBA_{>1product}$

$H6_A$: $CBA_{1product} \neq CBA_{>1product}$.

Figure 25: Cellphone banking registrations as a function of products held with the bank
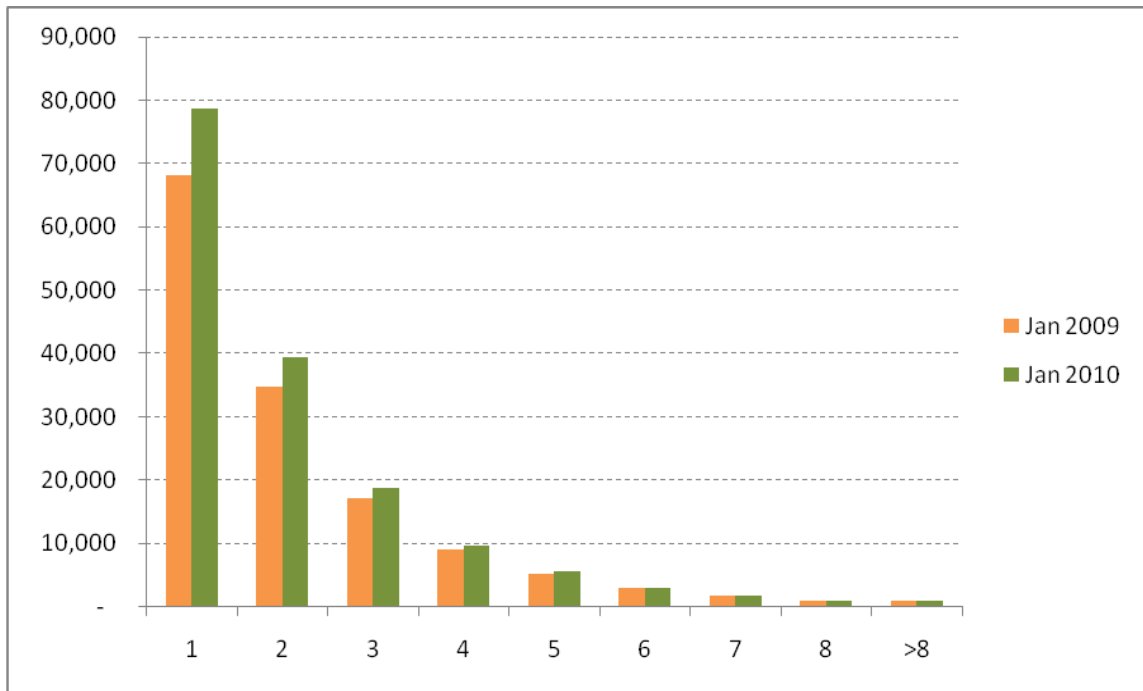
The number of customers with less than two products increased notably from Jan 2009 to Jan 2010.

Figure 26: Cellphone banking adoption as a function of number of banking products with the bank (Jan 2010)
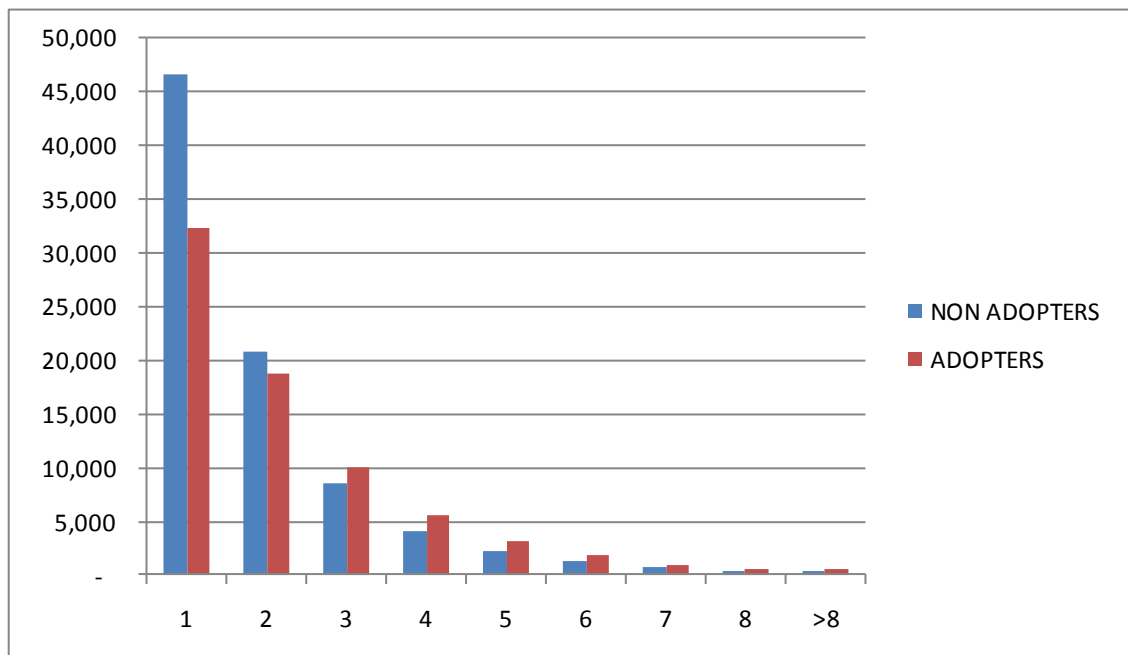
Figure 27: Cellphone banking adoption rate as a function of the number of products with the bank
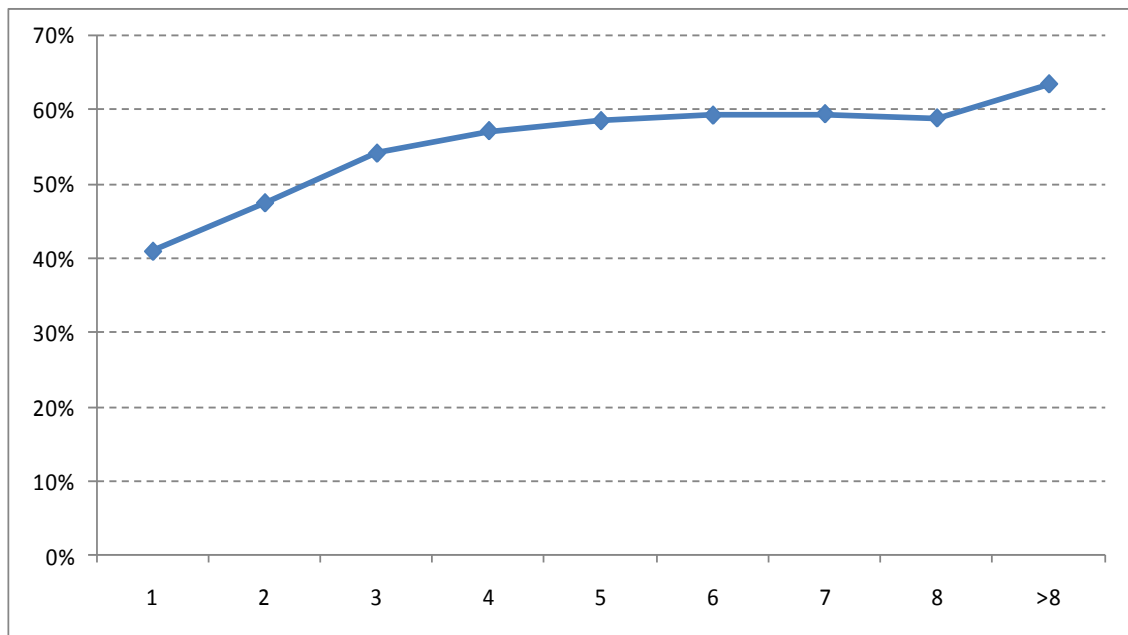
Based on the graph above, the adoption rate (which is the ratio of customers who adopted versus total number of customers with the same number of products) of cellphone banking is proportional to the number of products held with the bank.

Figure 28: Revised Adoption as a function of No. of Products Acquired
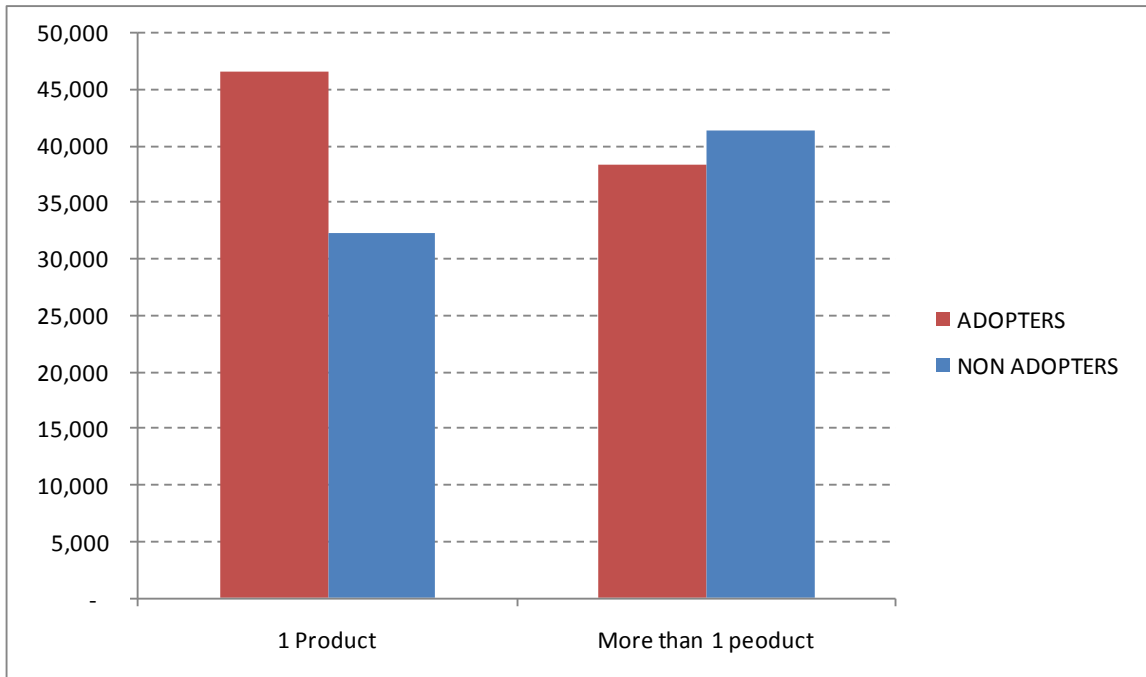
The number of customers with one product is significantly more than the other groups. In order to perform valid statistical analysis, the data has been grouped into two sets, that is, customers with one product and customers with more than one product.

The F-statistic was used to test the hypothesis:

Table 7: ANOVA (Banking Products with Bank)

Source of Variation	P-value	F crit
Columns	0.64	161.448

The null hypothesis cannot be rejected in favour of the alternative hypothesis because the p-value is larger than the significance level of 5%.

5.3 Individual Characteristics and their impact on the adoption of cellphone banking for Mzansi account holding consumers

Please refer to section 5.2 for the hypothesis to be tested.

5.3.1 Impact of age on the adoption of cellphone banking

The results for Mzansi consumers are presented below.

Figure 29: Mzansi cellphone banking registrations distributed by gender (Jan 2010)
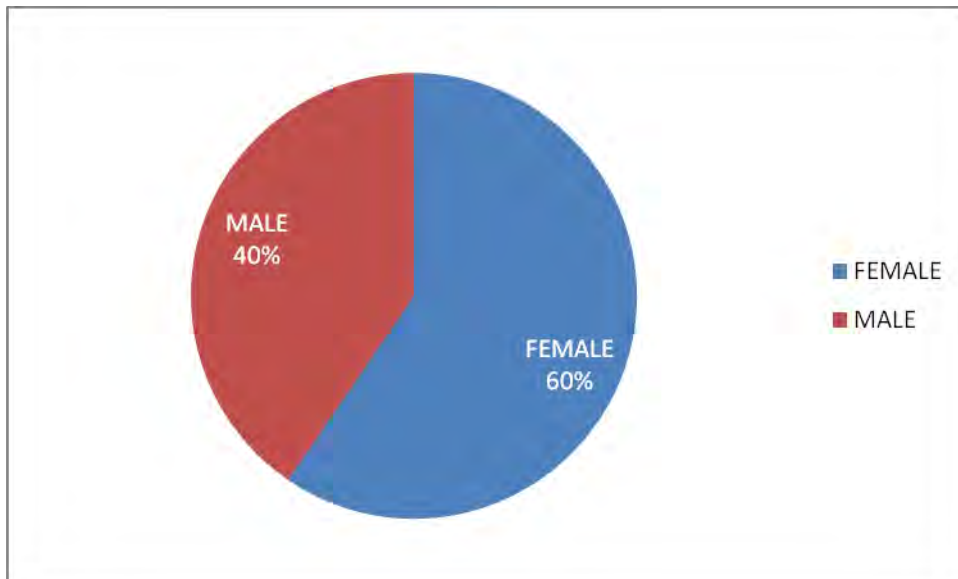
When observing the total number of registrations in January 2010, females have the

majority representation of 60%.   The split in gender acceptance is illustrated below.

Figure 30: Mzansi cellphone banking adoption as a function of gender (Jan 2010)
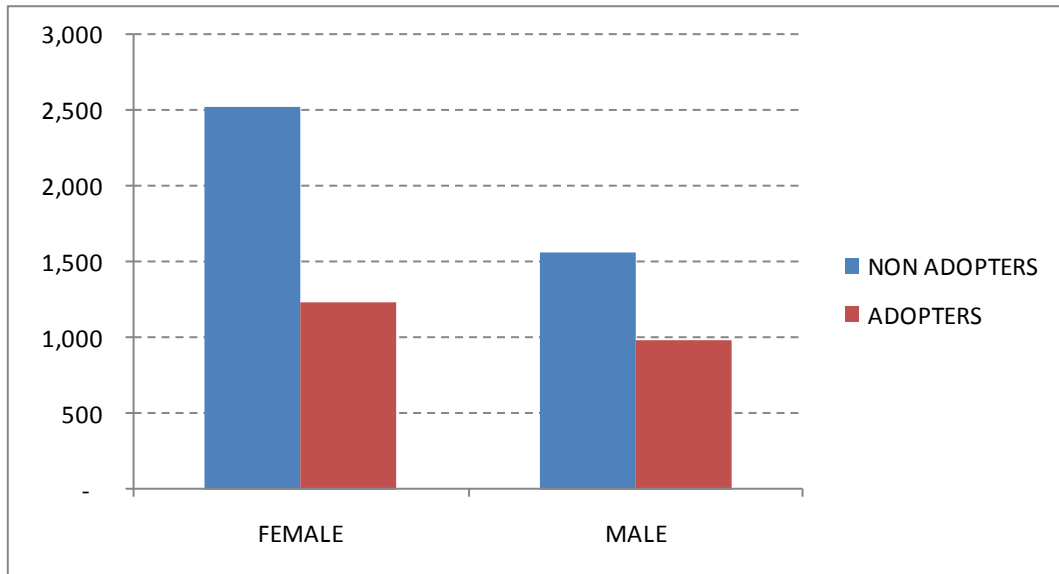
The F-statistic is used to test whether a relationship exists between gender and cellphone banking adoption by Mzansi consumers.

Table 8: ANOVA (Gender Mzansi)

Source of Variation	F crit	P-value
Columns	161.448	0.23

As a result of the p-value being larger than the confidence level of 5%, the null hypothesis cannot be rejected, that is, gender for Mzansi consumers is not significantly related to cellphone banking adoption.

5.3.2 Impact of age on the adoption of cellphone banking

When observing the Mzansi customer registrations for cellphone banking, the number of non adopters for all the age groups is more than the number of adopters.

Figure 31: Mzansi cellphone banking adoption breakdown as a function of age (Jan 2010)
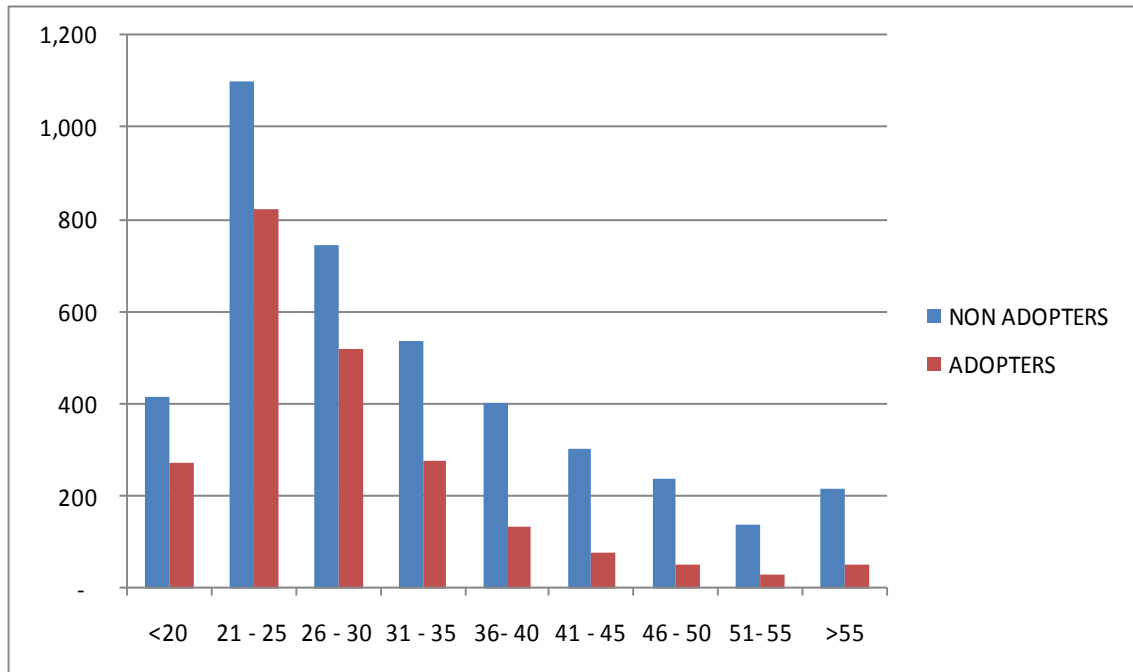
Figure 32: Mzansi cellphone banking adoption rate as a function of age (Jan 2010)
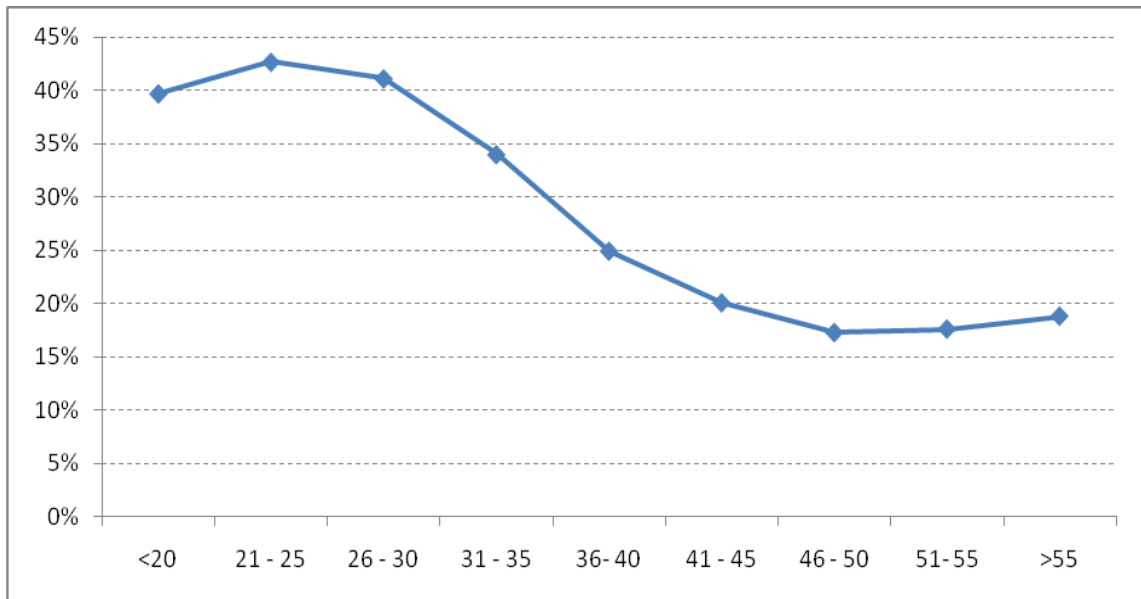
The 21 – 25 age group has the highest adoption rate when compared to the other age groups. The decline in acceptance with the increase in age is pronounced with Mzansi customers.

The F-statistic is used to test whether a relationship exists between age and cellphone banking adoption by Mzansi customers.

Table 9: ANOVA (Age - Mzansi)

Source of Variation	F crit	P-value
Columns	5.318	0.00

As a result of the p-value being less than the confidence level of 5%, the null hypothesis is rejected, that is, age for Mzansi account customers is significantly related to cellphone banking adoption.

5.3.3 Impact of race on the adoption of cellphone banking

Blacks in Jan 2010 (among the Mzansi customer registrations) accounted for 93% of the total cellphone banking registrations.

Figure 33: Mzansi cellphone banking registrations distributed based on race (Jan 2010)
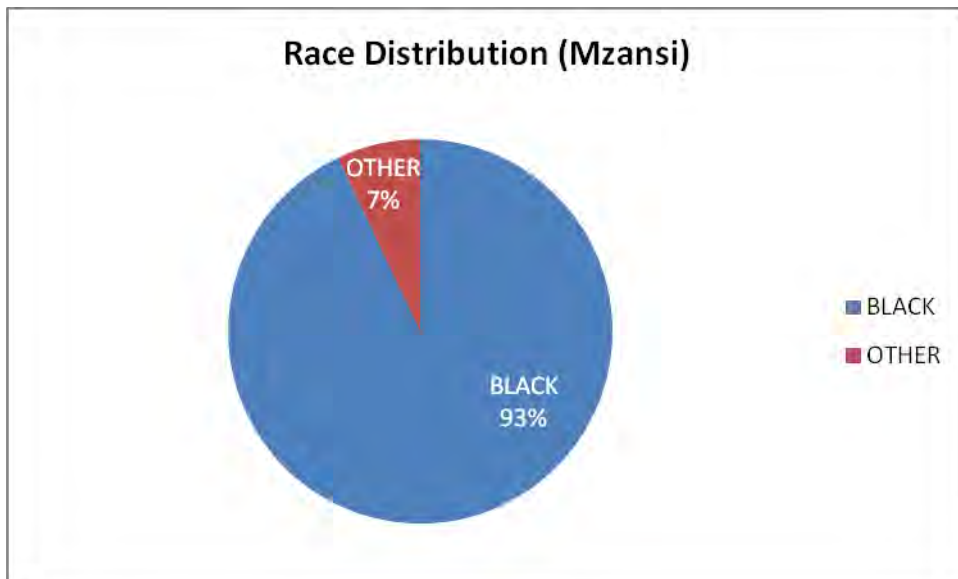
Figure 34: Mzansi cellphone banking adoption breakdown as a function of race (Jan 2010)
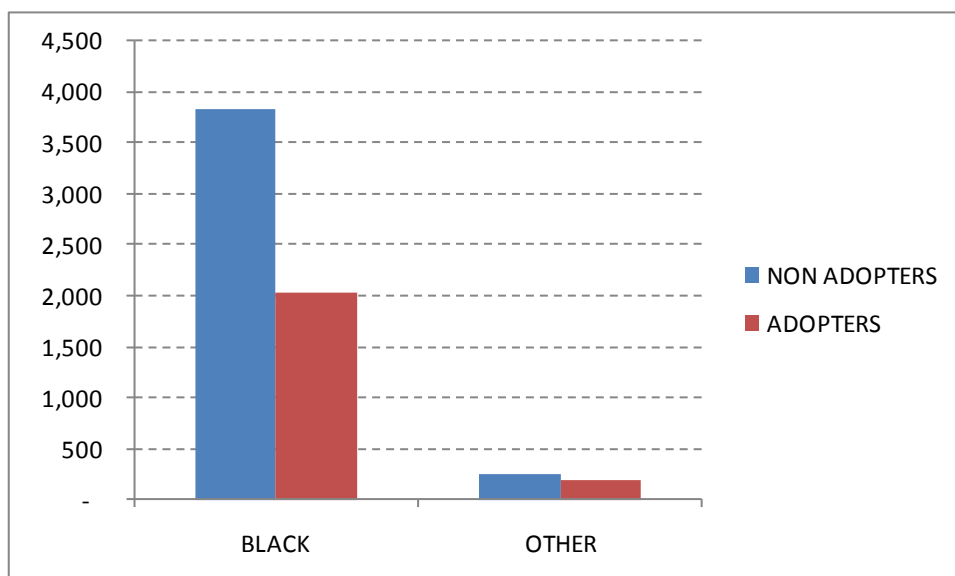
There is a notable difference in terms of adoption between the two groups.

The F-statistic is used to test whether a relationship exists between race and cellphone banking adoption by Mzansi customers.

Table 10: ANOVA (Race - Mzansi)

Source of Variation	F crit	P-value
Columns	161.448	0.48

As a result of the p-value being larger than the confidence level of 5%, the null hypothesis cannot be rejected, that is, race for Mzansi account customers is not significantly related to cellphone banking adoption.

5.3.4 Impact of channel of registration on the adoption of cellphone banking
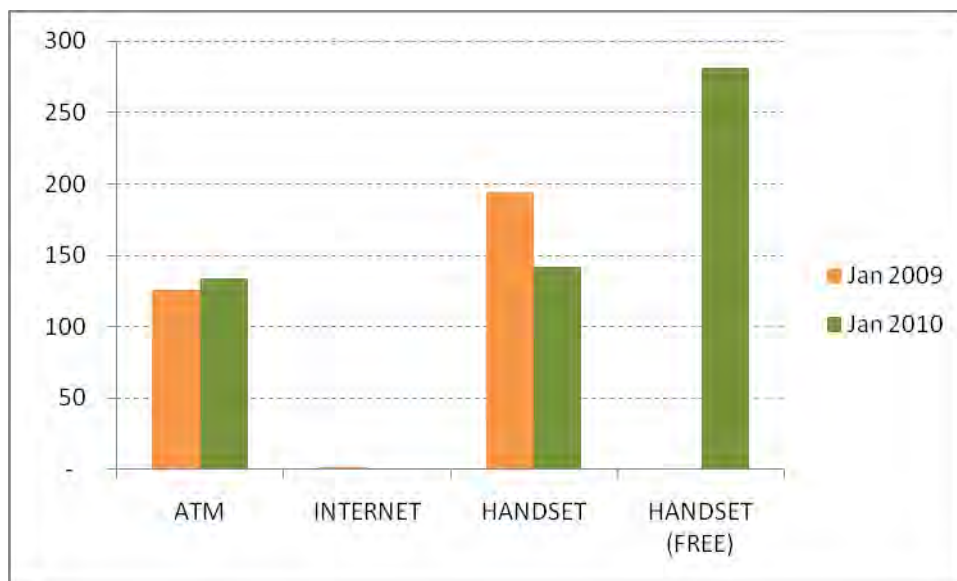
Figure 35: Mzansi cellphone banking registrations by e-Channel over 2 years

There were no internet initiated registrations in Jan 2010 in spite of the channel being available to Mzansi consumers.

Figure 36: Cellphone banking adoption as a function of registration e-channel (Jan 2010)
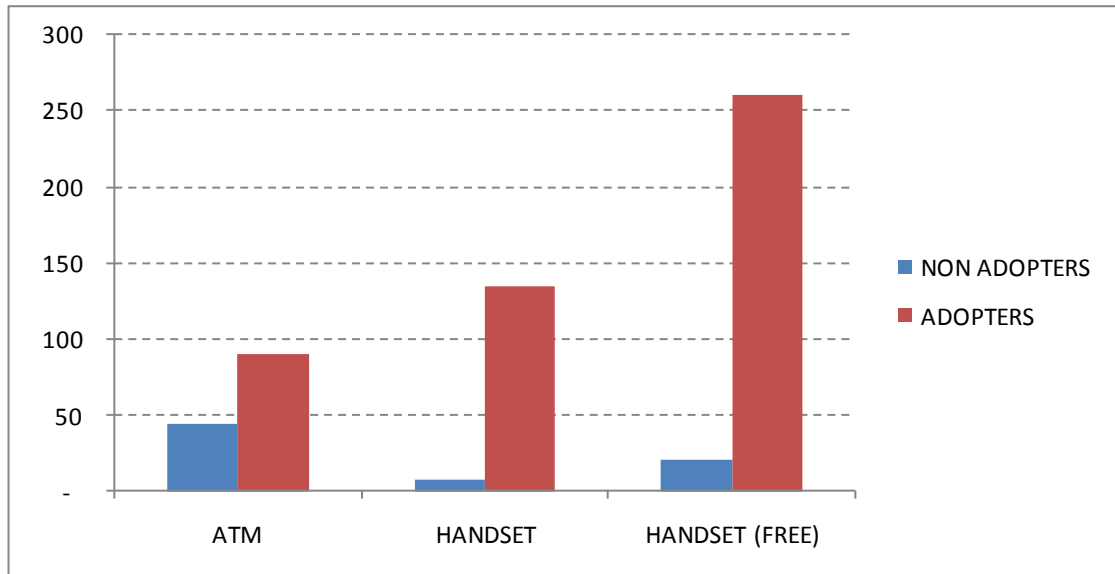
The free handset option has the largest number of adoptions with ATMs having the lowest.

The F-statistic is used to test whether a relationship exists between e-channel registration and cellphone banking adoption by Mzansi customers.

Table 11: ANOVA (eChannnel registration - Mzansi)

Source of Variation	P-value	F crit
Columns	0.13	18.513

As a result of the p-value being larger than the confidence level of 5%, the null hypothesis cannot be rejected, that is, e-channel registration for Mzansi account customers is not significantly related to cellphone banking adoption.

5.3.5 Number of Products Impact on Adoption

Based on the graph above, the majority of Mzansi customers have two or less products with the bank. This finding is consistent for the two years that have been reviewed.

Figure 37: Mzansi Cellphone banking registrations as a function of number of products with the bank
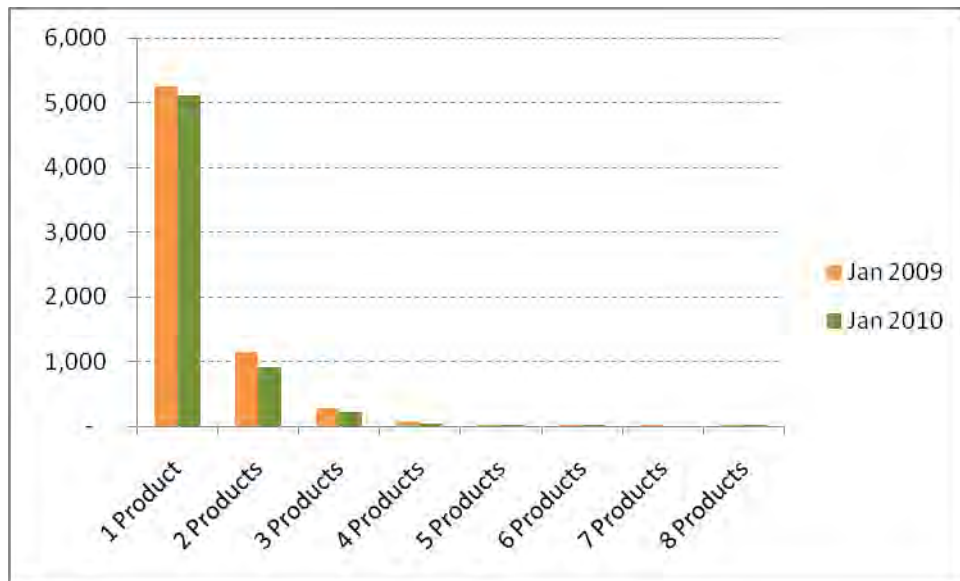
Figure 38: Mzansi cellphone banking adoption rate as a function of number of products held (Jan 2010)
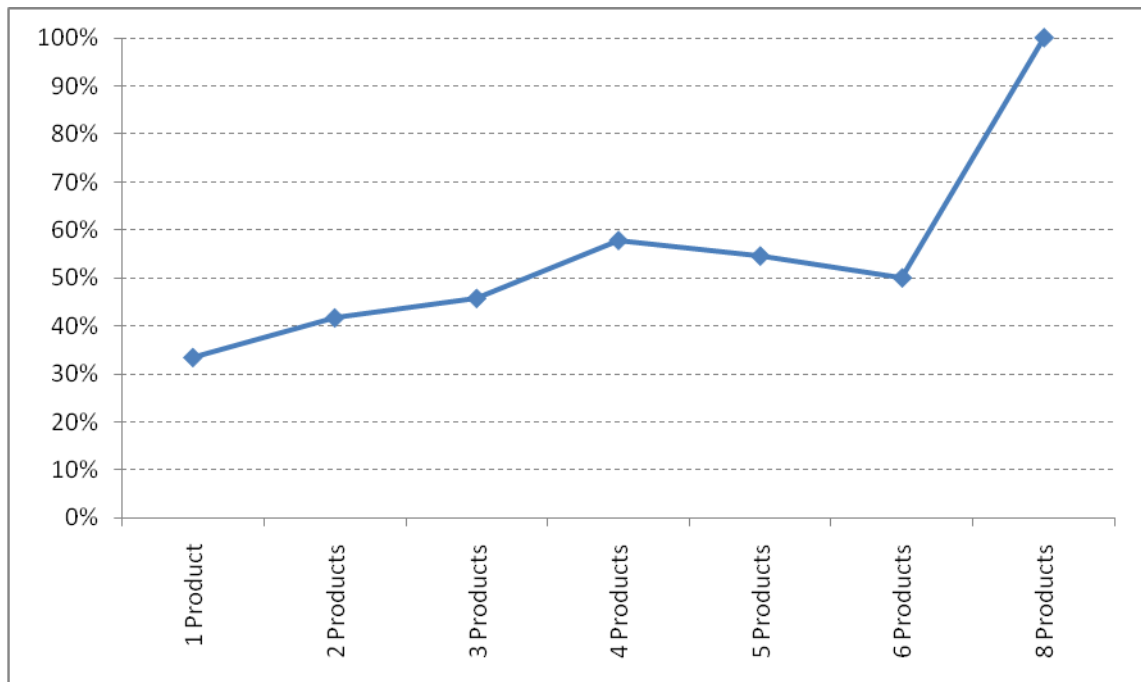
The following conclusion can be made with respect to the graph above: the adoption level for cellphone banking is in proportion to the number of products that a customer has with the bank.

Figure 39: Revised Mzansi cellphone banking adoption as a function of number of products with bank
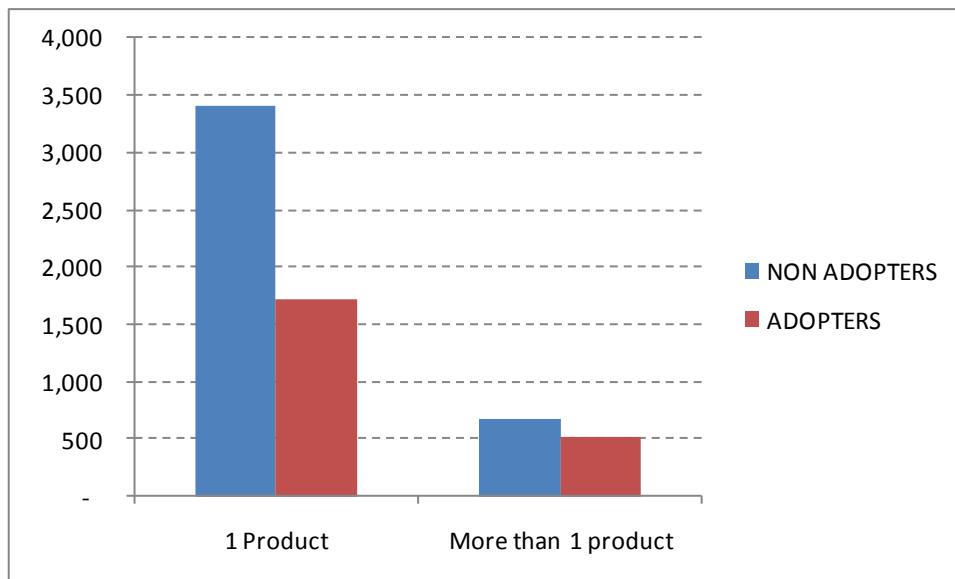
There is a large difference in terms of adoption when comparing the two groups. The customers with one product have a lower acceptance level than those customers with more than one product with the bank.

The F-statistic is used to test whether a relationship exists between the number of products with the bank and cellphone banking adoption by Mzansi customers.

Table 12: ANOVA (Products with Bank – Mzansi)

Source of Variation	P-value	F crit
Columns	0.44	161.448

As a result of the p-value being larger than the confidence level of 5%, the null hypothesis cannot be rejected, that is, the number of products with the bank for Mzansi account customers is not significantly related to cellphone banking adoption.

5.4 Comparison between Mzansi and the entire base

The results of Mzansi are compared to the results of the entire base to highlight any differences in adoption between the two groups.

Figure 40: Cellphone banking adoption rate as a function of age comparison (Jan 2010)
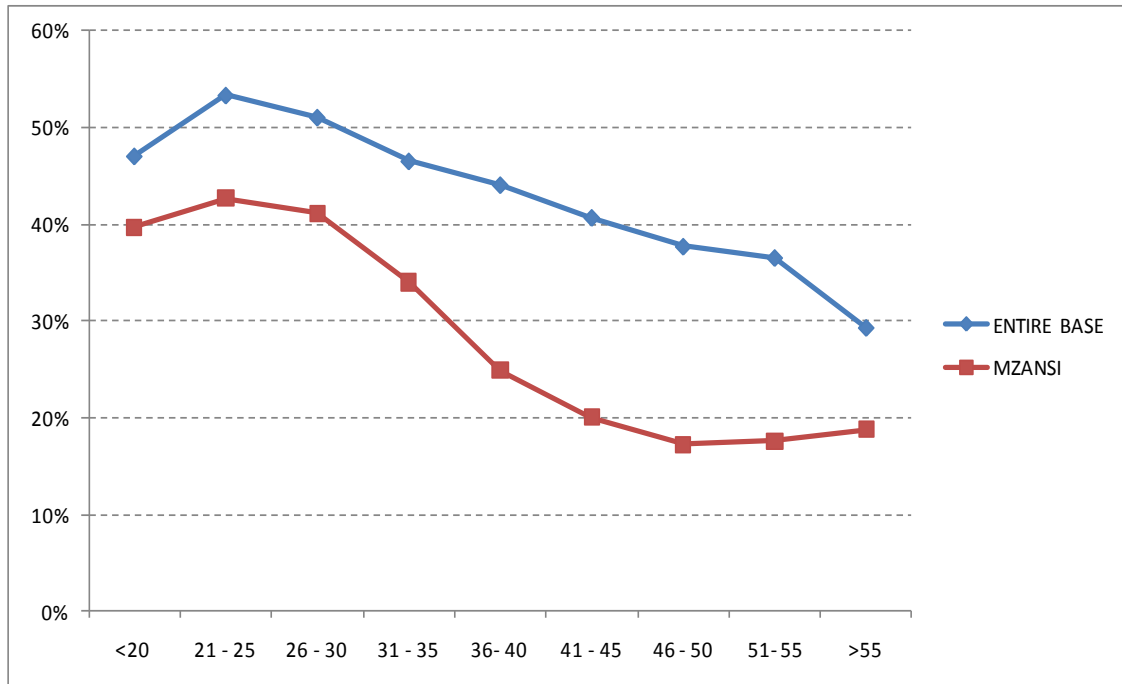
The adoption trend as a function of age is downward for Mzansi as well as the entire base. The Mzansi decline in adoption rate is however more pronounced when compared to the entire base.

Figure 41: Cellphone banking adoption rate as a function of number of products with the bank comparison
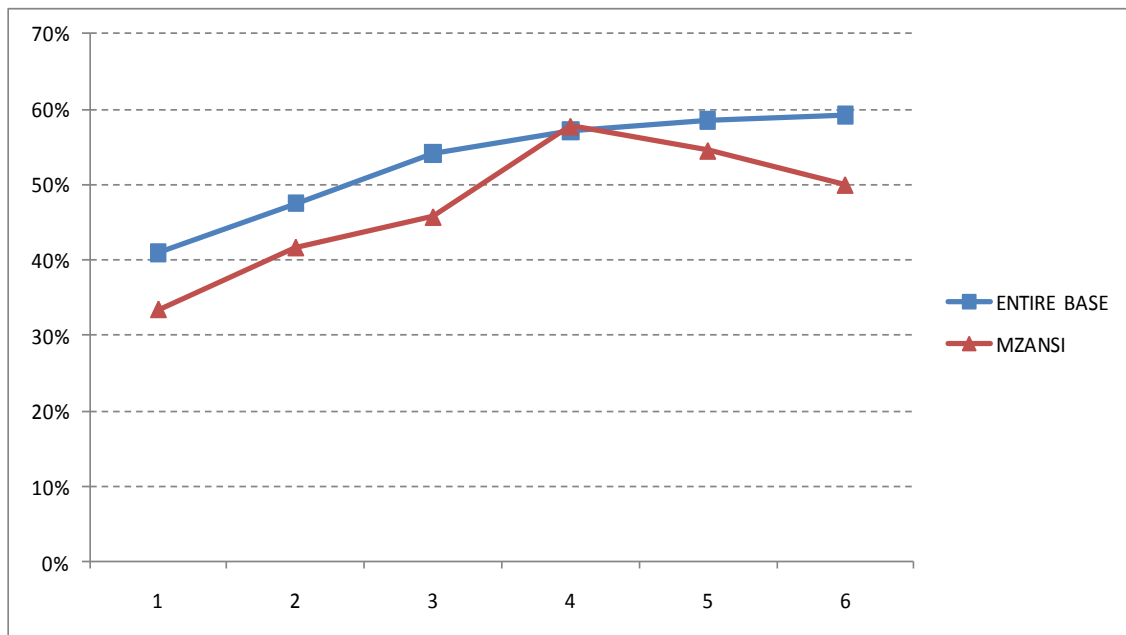
The adoption trend as a function of products held is upward for Mzansi as well as the entire base up until four products held at which point the Mzansi trend is downward. Although the Mzansi adoption rate is lower when compared to the entire base, the growth rate up until four products is comparable.

Table 13: ANOVA Results

	Entire Base		Mzansi Base	
	P-value	Finding	*P-value*	Finding
Gender	0.14	Accept Ho	0.23	Accept Ho
Race	0.53	Accept Ho	0.48	Accept Ho
Registration eChannel	0.09	Accept Ho	0.13	Accept Ho
Age	0.07	Accept Ho	0.00	Reject Ho
Income	0.69	Accept Ho	N/A	
No. of Products	0.64	Accept Ho	0.44	Accept Ho

At a significance level of 0.05, only age for Mzansi customers has a significant relationship with adoption. At a significance level of 0.1, the registration e-channel and age for the entire base, have a significant relationship with cellphone banking

adoption. Age is therefore the only variable that has a significant relationship with adoption for the entire base as well as the Mzansi base.

5.5   Mzansi Consumer Transacting Behaviour

The breakdown of the customer numbers is illustrated in the table below.

Table 14: Customer Breakdown of Mzansi Registration in Jan 2010

Customer Type	No. of Customers	% of Total
Non Adopters	1,232	40%
Adopters	1,882	60%
Total	**3,114**	**100%**

The data summary is illustrated next.

Figure 42: Transaction volumes of cellphone banking non adopting Mzansi consumers
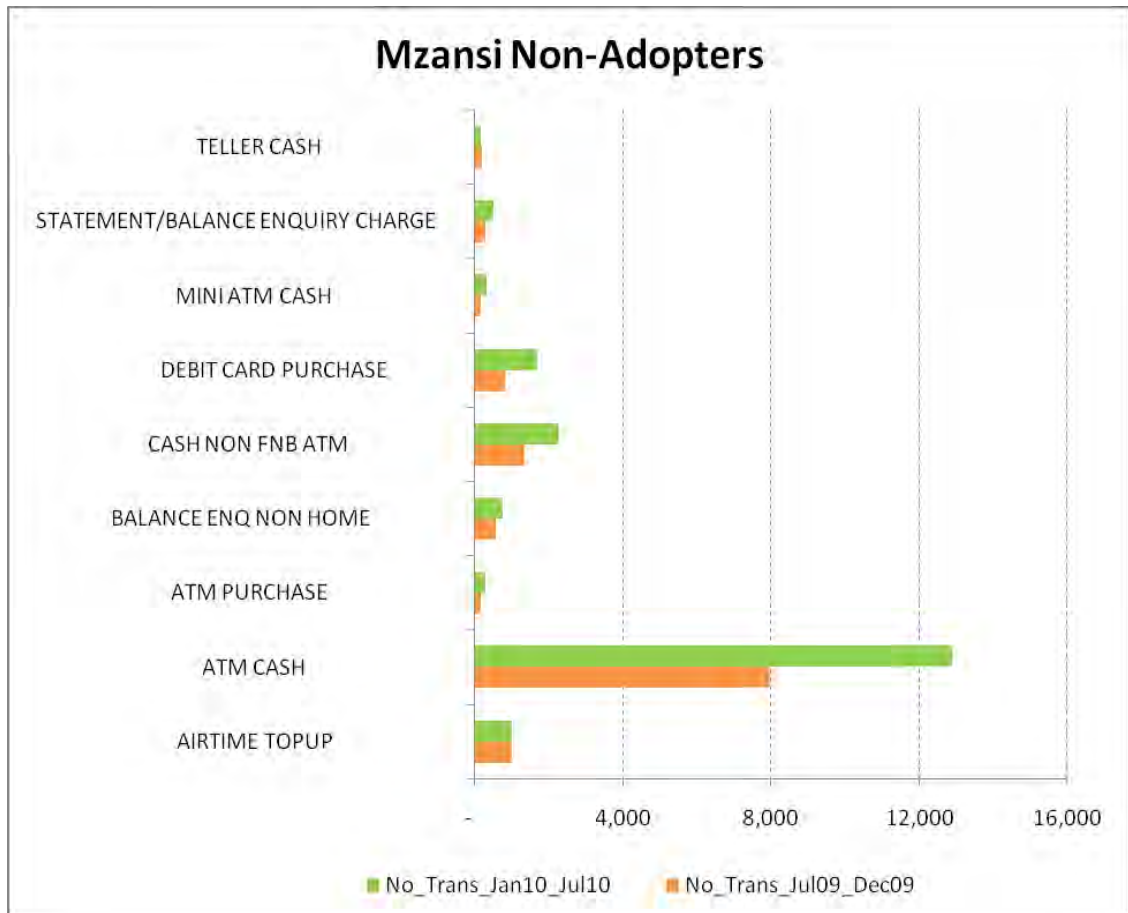
Figure 43: Transaction volumes of cellphone banking adopting Mzansi consumers
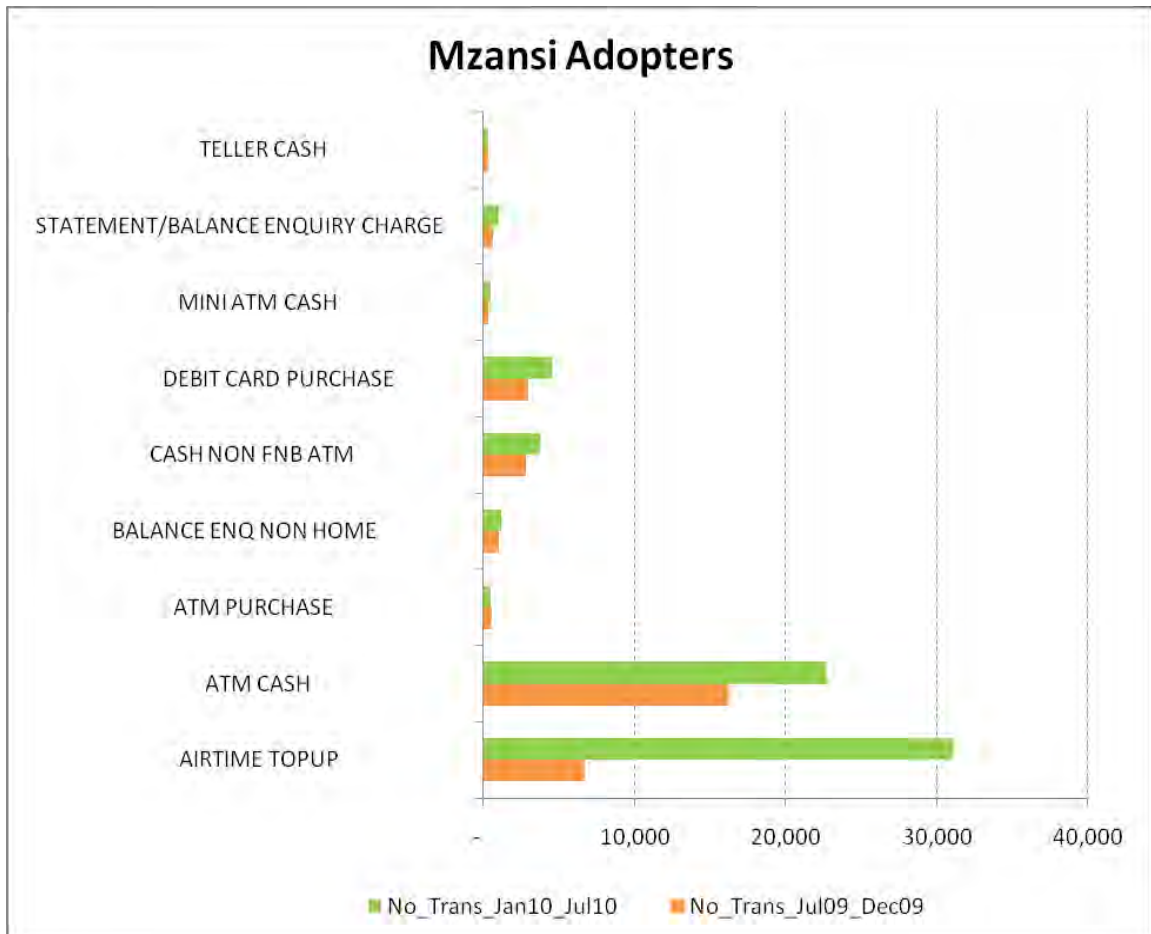
The percentage volume growth between the two periods indicated in the graphs above is represented graphically below.

Figure 44: Mzansi consumer transaction volume growth
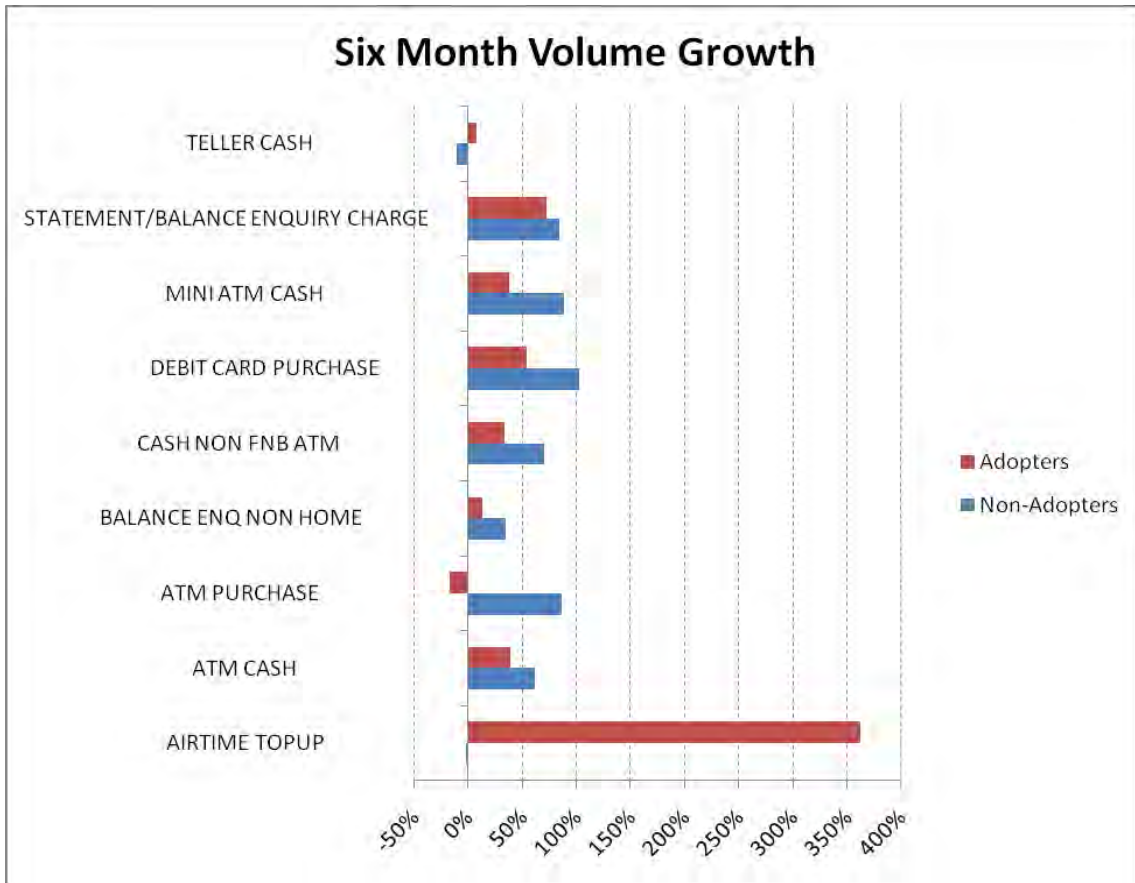
In order to enable ease of comparison, the transaction volumes have been normalised to a per customer value. The conversion result is illustrated below.

Table 15: Average number of transactions per customers

	Non-Adopters - Ave_Trans/Cust		Adopters- Ave_Trans/Cust	
	Jul09_Dec09	Jan10_Jul10	Jul09_Dec09	Jan10_Jul10
AIRTIME TOPUP	0.82	0.81	3.57	16.53
ATM CASH	6.48	10.48	8.66	12.08
ATM PURCHASE	0.12	0.23	0.29	0.24
BALANCE ENQ NON HOME	0.45	0.61	0.56	0.63
CASH NON FNB ATM	1.08	1.85	1.49	2.00
DEBIT CARD PURCHASE	0.67	1.36	1.56	2.40
MINI ATM CASH	0.13	0.24	0.17	0.24
STATEMENT/BALANCE ENQUIRY CHARGE	0.22	0.41	0.32	0.56
TELLER CASH	0.14	0.13	0.15	0.16
TOTAL	**10.13**	**16.12**	**16.78**	**34.84**

6 Discussion of Results

6.1 Introduction

According to Siya *et.al* (2006), socio-economic characteristics can be linked to the adoption of e-commerce. In a study conducted by Dupagne and Salwen (2005) it was found that ethnicity had a significant influence on technology adoption. They further postulated that because of the varying results of different prior studies, ethnic differences in communication technology adoption may be technology dependent. Ethnicity is a complex construct that consists of race, culture, income, education, national origin and other socio-economic variables (Dupagne & Salwen, 2005). In this study, the individual constructs have been isolated and an attempt has been made to determine the influence that the individual constructs have on adoption. The aim of this study was to determine whether individual characteristics can explain the adoption of cellphone banking in the lower income consumer segment. A series of statistical tests have been conducted on a sample that represents the entire cellphone banking base and the same tests subsequently applied to a sample that represents the Mzansi consumers. The purpose of testing the entire cellphone banking base is to identify those variables that have a different impact on cellphone banking adoption at the lower income segment level. The cellphone banking adoption results are discussed next. Where the Mzansi results differ from the entire base results, the possible cause for the difference will be discussed.

6.2 Individual Characteristics as predictors of cellphone banking adoption

6.2.1 Hypothesis 1: Gender as a predictor of cellphone banking adoption

When analysing the sample composition with respect to males and females for Jan 2009 and Jan 2010, there are no significant changes in gender composition. Although the total number of individuals that registered for cellphone banking has increased by 8% (from 147,199 to 158,426) year on year, the composition of males and females is relatively consistent. The growth in the number of total registrations is an indication of the growth in popularity of cellphone banking. As the product is promoted more by financial institutions, more customers are taking up the service year on year.

When analysing the entire base, males account for 53% of total registrations (as indicated in Figure 10). From the ANOVA results we can conclude that gender is not significantly related to the adoption of cellphone banking.

When analysing the Mzansi consumer registrations for Jan 2010, the ratio of males to females is different from that of the larger base. When looking at the Mzansi base, females account for 60% of total registrations as versus 47% in the entire base. Adoption of the service is lower for Mzansi consumers. Figure 29 portrays a less then optimal scenario. Although more women register for cellphone banking, the absolute number of woman who adopt the service is almost equal to that of males. From the ANOVA results we can conclude that gender is not significantly related to the adoption of cellphone banking, reflecting consistency with the larger sample. This finding is not consistent with the views of Rao and Troshani (2007) and the study by Crabbe et.al (2009) who found that demographics ought to impact adoption.

6.2.2 Hypothesis 2: Age as a predictor of cellphone banking adoption

Registration distributions as a function of age for Jan 2009 and Jan 2010 are quite similar (see Figure 12). There are however notable increases in the under 25 years age categories. Only for age groups 21 – 25 years and 26 to 30 years was the number of adoptions higher than the number of non adopters (Figure 13). When analysing the adoption rate graph, Figure 14, an inverse relationship exists between age and adoption. With the exception of the <20 year age group, the older the group, the lower their adoption rate. This finding is consistent with literature that concludes that innovation adoption has an inverse correlation with age (Kolodinsky *et.al,* 2004).

However, based on the ANOVA results, at a confidence level of 5%, age is not significantly related to cellphone banking adoption. At a confidence level of 10% however, there is sufficient evidence to reject the null hypothesis in favour of the alternative which states that age is significantly related to cellphone banking adoption. This finding is therefore consistent with prior studies on adoption of technology.

For Mzansi customers, in no age group are the number of adopters more than non adopters. The 21 – 25 year age group has a higher adoption rate than the other groups which is consistent with the entire base. The decline in acceptance is however more pronounced with Mzansi customers when compared to the larger base. With the exception of the < 20 year age group in the entire base, the older the group, the lower the adoption rate. For Mzansi customers on the other hand, the trend changes after the age of 50 years (see Figure 32). None of the reviewed literature can provide insight into this phenomenon.

When the ANOVA results for Mzansi customers are reviewed, the outcome is consistent with that of the entire base. Age is significantly related to cellphone banking adoption at a significance level of 10%. This outcome is expected as prior literature states that age does influence the adoption of technology (Kolodinsky *et.al*, 2004).

6.2.3 Hypothesis 3: Race as a predictor of cellphone banking adoption

The number of Blacks that registered for cellphone banking has increased from Jan 2009 to Jan 2010 as illustrated in Figure 15. As a result of Blacks being significantly more than the other race groups, the other race groups have been combined into one group. This consolidation will result in a loss of detail. It does however still enable the comparison of one group to the others. Blacks accounted for 80% of the registrations in Jan 2010. There is a notable difference in terms of acceptance between the two groups as illustrated in Figure 17, with Blacks having a lower level of acceptance when compared with the Other race group.

From the ANOVA results, race is not significantly related to adoption. In terms of Mzansi customers, Blacks account for 93% of registrations. This is consistent with the demographics of the country where Blacks are disproportionally more in the lower income segments. A difference exists when analysing the difference in adoption between the two groups (Figure34). The ANOVA results are consistent with that of the entire base, that is, race is not significantly related to adoption.

These findings are not consistent with the ethnicity study that was conducted by Siya *et.al* (2006) that concluded that ethnicity has a significant influence on technology adoption.

6.2.4 Hypothesis 4: Income as a predictor of cellphone banking adoption

The customer distribution as a function of income has remained consistent over the two year period as depicted in Figure 18. According to the research conducted by Kolodinsky *et.al* (2004), income is one of the factors that impact the adoption of electronic banking. In Figure 20, adoption has a direct relationship with income up until a certain point where it then becomes an inverse relationship. The following considerations need to be taken into account to interpret this phenomenon. Internet usage is highest at the upper income levels. The higher income earners are therefore more likely to be using online banking as opposed to cellphone banking. Adoption at the higher end of income is therefore anticipated to decline. In order to validate the plausibility of this rationale, an analysis of the channels of registration initiation against income was conducted and the results are displayed below:

Table 16: Income vs. e-channel of registrations

INCOME CATEGORY	ATM	INTERNET	HANDSET	HANDSET (FREE)	Grand Total
R1 - R10,000	16.84%	8.35%	25.18%	49.63%	100.00%
R10,001 - R20,000	22.99%	1.52%	24.20%	51.29%	100.00%
R20,001 - R30,000	25.66%	1.02%	22.28%	51.04%	100.00%
R40,001 - R50,000	22.30%	3.65%	25.53%	48.53%	100.00%
R30,001 - R40,000	20.89%	2.53%	28.99%	47.59%	100.00%
R50,001 - R60,000	18.79%	6.85%	27.92%	46.44%	100.00%
R60,001 - R70,000	18.44%	4.26%	26.48%	50.83%	100.00%
R70,001 - R80,000	17.45%	11.44%	28.52%	42.59%	100.00%
R80,001 - R90,000	15.30%	11.19%	30.37%	43.15%	100.00%
R90,001 - R100,000	15.40%	13.64%	23.48%	47.47%	100.00%
R100,001 - R150,000	16.93%	13.77%	28.72%	40.59%	100.00%
R150,000 - R200,000	15.61%	22.27%	24.55%	37.58%	100.00%
> R200,000	14.95%	39.01%	20.90%	25.14%	100.00%
Grand Total	**19.54%**	**10.40%**	**25.37%**	**44.69%**	**100.00%**

The graphical representation of the above results is illustrated below:

Figure 45: e-Channel registration split as a function of income
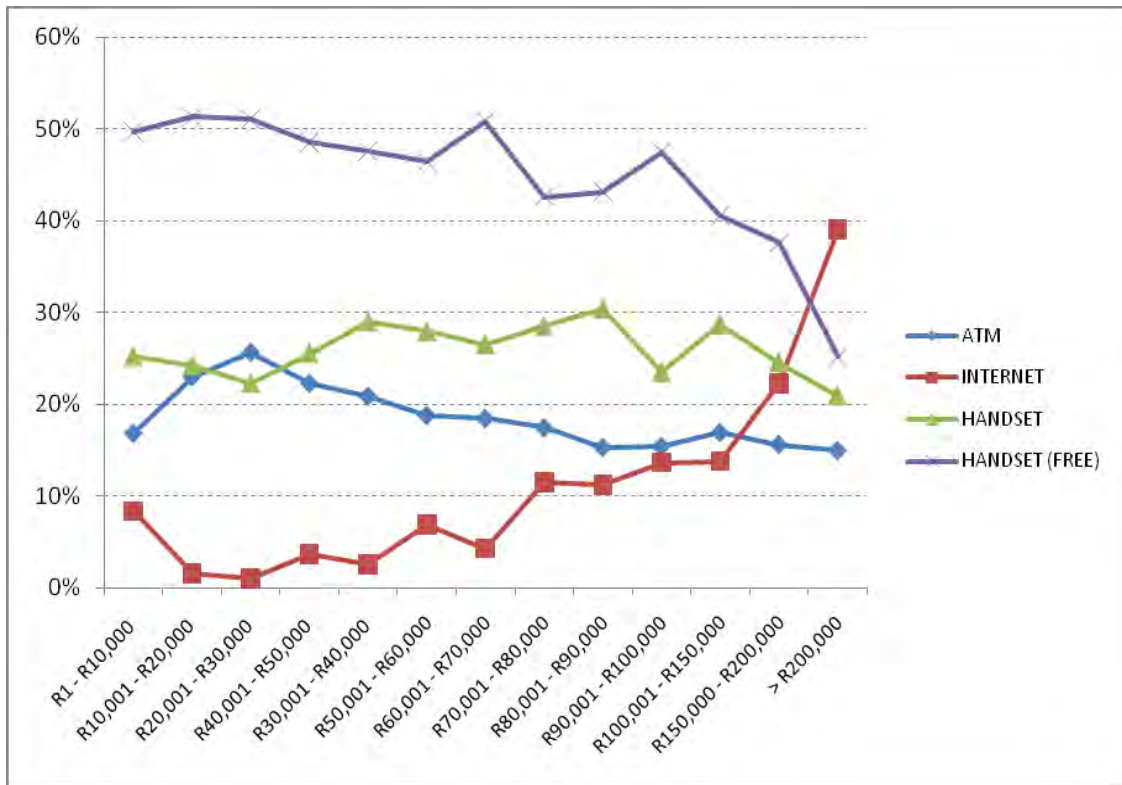
As can be seen from the graph above, as income increases, the online banking channel accounts for more registrations in that income band. Additionally, in order for a customer to register for cellphone banking online, they need to be registered for online banking. The argument of higher income consumers' preference for online banking is therefore plausible.

From the ANOVA results, it can be concluded that income is not significantly related to cellphone banking adoption.

6.2.5 Hypothesis 5: Registration channel as a predictor of cellphone banking adoption

In order to drive the take up of cellphone banking, financial institutions are enabling customers to register for the service via the different e-banking channels. Customers are able to register for cellphone banking via the ATM, Online Banking, Handset, Call Centre and via the Branch. The process of acquiring the e-service needs to be

simplified as lengthy processes will inhibit the customer from adopting the service (Kolodinsky (2004). A significant amount of effort has been applied to therefore optimise the registration processes via the different channels. The registration process for each channel has been optimised to eliminate unnecessary steps. In an attempt to increase accessibility to the service, the bank offers customers the option to acquire cellphone banking via a free USSD dial-string, that is, no network operator fees are incurred when using this channel.

When analysing the 2009 to 2010 trends (see Figure 22) of cellphone banking registrations, there is a significant change in behaviour. The free USSD channel was originally not offered in 2009. This channel has however become the largest customer acquisition channel. Although ATM and Online registrations have increased over the two years, their growth has been paltry in comparison to free USSD.

The adoption rate of customers that have registered via the e-channels is very high with ATM and Internet adoption levels just below 80% and the Handset channels being in access of 90%. From these figures it becomes apparent that customers that are registering via e-channels tend to adopt the service. Although not included in the analysis, Branch has an adoption rate of approximately 45%, significantly less than the e-channels. Because e-channel registrations are initiated by the customer, the likelihood of adoption is higher than Branch where the registration is usually initiated by the branch consultant.

From the ANOVA results it can be concluded that channel of registration at a confidence level of 5%, is not significantly related to cellphone banking adoption. At a confidence of 10% however, there is sufficient evidence to support the argument that channel registration is significantly related to cellphone banking.

6.2.6 Hypothesis 6: Number of products with the bank as a predictor of cellphone banking adoption

According to Yousafzai *et al.* (2003), the adoption of B2C e-commerce has to an extent been limited by risk concerns and trust-related issues. Hosmer (1995) is cited by Yousafzai *et al.* (2003) as having stated that buying decisions are in part made based on the level of trust in the individual or organisation. This view is further extended to electronic banking decisions which involve trust, not only in the transaction medium but also in the bank or the financial institution. If the number of products with the bank is used as a proxy for trust, then the expectation is for adoption to correlate with the number of products an individual has with the bank.

The positive correlation between the number of products and service adoption is demonstrated in Figure 27. According to the graph, customers with more products are more likely to adopt cellphone banking. To however determine if this finding is statistically relevant, an ANOVA has been applied on the data. For ease of computation, customers with more than 1 product are grouped into one group. This result does however lead to a loss of detail. Figure 28 is the revised data grouping. The ANOVA results conclude that the number of products with the bank is not significantly related to the adoption of cellphone banking.

The positive correlation between the number of products and adoption is also observed with Mzansi account customers as well (see Figure 38). Customers with one banking product have a lower acceptance level when compared to those with two or more products. The ANOVA analysis for Mzansi account customers is consistent with the larger sample, that is, the number of products with the bank is significantly related to the adoption of cellphone banking.

6.3   Mzansi consumer behaviour pre and post cellphone banking adoption

Access to formal banking services has been postulated to be one of the requirements for assisting individuals at the bottom of the pyramid. One of the challenges that exists with the informal financial services, is the exorbitant transactional costs that consumers within the lower income segment have to incur. As a result of the remote location of villages, townships and informal settlements from the cities and towns, combined with the high costs that are associated with setting up retail banking branch, banks have looked to cellphone banking to provide the necessary financial services to low income consumers.

The transactions of 3,114 consumers over a period of a year have been extracted. 1,882 of these consumers adopted cellphone banking six months into the year in question. The remaining 1,232 were also offered cellphone banking but they did not adopt the service. The latter six months transactions of the two groups have been compared to the first six months to identify any pronounced changes in transactional behaviour.

6.3.1 Mzansi cellphone banking non adopters

When analysing the Mzansi non-adopter transactions (see Figure 42), the number of transactions in the second six months are generally more than those conducted in the first six months. In total, transaction volumes increased by 57% over the two periods. Debit card purchases and ATM purchases increased by 103% and 86% respectively. As can been seen from the table below, similar aggressive transaction value growth can be observed.

Table 17: Growth in value of banking transactions

TRANSACTION	NON ADOPTER TRANSACTION VALUE GROWTH	ADOPTER TRANSACTION VALUE GROWTH
AIRTIME TOPUP	36%	358%
ATM CASH	52%	39%
ATM MINI STATEMENT CHRG	48%	46%
ATM PURCHASE	123%	-36%
CASH NON FNB ATM	65%	41%
DEBIT CARD PURCHASE	108%	55%
MINI ATM CASH	46%	25%
STATEMENT/BALANCE ENQUIRY CHARGE	82%	104%
TELLER CASH	7%	50%
Grand Total	**50%**	**44%**

What is however of interest is the fact that ATM cash withdrawal value from own bank and from other banks also increased by 52% and 65% over the same period. A trade-off between purchases using e-channel and the reduction in cash usage was expected but this is not the case. Based on the available data, it is difficult to hypothesise the basis for the increased consumption.

The frequency of balance enquiries from other banks ATMs increased by 35%. These transactions typically attract a direct banking charge but the willingness of customers to incur this cost is testimony to the need for these consumers to have access to information regarding the state of their financial matters.

6.3.2 Mzansi cellphone banking adopters

The growth in transactions for adopters when comparing the two periods is aggressive. Total transactions grew in access of 100%. The growth in transactions was fuelled significantly by the sudden surge in airtime top-ups. Airtime top-ups grew in access of 350% as opposed to the non adopter growth where a 2% decline in transactions was observed. This finding adds to the study conducted by Hahn (2008)

which found that mobile phone promoted consumption instead of production. In this study, cellphone banking access has led to a large increase in airtime consumption. The ease and convenience with which the airtime can now be acquired is probably one of the reasons for this huge growth.

Debit card purchases grew by 54%. The airtime purchase has displaced the ATM purchase transactions. The balance enquiries from other banks have grown at a lower rate (13%) when compared to the non adopters (35%). For the adopters, changes in transactional behaviour have been observed when comparing the adopters to the non adopters.

7 Conclusion

7.1 Introduction

The objective of this research was twofold:

- ✓ To determine the influence of individual characteristics on the adoption of cellphone banking in South Africa with an emphasis on low income consumers.

- ✓ To determine if there are differences in transactional behaviour pre and post the adoption of cellphone banking for low income consumers.

The Mzansi account has been used as the identifier of low income consumers. This account was developed as a response of the financial services sector in South Africa to provide affordable financial products that were predominantly targeting the unbanked. The high cost associated with traditional banking channels i.e. branch and ATMs has necessitated that alternative banking channels have had to be developed. The extensive reach of mobile infrastructure in South Africa has therefore positioned the mobile channel as an ideal platform for the provision of financial services.

7.2 Findings and Implications

Six individual characteristics have been analysed to determine their impact on the adoption of cellphone banking. These characteristics included gender, age, race, income, registration channel and number of products with the bank. Age was the only characteristic that was found to have an impact on cellphone banking adoption by low income consumers as well as the larger consumer base. The impact of age on

adoption can potentially be explained by considering the theory of innovation resistance. The theory aims to explain why consumers resist a technology. Ram and Sheth (1989) as cited by Laukkanen *et al*. (2008*), state that the resistance to innovation is as a result of functional and psychological barriers. Functional barriers are consistent of usage and risk barriers while psychological barriers include tradition and image barriers. Usage barriers arise when the technology is not consistent with existing practices or habits. Risk is associated with the degree of risk that the technology entails whereas image is more based on the products origin and positioning. Younger consumers are more familiar with mobile technologies with cellphone forming an integral part of their lifestyle Koenig-Lewis, Palmer and Moll (2010). Older consumers are more familiar with the traditional forms of banking and with the inherent risks associated with electronic communications; e-channels can be seen to poses more risk than the traditional channel. These views combined provide the basis for the adoption of cellphone banking to be impacted by age. The study conducted by Koenig-Lewis *et al.* (2010) also concluded that if the perception of cellphone banking is consistent with the lifestyle, values and beliefs of the consumer, then they are more likely to use the service.

Companies that provide financial service therefore need to have a detailed understanding of their target markets lifestyles, value systems, technology familiarity and their appetite for risk. Their products then need to be designed and developed in such a manner that they will appeal along these dimensions.

The adoption of technology according to Dupagne & Salwen (2005) can be technology dependent. In instances where a technology has been adopted by all sectors of society, then the ability of using individual characteristics to determine adoption

diminishes. Cellphone banking has been available in south for more than five years and therefore may be considered to be no longer a "new" innovation, and hence the lack of impact of individual characteristics on adoption. Caution therefore needs to be exercised when utilising innovation adoption theories to predict adoption.

When analysing the transactional behaviour of Mzansi consumer pre and post adoption, one of the observations noted between adopters and non adopters of cellphone banking was the difference in transaction behaviour before the adoption of cellphone banking. The adopters of cellphone banking had performed approximately 19 transactions per consumer over the six month period in comparison to 11 transactions conducted by the non-adopters.

The adoption of the service by their higher transacting group is explainable by considering Anckar & D'Incau (2002) Value Analysis Framework. The framework applicable in determining the value that m-commerce delivers. Because of the larger number of transactions that adopters perform on average, a more efficient means of completing banking transactions will be more valuable to them then non adopters who perform less transactions. This speaks to the efficiency ambitions of adopters. Cellphone banking has more value for adopters on the efficiency ambition dimension than it does for the non adopters.

It is practical to assume that the more transactions an individual makes, the higher the probability that they will be performing time urgent and spontaneous transactions. Adopters are therefore anticipated to rate cellphone banking higher on the time critical arrangements and spontaneous decisions and needs dimension.

It is appropriate to conclude that cellphone banking adopters have a higher value of cellphone banking than non adopters. The implication for business is as follows: the higher the value that a customer associates with a service, the higher the probability of the service being adopted.

The number of airtime topup transactions for adopters has had the most drastic growth when comparing all transactions types. Airtime topups grew by a massive 363% for adopters vs. a 2% decline for non adopters. The growth in airtime topup transactions may be as a result of consumers opting to make these purchases via the cellphone banking channel because of ease of completion and the lower transacting costs.

When comparing the differences in transactional behaviour between the adopters and non-adopters, one of the key findings was the higher demand for cash by non-adopters. The number of transactions demanding cash (Teller, Mini ATM, from other bank ATM and Banks ATM) grew by 62% for non adopters compared to 38% for adopters. Non adopters therefore continue transacting with cash. Another area where non adopters performed more transactions were via the debit card. Debit card transactions for non adopters grew by 103% vs. the adopters' growth of 54%.

Point of sale devises and ATMs are alternative e-channels that are available for competing banking transactions. From the data, it can be observed that non adopters have opted to use these channels instead of cellphone banking. Although these alternative channels necessitate that a customer travels to a bank terminal in order to use them, which typically attracts travelling costs, the growth of e-channel transactions especially within the low income consumer segment is a welcome trend.

This behaviour is beneficial to the banks as servicing customers via e-channels is much more cost efficient and translates to lower banking charges for the consumer.

7.3   Limitations

The following limitations have been identified in the study:

✓ The findings in the research are based on one month. Applying the analysis over additional periods would have made the results more robust.

✓ The data has been obtained from one financial institution. Consumers are usually attracted to a particular brand because it appeals to their needs and values. Although the bank has a diverse customer base, it's possible that certain factors have not been included or other one extenuated.

✓ Although Mzansi is predominantly intended for lower income consumers, higher income consumers are not excluded from taking up the product.

✓ Although the data was relatively consistent, some data cleaning had to be done to enable valid statistical analysis to be conducted.

7.4   Suggestions for future research

Cellphone banking has been available for more than five years in South Africa and has entered the mainstream. Once a technology reaches mass adoption, the ability of demographics to predict adoption diminishes. A demographics impact on adoption can be conducted in future by focussing on a relatively new service.

Additional further research needs to be conducted to understanding post adoption behaviour.

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