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Behaviour change from traditional to mobile banking channels in South Africa

Mungar, Sahil Royheath

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Behaviour change from traditional to mobile banking channels in South Africa

Sahil Mungar

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

Johannesburg, 2015

ABSTRACT

Mobile banking is a form of customer service channel offered by retail banks to allow customers to conduct transactions by themselves from a mobile phone. This was both a need as an evolution of technology and a driver of efficiency by banks, for customers to self-actualise day-to-day banking needs.

Although research in recent years has focussed on the factors of adoption of Mobile banking, little has been done in the form of assessing the effectiveness of migrating customer behaviour away from traditional banking. This research has analysed the post-adoption behaviour of bank customer transactions to determine whether a change in behaviour was observed.

Data was collected from a retail bank in South Africa, tested for fit to the South African population, and via the quantitative method of cluster analysis the behaviour change from traditional to Mobile banking channels was evaluated.

As a first proposition, factors of the informal economy in South Africa, and thus the reliance of cash by many South Africans, suggested that although Mobile banking would be adopted, traditional channel usage would continue with cash as the key motivator to continue using traditional banking channels.

As a secondary proposition, it was determined that due to accustomed and habitual use of traditional banking channels, the adoption of Mobile banking would not shift behaviour of consumers.

Data was analysed for the period from 1 January 2013 to 30 June 2013, and compared to the period of 1 January 2014 to 30 June 2014. The customers analysed maintained a continuous relationship with the bank from 1 January 2013 to 30 June 2014, having adopted Mobile banking during July 2013.

Using the process of cluster analysis, five clusters were found in the pre-Mobile banking adoption period. These clusters primarily transacted on online banking, ATM and branch banking respectively. During the post-Mobile banking adoption period, the five clusters reformed in to four clusters primarily transacting on mobile banking, ATM, and online banking respectively.

Predominant ATM users continued using the ATM channel after the adoption of mobile banking. This is likely due to the reliance of cash by this cluster.

Predominant users of online banking continued using the online banking channel after the adoption of mobile banking. This is likely due to the entrenched and habitual behaviour of this cluster, as well as the similarity of transactions offered on online and mobile banking.

Primary users of mobile banking were found to have originated from any previous channel behaviour, or combination thereof. This indicated that users of mobile banking were not predisposed to any prior behaviour trait.

It was found that younger individuals tended to have an affinity to mobile banking, and older individual tended to use the ATM channel (with some people using both ATM and Mobile channels).

Individuals with higher incomes were found to have an affinity for Online banking, whilst low income individuals tended to use mobile and ATM channels after the adoption of mobile banking.

When evaluating the race, gender and marital status of the sample, it was found that White, Unmarried and Male individuals that used online banking prior to the adoption of mobile banking, tended to maintain a preference to continue using online banking predominantly.

It is believed that this research would fill a much-needed gap in the understanding and perception of customer behaviour after the adoption of Mobile banking by consumers.

DECLARATION

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

Sahil Royheath Mungar

Signed at ……

On the …….. day of …… 20…..

DEDICATION

I would like to dedicate my thesis to my mum and late father. They have given me guidance and the means to achieve all that I have. I am forever grateful mum and dad, and I love you both.

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The completion of this study would have been impossible without the material and moral support from various people. It is my obligation therefore to extend my gratitude to them.

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CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

The purpose of this research is to understand whether the adoption of Mobile banking channels results in a consumer behavioural change to migrate transactions performed on traditional channels, i.e. Bank Branches and Automated Teller Machines (ATMs), to the newly adopted Mobile banking channel within the context of retail banking in South Africa.

This research is based on an extension of the study, Factors that influence the adoption of Cell Phone Banking in South Africa conducted by Sankar (2009), which was based on, the exploratory study of predictors of adopters of Cell Phone Banking in South Africa conducted by Brown, Cajee, and Davies (2003). The focus of this research is to extend the research of Sankar (2009) and Brown et al. (2003), which provided the consumer adoption factors of mobile phone banking, to the post adoption phase of the customer life cycle.

This study analysed the *ex post facto* behaviour of recent adopters of cell phone banking by means of an exploratory study using cluster analysis to determine whether these consumers migrate their transaction behaviour from traditional banking channels to Mobile banking.

1.2 Context of the study

1.2.1 Context of banking channels

Karjaluoto, Mattila, and Pento (2002) defined “e-banking” [electronic banking] as those that includes internet banking, Automated Teller Machines (ATMs), and Mobile banking. A subset of e-banking, as referred to in this report, is digital banking, which is also defined as virtual banking and home banking (Liao, Shao, Wang, & Chen, 1999), comprising of mobile and internet based banking.

Chou and Chou (2000) as cited by Akinci, Aksoy, and Atilgan (2004) list the services offered on internet banking as “viewing balances and transaction histories, paying bills, transferring funds” which correlates with the services offered on mobile banking described by Laukkanen (2007). Suoranta and Mattila (2004) offer a definition that electronic banking is a high level construct, of which, mobile banking and internet banking are subsets. Digital banking is thus defined as that which includes the mobile banking and internet banking channels, and excludes the ATM.

Further, Laukkanen (2007) and Wan, Luk, and Chow (2005) argue the customer perceived value of digital banking rallies around the immediacy, availability and convenience characteristics available to users of mobile and internet banking. Wan et al. (2005) reiterated the need for banks to implement digital banking, i.e. to reduce the operational costs of traditional types of banking channels. Thus it is concluded that benefit exists both to consumer and bank for the successful adoption of digital banking (including Mobile banking) by consumers.

The context of this study is therefore to measure the pre- and post-adoption transactional behaviour of customers who have adopted mobile banking. It is expected that the adoption of mobile banking would affect the behaviour characteristics of customers’ use of traditional banking channels.

For a retail bank, the perceived benefit of migrating customers to digital banking is viable in terms of total customer lifetime value. “Internet banks can operate at an expense ratio of 15-20 per cent compared to 50-60 per cent for the average bank” (Booz, Allen, & Hamilton, 1997) as cited by Sathye (1999) and Tan and Teo (2000). It follows that internet and mobile banking reduces the operational costs of traditional banking channels (i.e. branches and automated teller machines) for the bank.

Digital banking also offers ancillary customer relationship advantages. Peppard (2000) explored the role of “ebanking” in terms of customer relationship management and its ability to directly contribute to customised relationship management, back-office and front-office integration within a customer centric

strategy, e-billing (i.e. electronic bill presentment and payment), amongst other bank and customer benefits.

The post-adoption benefits of mobile banking could thus be summed up as the operational cost savings associated to customers transacting on these channels, instead of traditional channels, and the ability to have a customer centric relationship with the customer which introduces a new platform for new product sales, advertising and communication.

1.2.1 Context of South African bank customers

South Africa has 23.2 millions citizens that hold a bank account (BusinessTech, 2013), out of a total population estimated at 52.9 million (2013 Statistics South Africa mid-year estimate) (Statistics South Africa, 2013). There is a 123% penetration of mobile connections in the country (Deloitte & GSMA, 2012), with many people owning one or more active SIM cards.

Driving this high rate of mobile adoption within the country has been the increasing decline in the cost of device ownership as depicted in Figure 1.

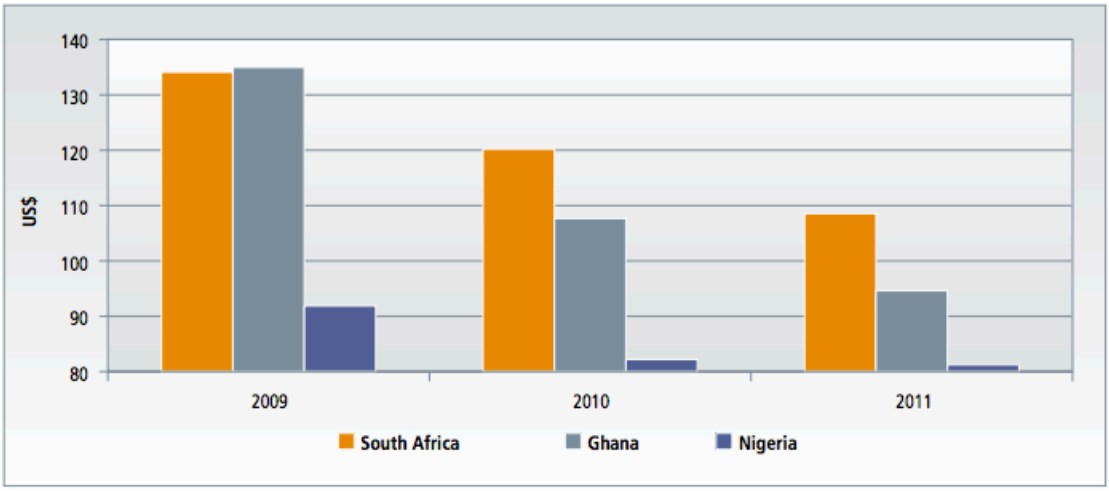

Figure 1 - Reductions in mobile device prices (2009-2011) (Deloitte & GSMA, 2012)

South Africans spend considerably more, as measured by total industry revenue, in the mobile industry that any other country in Africa. Figure 2 depicts South Africa's revenues (placing it as the highest in the continent) and further

depicts that South Africans spend approximately 20% of revenues on data (Deloitte & GSMA, 2012).

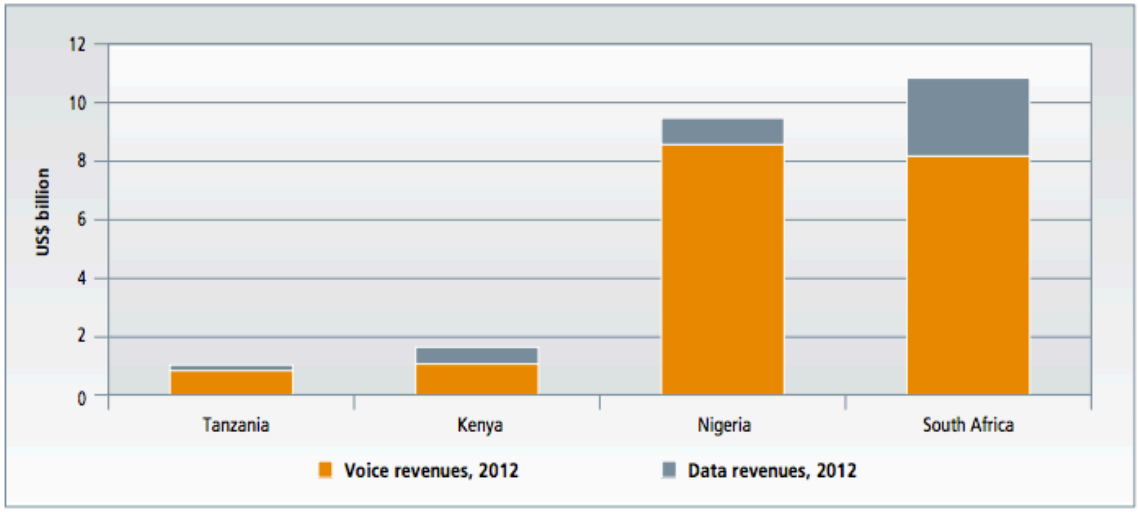

Figure 2 - Revenue composition in Tanzania, Kenya, Nigeria and South Africa (2012) (Deloitte & GSMA, 2012)

It follows that due to a high rate of mobile technology adoption in South Africa, and by extension growing adoption of mobile data, that via the Theory of Reasoned Action (Rodger, 1995) that this forms part of the adoption pre-requisites for mobile banking (Hoehle, Scornavacca, & Huff, 2012).

For purposes of this study, we assume that the data analysed for the customers of mobile banking, have fully adopted the channel via the theory of the Technology Adoption Model and Theory of Reasoned action, i.e. relative advantage, compatability, trialability, observability, and complexity, (Rodger, 1995) as cited by Hoehle et al. (2012), and the framework developed by Tan and Teo (2000), as cited by Brown et al. (2003). This assumption is based on the fact that the sample of customers has adopted and is using mobile banking.

1.3 Problem statement

1.3.1 Main problem

The purpose of this study is to analyse the *ex post facto* (after adoption) behaviour of retail mobile-banked customers, with the expectation that adopting

mobile banking has had the effect of reducing the use of traditional banking channels. By comparing the pre-adoption behaviour to the post-adoption behaviour of these customers, across all banking channels, a meaningful analysis that illustrates the shift of transactions from traditional to digital banking should be observed.

1.3.2 Sub-problems

The first sub-problem is to identify the transactions undertaken during the pre-mobile banking adoption stage (traditional banking), observing consumer usage behaviour, to determine the transactions that mobile banking could migrate.

The second sub-problem is to analyse the post-adoption stage of mobile banking for these customers to observe the usage behaviour whilst using both traditional and digital banking channels. This is expected to determine whether the transactions identified in sub-problem one were migrated to mobile banking channels.

1.4 Significance of the study

The study fills a gap in that much research has been performed on the adoption characteristics of mobile and internet banking (Beckett, Hewer, & Howcroft, 2000; Brown et al., 2003; Hoehle et al., 2012; Howcroft, Hamilton, & Hewer, 2002; Kim, Shin, & Lee, 2009; Sathye, 1999; Tan & Teo, 2000), and more can be understood in the post-adoption behaviour of mobile banking, whether it does indeed result in a shift of customer transaction behaviour.

This study will attempt to directly compare the pre- and post-adoption consumer behaviour changes for transactions that are available on both traditional and digital transactional channels. Transactions such as cash withdrawals and deposits would also be included for traditional channels, but not for digital channels as these are not possible on these channels. If it were observed that there tends to be an overall behaviour shift from traditional to mobile channels, then this would affirm the pre-analysis assumptions of this study.

The study will provide guidance to senior management, marketers and strategists in the financial services industry to understand the *ex post facto* consumer behaviour changes and overall customer lifetime value to the organisation when customers migrate from traditional banking channels to mobile banking channels.

By understanding the shifts in consumer behaviour, it could be possible for the individuals responsible for the banking organisation's strategy to forecast how to reduce its reliance on traditional banking channels and therefore to increase the adoption of mobile banking by its customers. Suoranta and Mattila (2004) provided evidence that traditional banking usage had decreased due to mobile banking in a study conducted in Finland. Ultimately this study aims to quantify the positive value of mobile banking channels and the reduced consumption of traditional banking channels by customers that adopt mobile banking.

1.5 Delimitations of the study

This study has been limited to the transactional behaviour changes of consumers of retail banking and excludes business, micro, small, medium and large-scale enterprises.

This study evaluates the consumer behaviour changes related to the financial transactions (i.e. payments, transfers, mobile airtime, cash deposits and cash withdrawals).

The customers evaluated in this study would need to have held at least one transactional bank account, and were not users of mobile banking for a period of at least 6 months prior to the adoption of mobile banking, and remained as active users of Mobile banking for a period of at least 12 months after the adoption of mobile banking. The comparison of banking behaviour would be analysed for the pre-adoption period (January 2013 to June 2013) and the post-adoption period (January 2014 to June 2014). Effects of seasonal behaviour changes have thus been eliminated.

The data gathered for purposes of this study are to be limited to the internal data obtained from one bank's customer behaviour in the South African retail bank industry.

1.6 Definition of terms

Table 1 - Table of terms and definitions

Term	Definition	Reference
ATM (Automated teller machine)	A machine that allows bank customers to withdraw cash and perform other transactions at more convenient times and places than during banking hours at branches.	McAndrews (2003)
Branch banking channel	A physical, "brick and mortar" location where a bank customer can access accounts and perform transactions, usually with human-assistance.	McAndrews (2003); Sathye (1999)
Mobile banking	A channel accessed via a cellphone where customers are able to access their accounts, check balances, make transfers, payments, and perform various other transactions. This includes the USSD, Mobile Internet and App Banking Channels	Birch (1999) cited in Brown et al. (2003)
Traditional banking channels	Banking channels that depend on the user travelling to a location to utilise the physical channel, as opposed to a virtual channel (mobile or internet). Traditional channels include branches and ATMs.	Wan et al. (2005)

1.7 Assumptions

It is assumed that using the data from one bank will provide a fair reflection of behaviour patterns of the banking consumer in the South African retail-banking sector.

The reasoning applied to this assumption is that this would apply to customers who have adopted mobile banking (hence any competitive advantage of any one bank with regard to this channel is considered not relevant); and that the research is limited to transactions offered by all mobile channels of the four main retail banks in South Africa, i.e. Amalgamated Banks of South Africa (ABSA), First National Bank (FNB), Nedbank and Standard Bank, viz. payments, transfers, prepaid purchases, cash deposits and cash withdrawals.

The use of internal data from a bank should ensure that the data is clean, has external and internal validity and is fit for use for this research.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

Existing works in the areas of mobile banking, customer loyalty and consumer behaviour will be presented in this literature review. This is necessary to "prevent reinvention of the wheel" (Carole & Meyer, 1999), and to develop a theoretical framework from which the problem stated in this research can be applied to and evaluated against.

A study in Finland by Suoranta and Mattila (2004) evaluated the ex-post facto consumer behaviour of mobile banking customers and found that customers who adopt mobile banking, reduce their financial transactions on traditional banking channels. The study was based on the extension of previous work related to the Technology Adoption Model by Rodger (1995), but did not factor the types of transactions that were migrated from traditional banking channels. Suoranta and Mattila (2004) found that the increased usage of mobile banking was correlated to the closure of bank branches, hence suggesting that consumers' increased usage of digital banking had an effect of reducing the number of bank branches.

This literature review will review the factors used in the Brown et al. (2003) study and the adopters identified by the Sankar (2009) study. It will further develop the problem statement, i.e. the *ex post facto* behaviour of the adopters of mobile banking, to determine whether there is a basis to suggest a change in customer behaviour from traditional banking channels to digital banking channels.

2.2 Definition of topic

The topic herein aims to understand the behaviour change of customers before and after the adoption of mobile banking.

Traditional banking refers to the Branch and ATM channels offered by banks to customers in order for customers to transact with accounts held at the bank (Moutinho, Davies, Deng, Peris, & Alcaniz, 1997).

Mobile banking is a type of digital distribution channel (Dohmen, Moormann, & Rosemann, 2009), a software application, that allows customers to conduct transactions with accounts held via a mobile phone.

Before the adoption of mobile banking, customers would transact via traditional banking channels, herein having a spread of behaviour across the traditional channels offered by the bank (Moutinho et al., 1997).

The aim of this study is to evaluate the behaviour of customers prior to the adoption of mobile banking, i.e. the spread of behaviour across traditional banking channels, and to compare this to the spread of behaviour across both traditional and mobile banking channels.

Suoranta (2003); Suoranta and Mattila (2004) found in two Finnish based studies that after the adoption of mobile banking, the spread of banking behaviour across channels had changed, i.e. transactions were spread across traditional and mobile banking channels.

It is therefore the aim of this study to evaluate the behaviour change from traditional banking to mobile banking within the context of South Africa.

2.3 Traditional banking

In his assessment of strategic distribution channel decisions for banks, Mols (1998) alluded to the high operational costs involved in the operations and maintenance of bank branches. Apart from financial costs, he described the challenges banks face when they attempted to gain market share and or provide convenient access to existing customers. As such the number of branches that are available in the geographic context can also measure larger and smaller banks.

Moutinho et al. (1997), and as cited by Mols (1998), both suggest that the future of branch banking is “doomed”. However the work of Mols (1998), whilst evaluating online banking to branch banking, suggested that that the adoption of online banking would be determined by the literacy of the consumer (in relation to using the internet), and the extent of services available on online banking compared to the bank branch. Therefore it can be assumed that in the foreseeable future there would exist a need for physical bank branches however the number of bank branches available and services offered may likely reduce.

2.3.1 Proposition 1 – Cash reliance would inhibit mobile banking adoption

Cash is a driver of continued traditional banking usage after the adoption of mobile banking.

The services offered by both branches and ATMs that cannot be replaced by digital banking. Currently are the issues of “Know-Your-Customer (KYC)” and physical cash needs (King, 2010).

KYC is a compliance need whereby customers need to physically interact with a bank to establish the customer’s identity, physical domicile and other identifying information for the purposes supporting the prevention of fraud and money laundering (Batista, Simione, & Vicente, 2012).

2.3.2 South African retail banking

Retail banking in South Africa is largely provided by the “Big 4” banks viz. ABSA, FNB, Nedbank and Standard Bank. Retail banking in South Africa is highly regulated and complies with the Banks Act (1990) of South Africa, as is regulated by the South African Reserve Bank. The monetary system in South Africa is independent of the state (Kirsten, 2006).

One of the challenges faced by South African banks is the issue of banking the unbanked, i.e. to provide banking services to people who previously did not have banks accounts due to this demographic living in rural areas, the structural

after-effects of apartheid, poor financial literacy, and/or past experience of not receiving credit from banks, therefore being perceived as unworthy customers (J Coetzee, van Zyl, & Tait, 2012; Maumbe, 2006). Where the unbanked have recently started to hold bank accounts is via the introduction of “Mzanzi” accounts, a government compliance initiative, where all retail banks in South Africa are obliged to make banking more accessible to the larger unbanked population (Brown et al., 2003; J Coetzee et al., 2012; Maumbe, 2006).

Brown et al. (2003) and Maumbe (2006) postulate that the penetration of banking into the unbanked community is largely driven by mobile banking services, where the geographic location of the bank branch is no longer a challenge and the basic transactions needed are available on a mobile phone.

2.4 Consumer behaviour

The essence of this research report aims to determine whether the adoption of mobile banking by South African retail banking consumers has the desired effect of replacing traditional banking channels, which by inference seeks to determine whether the banking behaviour of the consumer has fundamentally changed from traditional to digital banking channels, after mobile banking was adopted.

Aker and Mbiti (2010) examined the effects of mobile phone adoption and formed a correlation to economic development. It was established, via examples of the myriad of innovative applications of mobile phones in Africa, that the device is much more than a mechanism of communication. It was further found that sixty per cent of the African population (including sub-Saharan Africa) owned a mobile phone, but it was not conclusive whether there was a direct correlation to economic development due to the infancy of mobile commerce applications at the time of the report.

2.4.1 Factors influencing mobile banking adoption

Many articles and studies have established the primary factors that influence that affect mobile banking adoption. The basis of this study, from the work of

Brown et al. (2003) and Sankar (2009), is embedded in the psychology of consumer behaviour change with respect to mobile banking.

Brown et al. (2003) and subsequently Sankar (2009) established that the Technology Adoption Model developed by Rodger (1995), from the initial work of J and D (1986), i.e. the Technology Acceptance Model, is a reliable basis of factors for consumers to choose to adopt Mobile banking. Figure 3 depicts the Technology Acceptance Model, which illustrates the causal link between technology attributes and human behaviour responses.

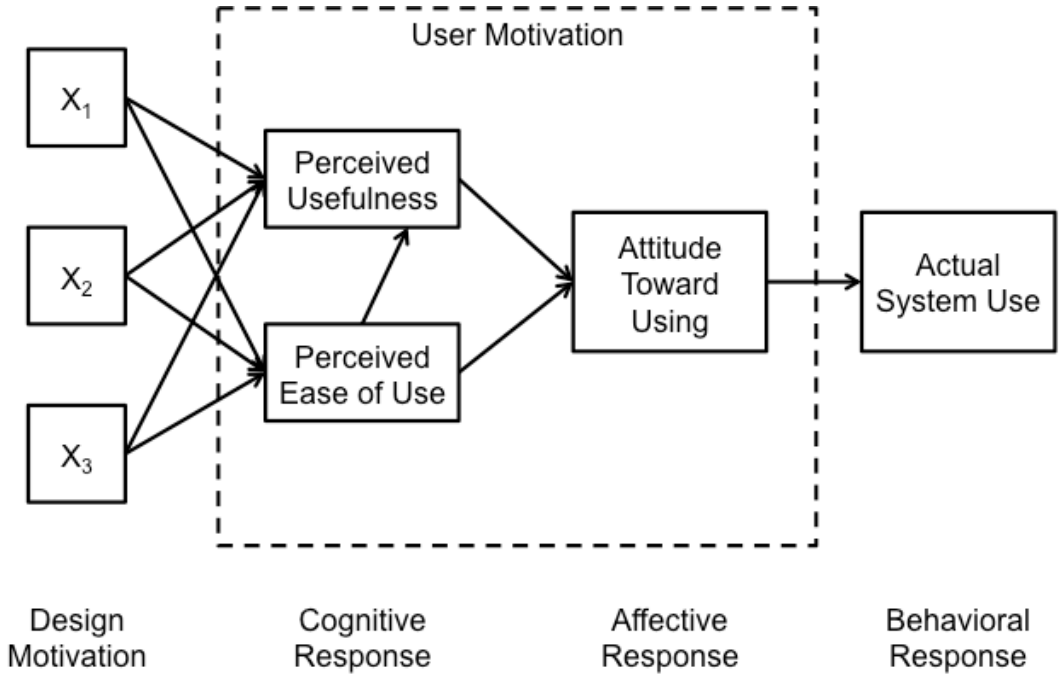

Figure 3 - Technology Acceptance Model (J & D, 1986)

The studies by Brown et al. (2003) and Sankar (2009) correlate to a large extent in relation to the aspects of the TAM model that apply to mobile banking adoption. These are listed below and include the specific aspects that clearly stand out as significant from both studies.

> **Perceived Value** – Respondents indicated that convenience, time saving, and availability of transactions from other channels would rate high in terms of the value that mobile banking offered.

Trialability – Respondents from both studies indicated that the ability to demonstrate the service before adoption would put their minds at ease in terms of the correct operation of the service.

Perceived Complexity - Sankar (2009) found that one of the strong entry barriers was the perceived complexity of the channel. Respondents indicated a strong preference toward simplicity and ease of use.

Perceived Risk – Both studies highlighted that security was of high concern for the respondents, with Sankar (2009) finding that the security features were not well understood and that the threat of fraudsters was of concern. Brown et al. (2003) stated that the *"perception of risk … is a major impediment to cell phone banking adoption"*.

It is assumed that customers who have adopted mobile banking have overcome the hurdles of the Technology Acceptance Model, i.e. that the channel has intrinsic value, is simple enough for the user to understand its operation and, the risk perception of the channel is at an acceptable level for the customer.

2.4.2 Informal economic activity in South Africa

Approximately 30 to 45% of South Africans are unbanked, i.e. this percentage of people do not have any formal bank accounts (Kirsten, 2006; Maumbe, 2006). Most of these people live in townships and rural areas (Kitten, 2006) as cited by Maumbe (2006).

Neves and Toit (2013) argue that most rural and poor South Africans form the informal economic sector which is included in the economy via monetary injection from urban labour (migrant workers that send money to their families), informal trade and state cash transfers (social grants). Due to the nature of the informal economy, physical cash (banknotes) remains a reliable and secure

medium of money. Due to the reliability factor, it can be inferred that tangible money bears a feeling of trust (Neves & Toit, 2013).

Banknotes are also likely to continue to remain in use, not only in the informal sector, as it continues to be a truly anonymous payment mechanism. In a study by Paunonen and Jyrkonen (2002), exploring the use of cash in Finland, a first-world economy, banknotes continue to form a significant part of the country's economy. A large part of the unexplained reserves of cash were attributed to small transaction payments, hoarding and the use of banknotes in illegal activities. Although this study was conducted between 1995 and 2000, most payments and money exchanges in Finland took place in a cashless form. By extension, it is believed that at the least South Africans would have a dependency for cash, even if the consumer adopted Mobile banking.

2.4.3 Ex-post facto adoption behaviour of consumers

Mobile banking offers customers the services of account balances, transaction history statements, payments, transfers and prepaid airtime purchases. Suoranta and Mattila (2004) continue to state that the comparable services offered via mobile banking compared to traditional banking made this a convenient alternative channel of banking, which is enabled via the innovative use of intricate technology to create a vital element of service delivery.

Adoption of technology is attributed to the Technology Acceptance Model presented in chapter 2.4.1. The Fogg Behaviour Model (FBM) (Fogg, 2009) can explain the behaviour change of human beings when technology has been adopted.

The Fogg Behaviour Model provides for 3 conditions to be met for a person to perform target behaviour. These are, (1) the person must be sufficiently motivated, (2) have the ability to perform the behaviour, and (3) be triggered to perform the behaviour (Fogg, 2009).

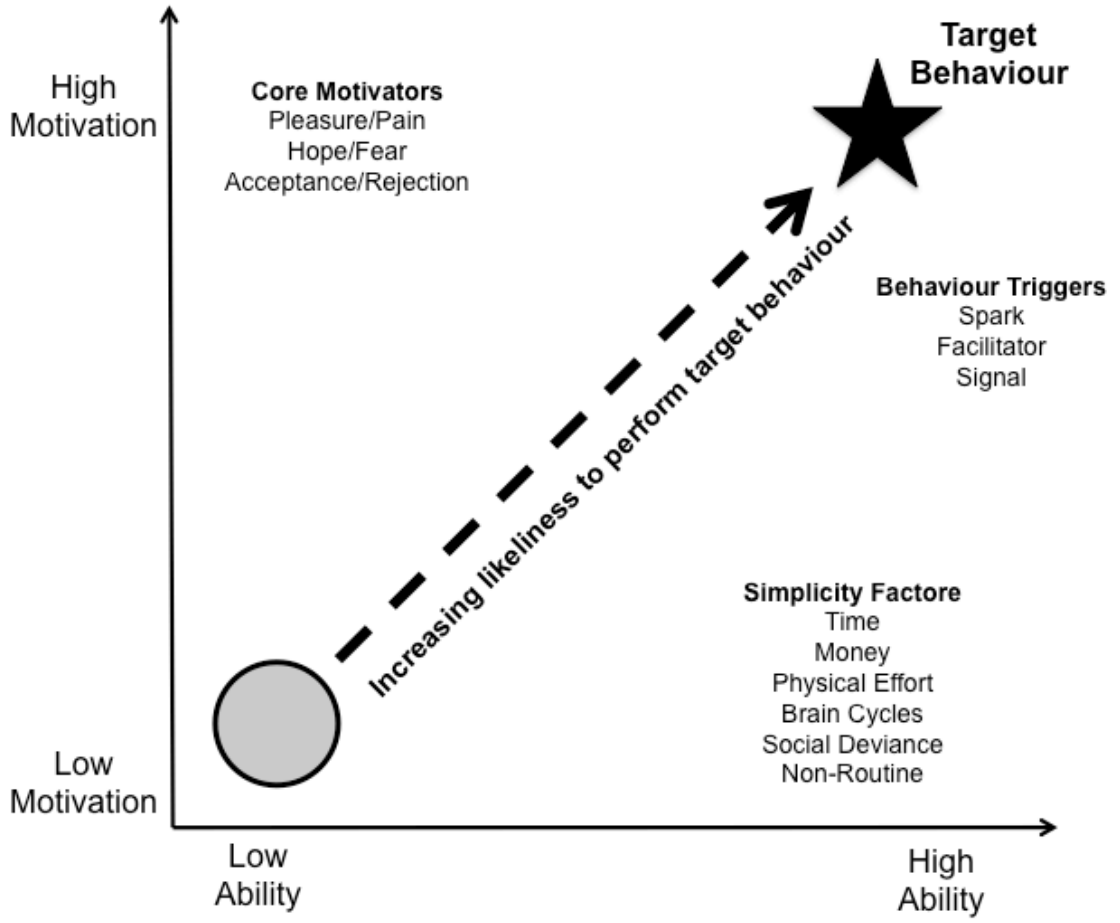

Figure 4 - Fogg Behaviour Model (Fogg, 2009)

The above model would thus suggest that for a customer to adopt mobile banking, and to migrate his transactions from traditional banking channels to mobile banking, the customer must be highly motivated to do so, have the ability to do so, and be triggered to perform the action.

In the study of Sankar (2009) it was found that the mostly frequently used channels by respondents were online banking (34%), ATM (32%), branch (17%) and lastly mobile banking by 15% of respondents.

Aggregating these results, we can determine that 49% of respondents used traditional channels (branch and ATM) most frequently. It would therefore be plausible that although customers have access to (and awareness of) mobile banking, that traditional banking channels would remain relevant for transactions that customers are accustomed to performing on these channels.

2.4.4 Human behaviour change

The essence of this study is to determine the post-adoption behaviour characteristics of people who adopt mobile banking as a new channel (and technology) of banking. It is well known that some people embrace change, and others do not, but little is understood of why this is so (Logie-MacIver, Piacentini, & Eadie, 2012).

Logie-MacIver et al. (2012) define a Stages of Change model, Figure 5, which contains the phases of "pre-contemplation, contemplation, determination, action, relapse and maintenance". People may move back and forth between phases to assess and compare the positive and negative attributes between the new and old behaviour.

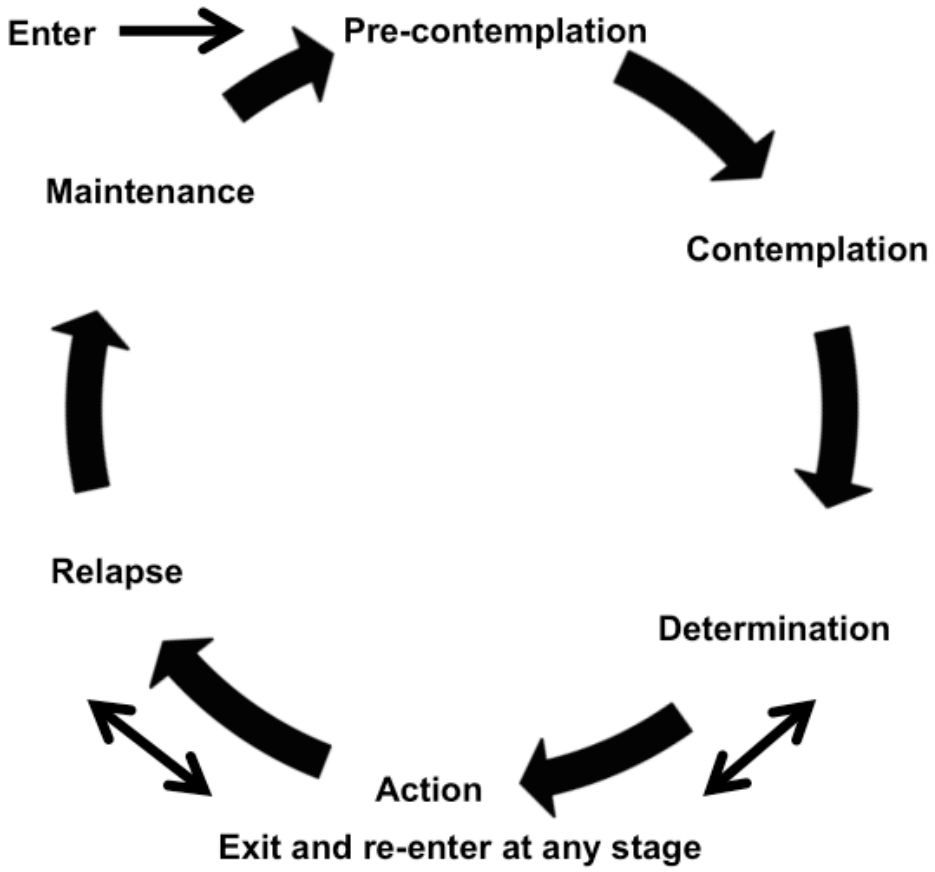

Figure 5 - Stages of Change Model (Logie-MacIver et al., 2012)

The changes phases are driven by processes that influence human behaviour and trigger the adoption or non-adoption of a certain type of behaviour (Prochaska & DiClemente, 1991) as cited by (Logie-MacIver et al., 2012). The underlying processes of change consist of verbal processes (education and information), commitment processes (overcoming barriers to change), behavioural processes (taking up alternate behaviour) and contingency processes (referring back to original motivators for change).

It is proposed that digital banking can be likened to online shopping due to the traditional channels (visiting a store similar to a bank branch), or utilising an online or mobile-based channel of transaction. Ahmad, Omar, and Ramayah (2010) found that conveniences exist for the customer, with regard to online shopping such as battling crowds, standing in long lines, and finding parking spaces in shopping malls.

Hoehle et al. (2012) proposed a theory of technology resistance. This suggests that factors exist that inhibit the adoption of technology. Following on the work of Laukkanen and Kiviniemi (2010) it was found that consumers can be resistant to mobile banking as a new channel of banking due to the barriers of having a lack of information and guidance, perceived risk, entrenched tradition and perceived lack of value.

It was further found that acceptance decisions (i.e. Technology Acceptance Model, Fogg Model and Stages of Change Model) are vital in the introduction of technology to a consumer (Yu, 2007) as cited by Ahmad et al. (2010). However this fundamentally differs from continuous use, which can be described as the continuance decisions made post-adoption of a new technology.

2.4.5 Proposition 2 – Habitual behaviour would inhibit mobile banking adoption

Customers, who adopt mobile banking, may not migrate their transactional behaviour to the channel due to habitual behaviour.

Ahmad et al. (2010) further found that trust and habitual strength plays and important role in the continuous use of an online channel in comparison to a traditional channel.

Grabner-Kraeuter (2002), as cited by Ahmad et al. (2010), found that trust in online retail shopping stemmed from the scepticism and suspicions consumer had with regard to electronic commerce, i.e. the in-transparent nature of the channel, and the perceived quality of the product or service being purchased.

Ahmad et al. (2010) found that habitual strength refers to the formation of a continuous behaviour by a consumer in relation to a new technology. Various intangible attributes were found to be markers of continuous habitual use, i.e. trust, confidence of using the channel and product pricing.

2.5 Conclusion of literature review

Brown et al. (2003) and Sankar (2009) investigated the factors that influence the adoption of mobile banking within the South African retail banking context. These drew on from the Technology Acceptance Model by Rodger (1995). The adoption of mobile banking via the Technology Acceptance Model was found in numerous other literary works namely Suoranta (2003) in Finland, Kolodinsky, Hogarth, and Hilgert (2004) in the United States, Kim et al. (2009) in Korea and Tan and Teo (2000) in Singapore.

The adoption factors of mobile banking from these studies suggest that the principles of the Technology Acceptance Model must remain intact, that is, there must exist a perception of value for the channel by the consumer, trialability of the channel to help equip the consumer with the self-efficacy required to adopt mobile banking, that the perceived complexity of the channel must remain relatively low (thus to be simplistic) and that the risk of conducting transactions on mobile banking is sufficiently mitigated.

Logie-MacIver et al. (2012) suggested that apart from the decision to adopt a technology there requires a decision to continue using a newly adopted technology. This study focuses on this aspect of ex-post facto mobile banking

adoption to determine what behaviour changes take place once mobile banking has been successfully adopted by a consumer.

2.5.1 Proposition 1 – Cash reliance would inhibit mobile banking adoption

Retail banking in a developing country such as South Africa has components of both formal and informal banking practices (J. Coetzee, 2011; Kirsten, 2006; Maumbe, 2006). It was further found that there is a likely propensity for most people to adopt mobile banking due to the structural challenges of the country and banks being able to physically reach consumers in far out rural areas.

Mobile banking holds the promise to bank the unbanked. The studies of Aker and Mbiti (2010), Kirsten (2006), Maumbe (2006), and Deloitte and GSMA (2012) provide the state of the unbanked economy in South Africa (and Sub-Saharan Africa where applicable), and the drivers of mobile banking adoption to assist in bringing banking services to these consumers.

Proposition 1 therefore holds that for informal customers, the reliance on cash and trust of utilising cash will hold as a barrier of migration from traditional banking to mobile banking.

2.5.2 Proposition 2 – Habitual behaviour would inhibit mobile banking adoption

The factors that act as barriers to the adoption of mobile banking were investigated by Laukkanen and Kiviniemi (2010). The key factors were perceived risk and the lack of information about mobile banking offered to the customer. Apart from resistance, the reliance of cash within the informal sector, as well as the perceived trust of cash and interacting with a human being, are societal features in South Africa (Kirsten, 2006). This proposition therefore suggests that although customers may have adopted mobile banking, the practices previously performed on traditional banking channels may still remain for certain types of customers due to habitual and entrenched practices.

CHAPTER 3. RESEARCH METHODOLOGY

The research methodology explains and justifies the proposed research method to be used to analyse the ex-post facto adoption behaviour of mobile banking customers.

3.1 Introduction

The objective of this research is to explore the behaviour of consumers post the adoption of mobile banking to determine whether a shift from traditional banking behaviour to mobile banking can be observed. An analytical approach of analysing the transactional information of retail banking clients, that have successfully adopted mobile banking after using traditional banking, was conducted to determine whether a change in customer behaviour does indeed take place. The research was carried out on the proportions of transactions performed per user per channel. Each observed user made use of all channels before mobile banking adoption, and all channels after mobile banking adoption.

3.2 Research methodology/paradigm

A quantitative methodological approach of data analysis is required in this study to measure the ex-post facto behaviour changes of customers. K-means cluster analysis was used to determine the behaviour change of mobile banking customers from pre-adoption to post-adoption.

In attempting to model the behaviour change via transactional data of customers, a quantitative application of analysis was required. When segmented data observations are available, the application of a process such as cluster analysis is required, to model the behaviour of the observed data. This differs from discriminant analysis where the observation are used to infer the structure of the data as a whole or the categorisation of the sample (Fraley & Raftery, 1998).

3.3 Research design

The study was conducted using primary data made available from a retail bank in South Africa. One of the four major retail banks made data available for this study. This data was found to have the characteristic of being reliable due to the source of extraction. Unlike surveys or questionnaires, the data will be interval and continuous data offering a high level of statistical information (Penman, 2013).

3.4 Population and sample

3.4.1 Population

The population of mobile banking customers in South Africa is estimated to be at least approximately eight per cent (Mahlong, 2011) of the population of approximately 52.9 million people (Statistics South Africa, 2013), equating to 4.2 million mobile banking users.

3.4.2 Sample and sampling method

Retail banking transactional information was collected from the bank systems and was anonymous to the author. Demographic information was collected in conjunction with the transactional information for purposes of segmentation and analysis as required from the cluster analysis process, and further to provide demographic information as needed for interpretation.

The transactional data focussed on financial transactions (viz. payments, transfers, deposits, withdrawals, prepaid purchases) conducted by consumers who registered for mobile banking between 1 January 2013 and 30 June 2014.

Further, the analysis aggregated the transactional behaviour of these customers for a period of 6 months prior to mobile banking adoption and 6 months post the adoption of mobile banking, during the same calendar period, in order to rule out any seasonal and promotional effects, if they exist. Therefore the data collected measured transactional behaviour prior to the adoption of mobile

banking from 1 January 2013 to 30 June 2013; customers registered for mobile banking during the month of July 2013; the post-adoption period was measured from 1 January 2014 to 30 June 2014.

The selected sample was based on users that made use of all channels prior to the adoption of mobile banking, i.e. branch, ATM and online banking channels, and continued using all channels after the adoption of mobile banking, i.e. branch, ATM, online banking and mobile banking.

The proportions of transactions per channel per user were used to determine the level of preference to each channel. It was found that clusters were formed on a plane in space bound by the channels in each phase.

The intention of sampling existing customers from a retail bank was required to form as representative as possible sample selection of the population of mobile banking customers.

3.5 The research instrument

The proposed instrument of analysis to be used is K-means cluster analysis. It is expected that behaviour of respondents, pre- and post-mobile banking adoption, will vary between groups of the population.

As such a method of partitioning data in groups and sub-groups (Fraley & Raftery, 1998) would be required to compare the changes in customer behaviour.

A model of pre-mobile banking behaviour is required to understand the behaviour followed by these customers. Then a model of post-mobile banking adoption behaviour would be created to view a shift (or not) in transactional patterns of the groups (clusters). It was therefore expected that cluster analysis would be able to classify these cases in to homogenous groups (clusters) (Malhotra, 1996), and observe the differences between the customer groups.

3.6 Procedure for data collection

Utilising internal bank data, a high level of internal validity is expected from the information acquired. The fields required from the retail banks for the purposes of this study are listed in Table 2.

Table 2 - Demographic fields required for study

Field	Description	Type
Customer Number	A unique number assigned to each customer profile	Nominal
Age	The age of the customer	Interval
Gender	The gender of the customer	Nominal
Annual Income	The annual (gross) income of the customer	Interval
Race	The ethnic origin of the customer	Nominal
Marital Status	The marital status of the customer	Nominal
Phase of mobile banking	An indicator of whether the observation relates to the pre- or post-mobile banking adoption phase of the customer life time with the bank	Nominal
Channel	The channel that the transaction was performed on	Nominal
Transaction Type	The type of transaction that was performed by the customer	Nominal
Volume	The cumulative sum of number of transactions from the unique phase, channel and transaction type performed by the customer	Interval

3.7 Data analysis and interpretation

The analysis of the data is proposed to follow K-means clustering procedure (Malhotra, 1996), due to the grouped nature of bank customers. The groups are expected to be akin to marketing segmentation of customers.

Malhotra (1996) described K-means clustering as that which finds the distance from the cluster centre for each observation. The researcher is required to specify the number of clusters required. For each cluster the square sum of the Euclidean distance from the cluster centre is calculated. The square sum is plotted against the number of cluster solutions, and the “elbow” of the curve would indicate the optimal number of clusters required for the analysis.

3.8 Limitations of the study

- The study will be limited to the analysis and interpretation of mobile banking customer that adopt App, USSD and mobile internet banking channels.
- The results of this study are applicable within the South African context and is not offered for interpretation elsewhere.
- The transactions reviewed are subset of financial based transactions only, and exclude informational transactions (i.e. balance enquiries, statement requests, etc).

3.9 Validity and reliability

Golafshani (2003) offers that quantitative research allows a researcher to test a given hypothesis or proposition in terms of the facts and causes of behaviour, that the facts and numbers can be summarised and quantified, a numeric process is the norm for analysing the numeric data, and the final results are interpreted in statistical terminology.

Validity is the ability of the research to measure the expected results. In other words the ability for the research results to be measured accurately with the given data.

3.9.1 External validity

The external validity of the study is the ability to generalise the population behaviour, thereby drawing a statistical inference (Bracht & Glass, 1968). In choosing to obtain customer transactional data from the retail banks in South Africa, it is expected to draw on a significantly large sample of observations, for two key requirements:

- To resemble as true as possible set of results to draw an inference to the larger population, and
- To obtain a sufficient sample of observations for each transaction, conducted on each of the channels, for both phases of the customer life cycle.

3.9.2 Internal validity

Shadish, Cook, and Campbell (2002) offer three criteria to ensure internal validity:

- The cause precedes the effect in time,
- The is a causal relationship between the cause and the effect,
- The observation is not spurious, i.e. there is no plausible alternative explanation for the results

This study concerns itself with the behaviour change of consumer banking habit after the adoption of mobile banking. The event of adopting mobile banking is proposed to change the traditional banking behaviour of the customer. Using the bank sourced customer data; it was possible to ensure that the cause (adoption of mobile banking) would precede the effect (changed customer behaviour, post-adoption). The explanation of the results could be attributed to the introduction of mobile banking as a new banking channel to explain the change in behaviour, however other effects such as advertising, promotions, or other causes could result in a change of consumer behaviour.

3.9.3 Reliability

Golafshani (2003) described reliability as the ability to replicate the study at a later time using the same or similar constructs of data. For this reason this study aims to use data collected over a total period of 18 months of a customer's life cycle. After the pre-adoption observation period, the customer would have adopted mobile banking, and further the date of adoption spans between 1 July 2013 and 31 July 2013.

It is assumed that the seasonal effects of advertising campaigns, holidays, bonuses, and/or other effects would be mitigated by observing a relatively long term of customer behaviour. Bracht and Glass (1968) describe the interaction time of measurement as a factor that can lead to unreliable experiments. Additionally, developing a significantly large sample, would further infer a degree of reliability.

3.10 Sample size

The sample of unique customer records obtained was 445. The sample was based on actual customer data collected between January 2013 and June 2013, and compared to the same period between January 2014 and June 2014. The same sample of customers was used; observing the number of transactions performed per channel during both periods.

The sampling methodology was based on customers that adopted mobile banking between 1 July 2013 and 31 July 2013. The transaction and channel data collected between 1 January 2013 and 30 June 2013 forms the pre-adoption behaviour, and the data collected between 1 January 2014 and 30 June 2014 forms the post-adoption behaviour.

3.11 Demographic profile of sample

Each variable was qualitatively evaluated against research for its representation of the demographic makeup of South Africa.

3.11.1 Age

The mean age group of the sample was 39.6, with a standard deviation of 11.1 years, i.e. indicating a grouping of most ages between the 26-51 range, Figure 7.

Table 3 - Descriptive statistics of age

Statistics	Age
N	445
Mean	40
Median	38
Std. Deviation	11
Variance	124
Range	59
Minimum	18
Maximum	77

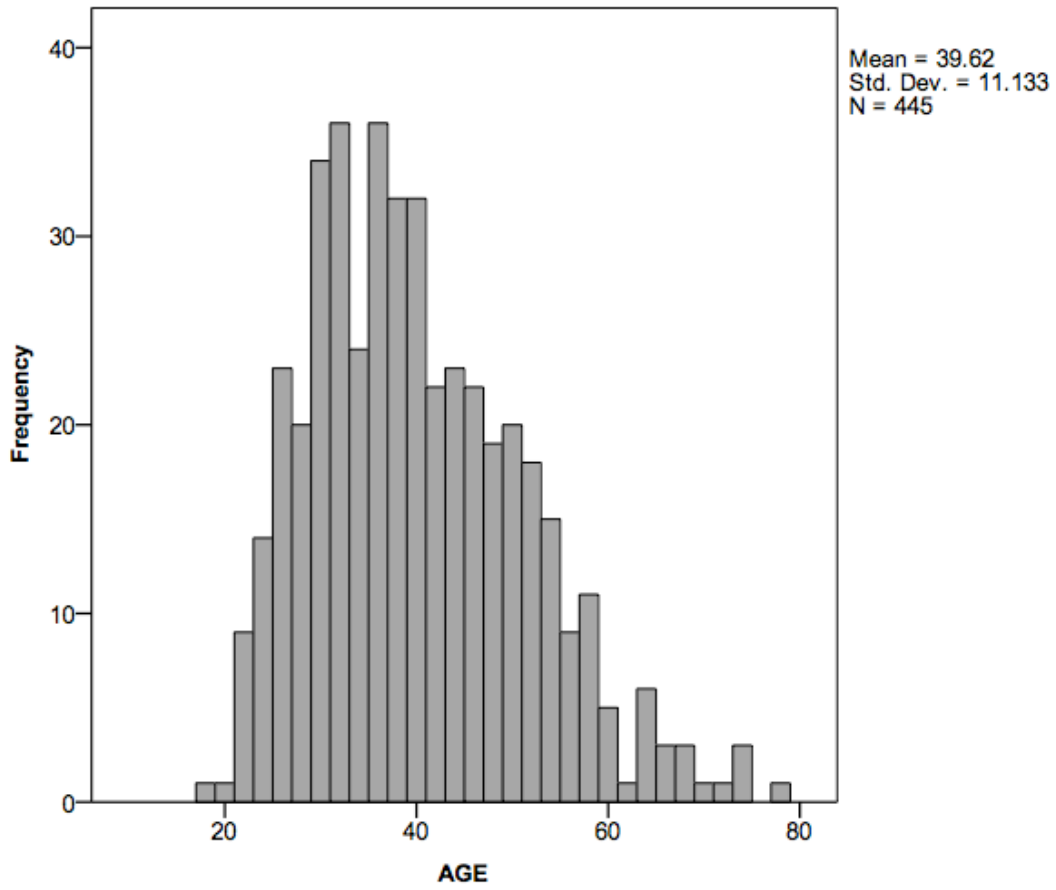

Figure 6 - Age of sample

3.11.2 Income

The mean income of the sample was R221,279, with a standard deviation of R413,331.

Table 4 - Descriptive statistics of income

Statistics	Income
N	445
Mean	221,279
Median	132,000
Std. Deviation	413,331
Variance	170,842,675,401
Range	6,000,000
Minimum	0
Maximum	6,000,000

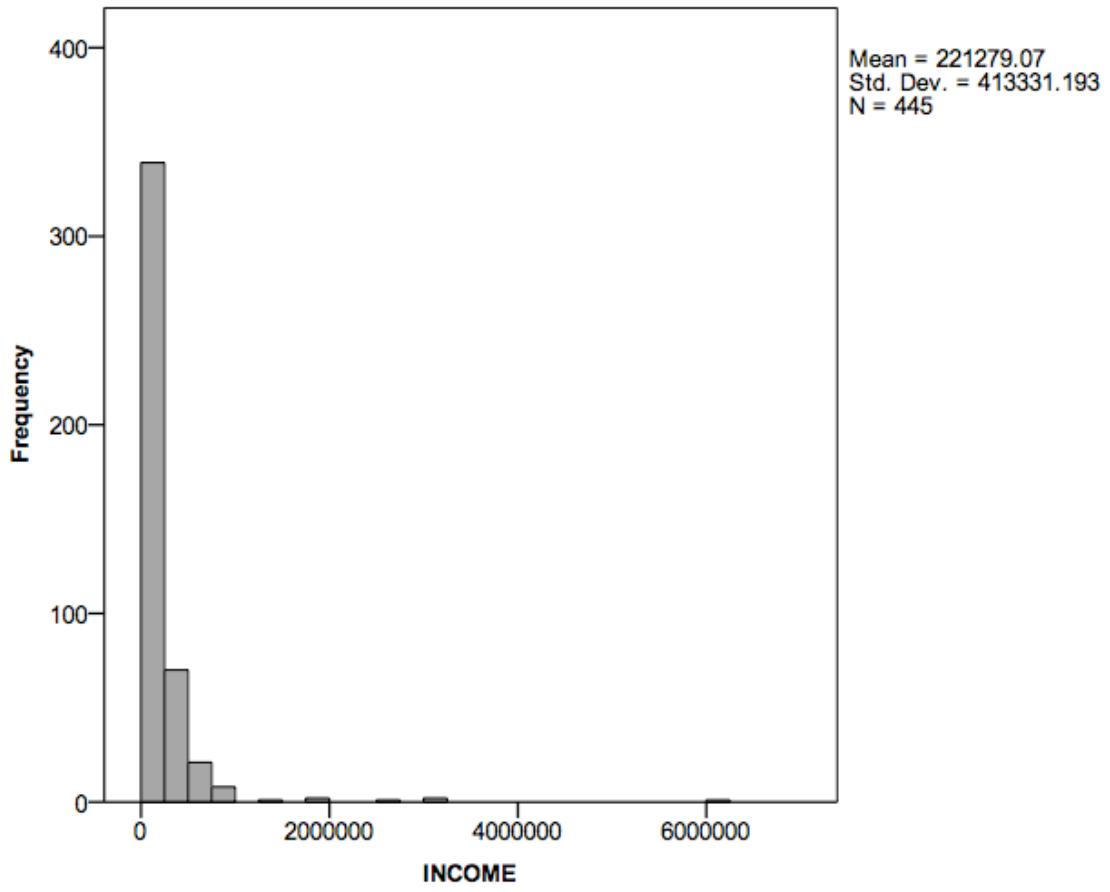

Figure 7 - Income of sample

3.11.3 Race

The race spread in concentrated to Black and White samples predominantly, Figure 8.

Table 5 - Descriptive statistics of race

Race	Frequency	Percent	Valid Percent	Cumulative Percent
Black	314	70.6	70.6	70.6
Coloured	29	6.5	6.5	77.1
Indian	27	6.1	6.1	83.1
White	75	16.9	16.9	100.0
Total	**445**	**100.0**	**100.0**	

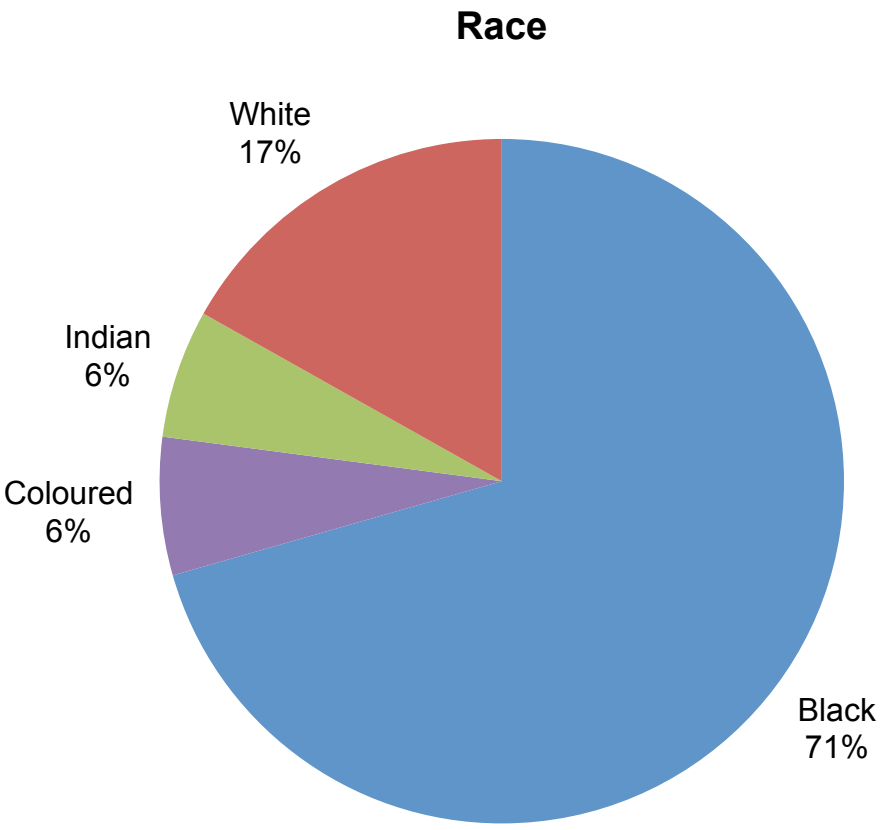

Figure 8 - Race distribution of sample

3.11.4 Gender

The gender of the sampled population indicates a higher percentage of males to females, Figure 9.

Table 6 - Descriptive statistics of gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	170	38.2	38.2	38.2
Male	275	61.8	61.8	100.0
Total	**445**	**100.0**	**100.0**	

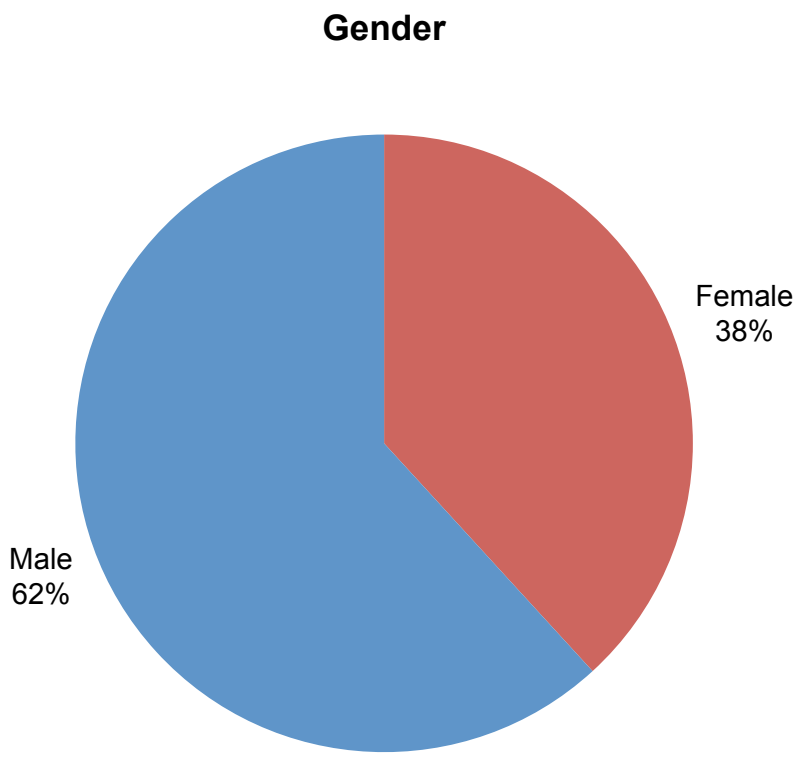

Figure 9 - Gender distribution of sample

3.11.5 Marital status

59% of the sample was observed as unmarried, 35% as married, 4% as divorced and 2% as widowed, Figure 10.

Table 7 - Descriptive statistics of marital status

Marital Status	Frequency	Percent	Valid Percent	Cumulative Percent
Divorced	19	4.3	4.3	4.3
Married	156	35.1	35.1	39.3
Unmarried	260	58.4	58.4	97.8
Widowed	10	2.2	2.2	100.0
Total	**445**	**100.0**	**100.0**	

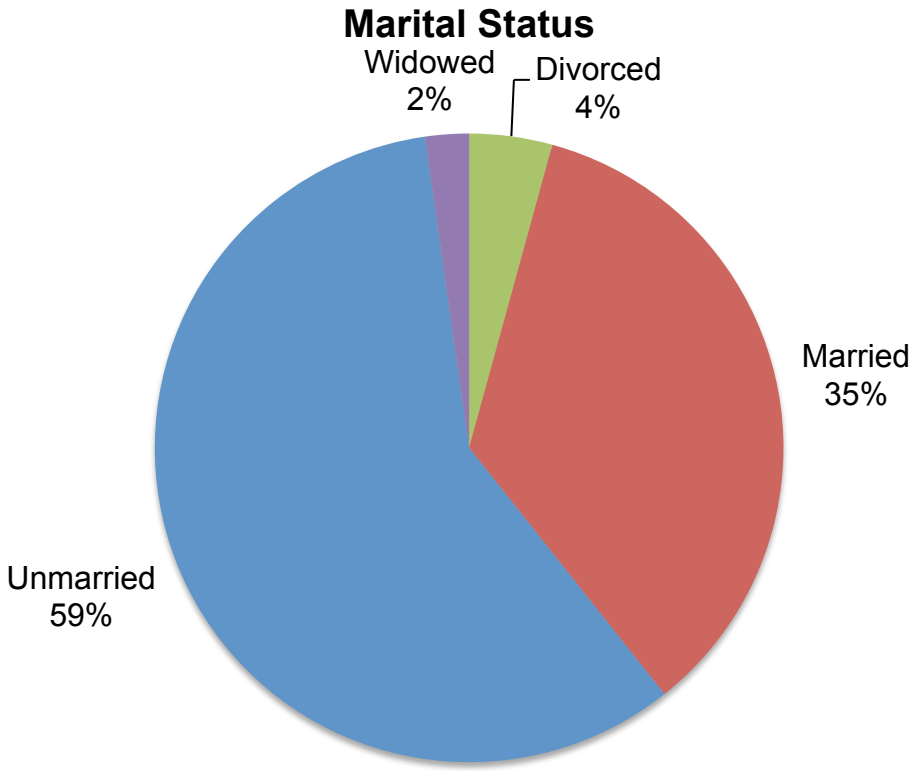

Figure 10 - Marital status of sample

CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

The purpose of this chapter is to present the results obtained from the primary data that was analysed. The first part of the chapter discusses the number of customers obtained in the sample and the demographics of these customers, as indicated in Chapter 3. The second part is the presentation of the pre- and post-cluster analysis of the data. Finally, output of the results of the clusters are described as well as results of ANOVA and Chi-Squared tests performed on the demographic variables of the sample group.

4.2 Pre-mobile banking behaviour

Prior to the adoption of mobile banking, the sample had made use of ATM, branch and online banking channels for transacting with their accounts. Descriptive statistics were drawn for the sample (Table 8).

Table 8 – Pre-mobile banking adoption descriptive statistics per channel

Pre-Mobile	ATM	Branch	Online
N	445	445	445
Mean	11	3	16
Median	4	2	7
Std. Deviation	20	3	42
Range	159	23	634
Minimum	1	1	1
Maximum	160	24	635
Total transactions	4 991	1 207	6 939

4.2.1 ATM usage

Based on the number of uses of the ATM channel during the 6-month period before mobile banking adoption, it was found that the mean number of transactions was 11. A histogram depicting the frequency of ATM usage is shown in Figure 11.

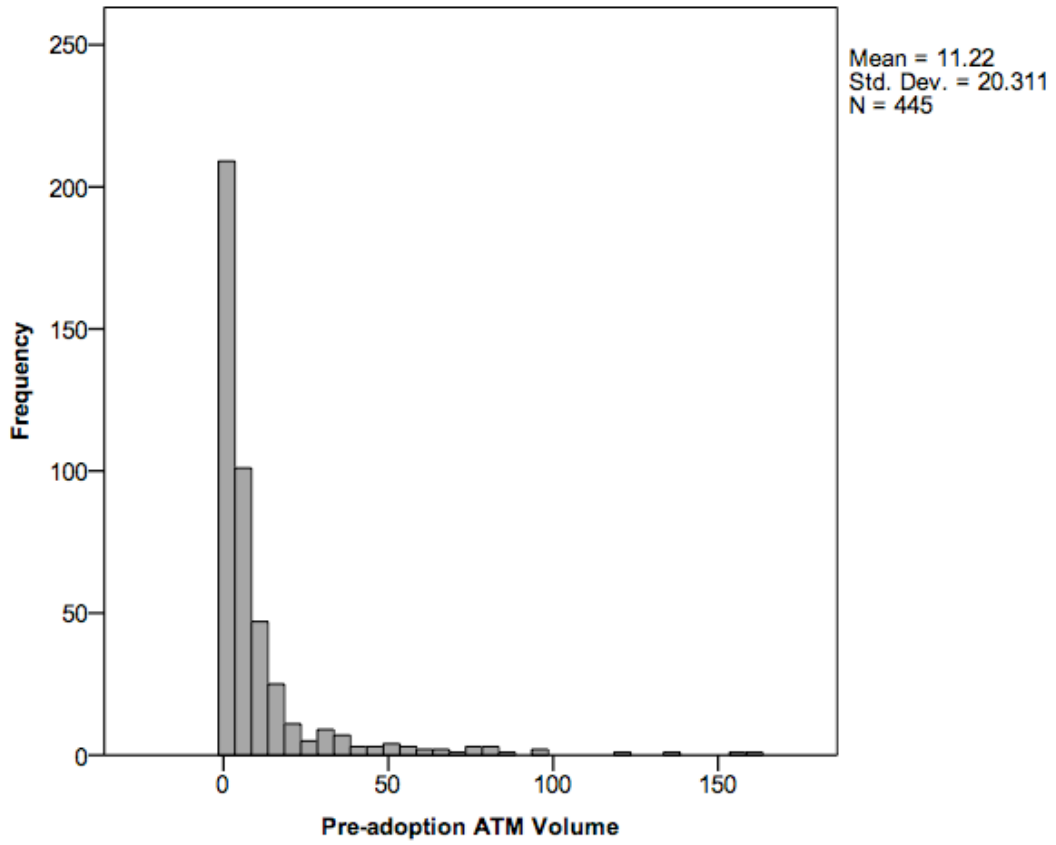

Figure 11 - ATM usage prior to mobile banking adoption

4.2.2 Branch usage

Based on the number of uses of the branch channel during the 6-month period before mobile banking adoption, it was found that the mean number of transactions was 3. A histogram depicting the frequency of branch usage is shown in Figure 12.

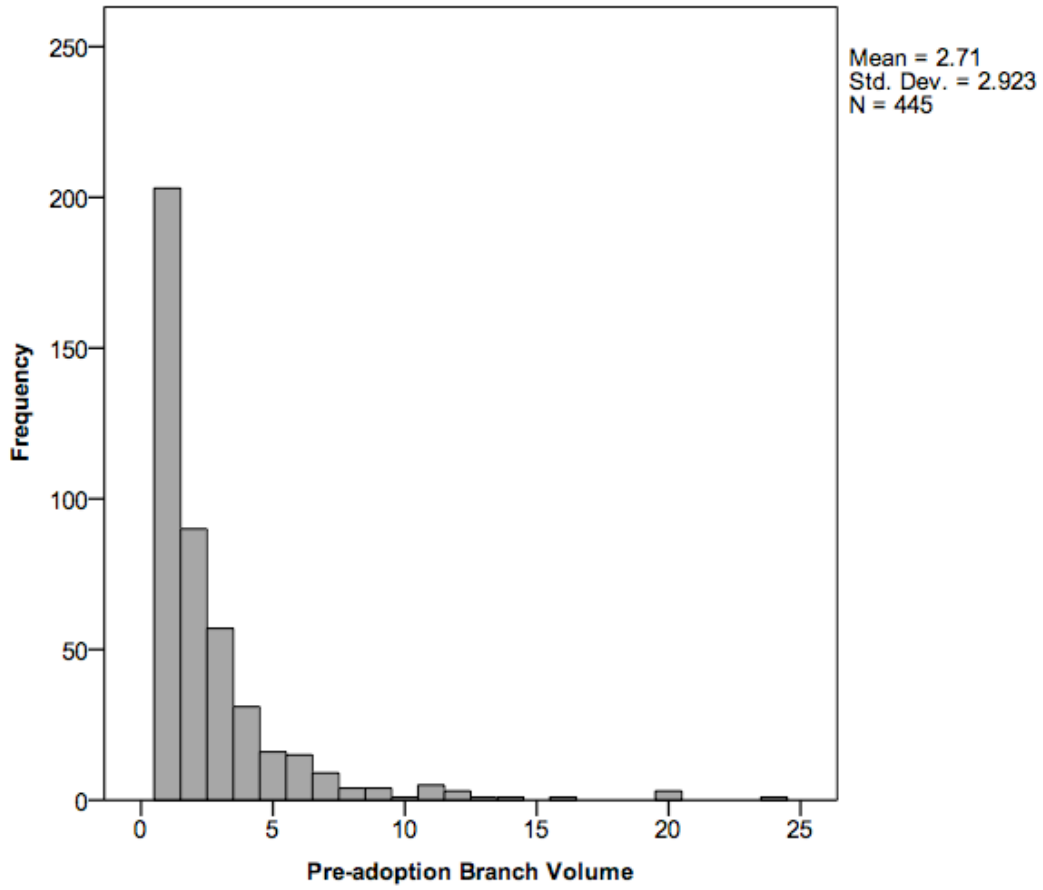

Figure 12 - Branch usage prior to mobile banking adoption

4.2.3 Online banking usage

Based on the number of uses of the online channel during the 6-month period before mobile banking adoption, it was found that the mean number of transactions was 16. A histogram depicting the frequency of online banking usage is shown in Figure 13.

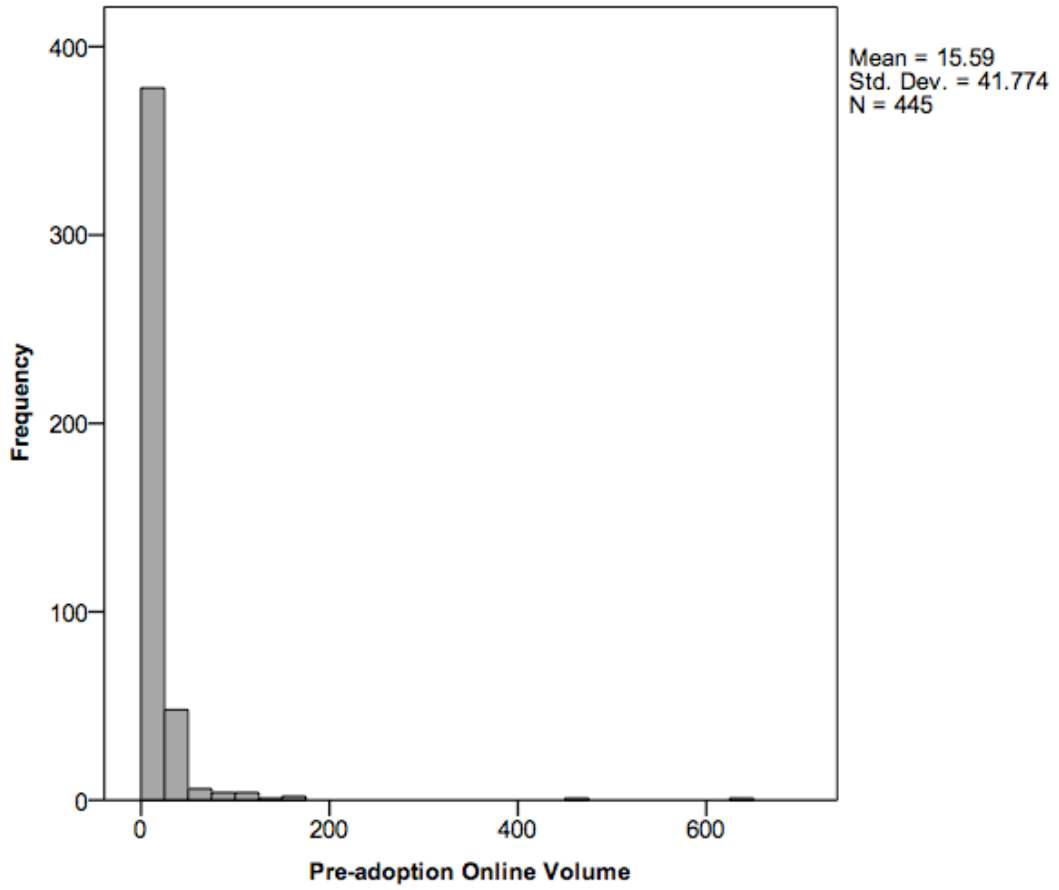

Figure 13 - Online banking usage prior to mobile banking adoption

4.2.4 Conclusion of pre-mobile banking behaviour

Online banking was the most used channel with a mean number of transactions of 16 and a total volume of 6,939 transactions, followed by ATM banking with a mean of 11 and total of 4,991 transactions, and lastly branch banking with a mean of 3 and total of 1,207 transactions within the 6-month period of observation.

4.3 Post-mobile banking behaviour

After the adoption of mobile banking, the sample had made use of ATM, branch, online banking and mobile banking channels for transacting with their accounts. Descriptive statistics were drawn for the sample (Table 9).

Table 9 – Post-mobile banking adoption descriptive statistics per channel

Post-Mobile	ATM	Branch	Online	Mobile
N	445	445	445	445
Mean	49	2	16	54
Median	37	1	7	37
Std. Deviation	43	2	42	58
Range	382	18	719	536
Minimum	4	1	1	1
Maximum	386	19	720	537
Total transactions	21 702	1 046	7 238	24 046

4.3.1 ATM usage

Based on the number of uses of the ATM channel during the 6-month period after mobile banking adoption, it was found that the mean number of transactions was 49. A histogram depicting the frequency of ATM usage is shown in Figure 14.

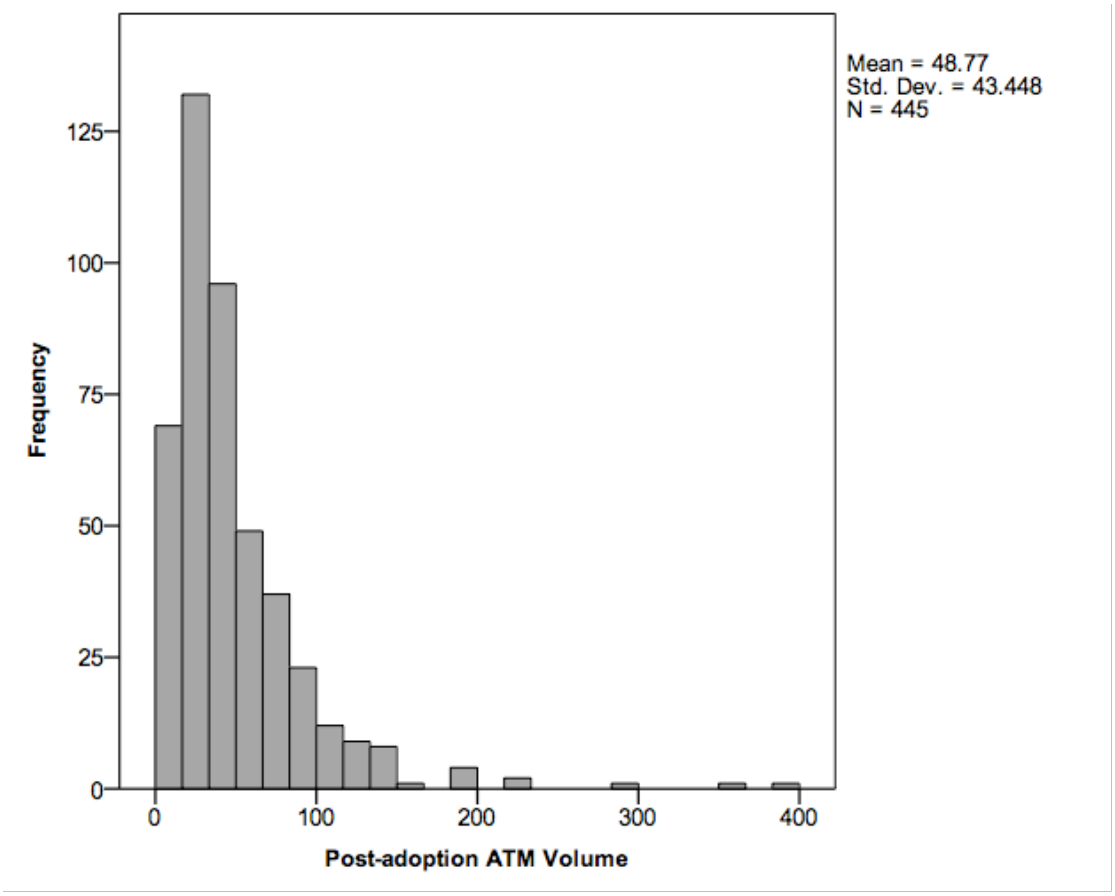

Figure 14 - ATM usage after mobile banking adoption

4.3.2 Branch usage

Based on the number of uses of the branch channel during the 6-month period after mobile banking adoption, it was found that the mean number of transactions was 2. A histogram depicting the frequency of branch usage is shown in Figure 15.

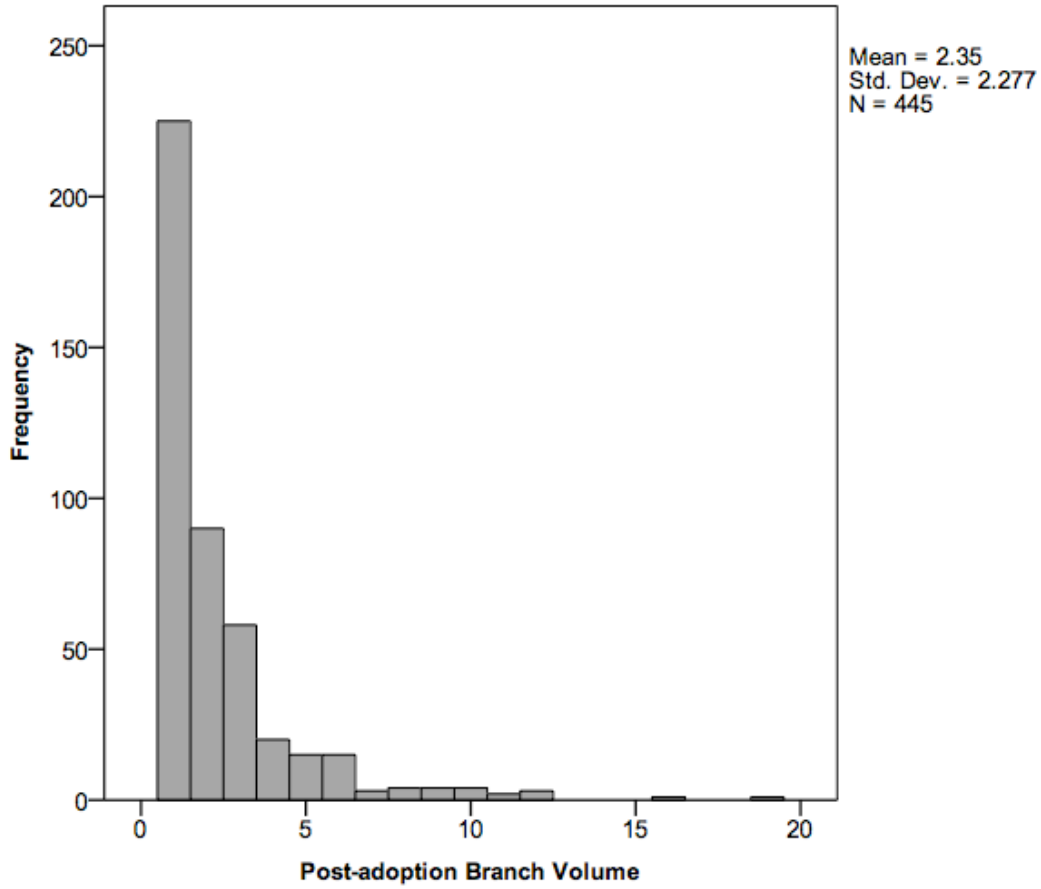

Figure 15 - Branch usage after mobile banking adoption

4.3.3 Online banking usage

Based on the number of uses of the online banking channel during the 6-month period after mobile banking adoption, it was found that the mean number of transactions was 16. A histogram depicting the frequency of online banking usage is shown in Figure 16.

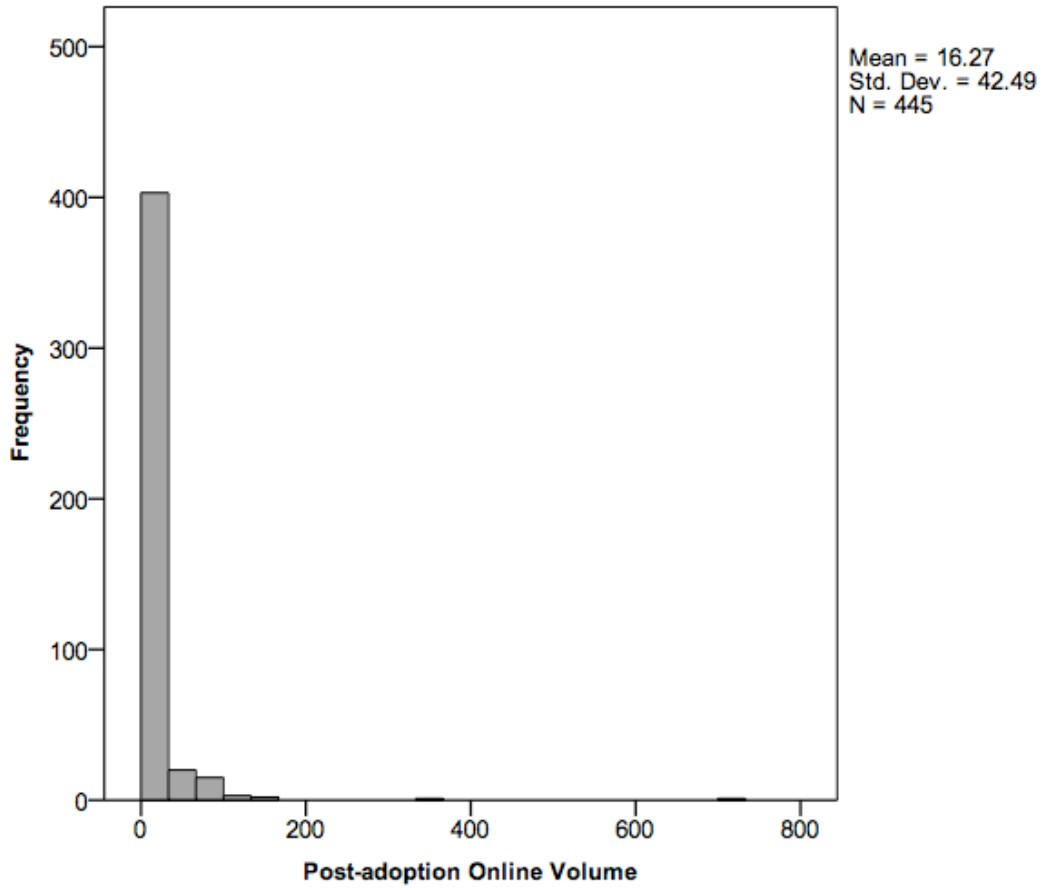

Figure 16 - Online banking usage after mobile banking adoption

4.3.1 Mobile banking usage

Based on the number of uses of the mobile banking channel during the 6-month period after mobile banking adoption, it was found that the mean number of transactions was 16. A histogram depicting the frequency of mobile banking usage is shown in Figure 17.

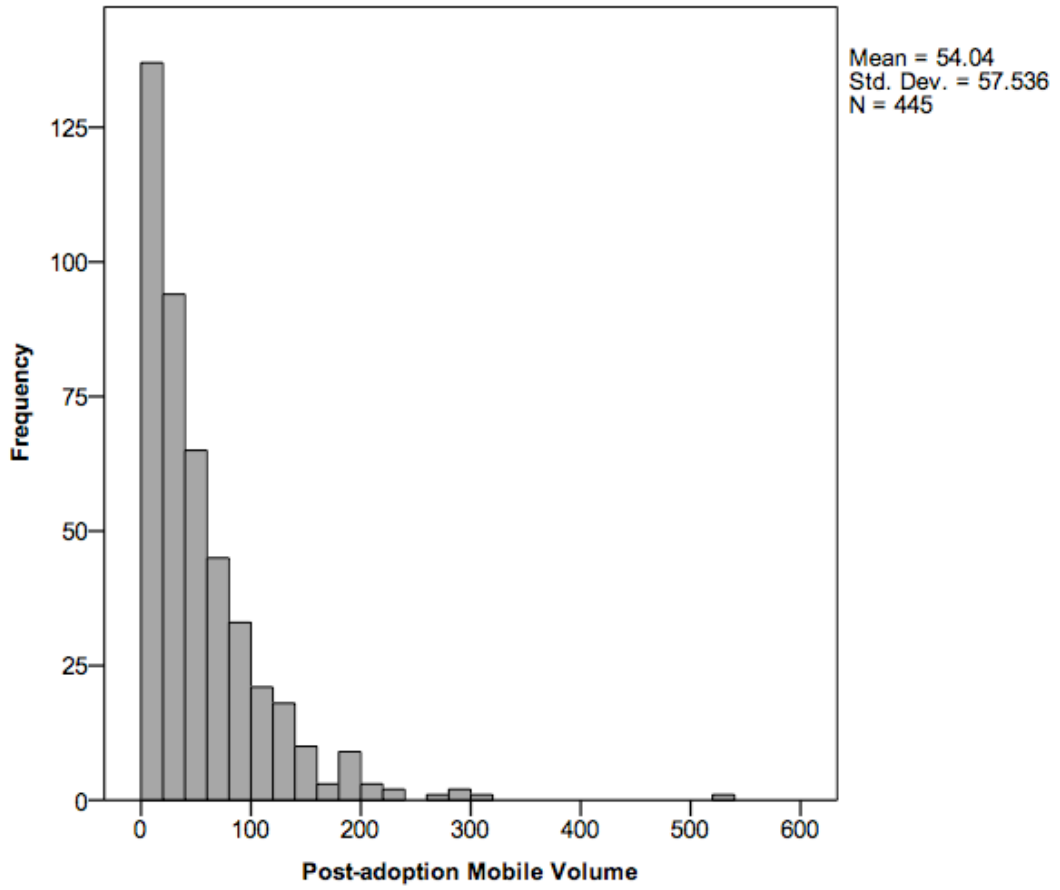

Figure 17 - Mobile banking usage

4.3.2 Conclusion of post-mobile banking behaviour

Mobile banking was the most used channel with a mean number of transactions of 54 and total of 24,046, followed by ATM banking with a means of 49 and total of 21,702 transactions, online banking with a mean of 16 and total of 7,238 transactions and branch with a mean of 2 and total of 1,046 transactions within the 6-month period of observation.

4.4 Cluster Analysis

Cluster analysis was carried out on the pre-adoption channel behaviour, i.e. ATM, branch and online banking channels. The K-Means clustering solution was used, applying a sequential number of clusters and recording the distances from the cluster centroids. The unexplained variance was plotted on a scree plot

to determine the optimal number of clusters at the “elbow-bend” of the scree plot.

This method was repeated for the post-adoption channels, i.e. ATM, branch, online and mobile banking.

4.4.1 Pre-adoption cluster solution

The K-means cluster analysis approach, recording the distances from the cluster centroids, was applied to the pre-adoption variables, ATM, branch and online volume of transactions. .

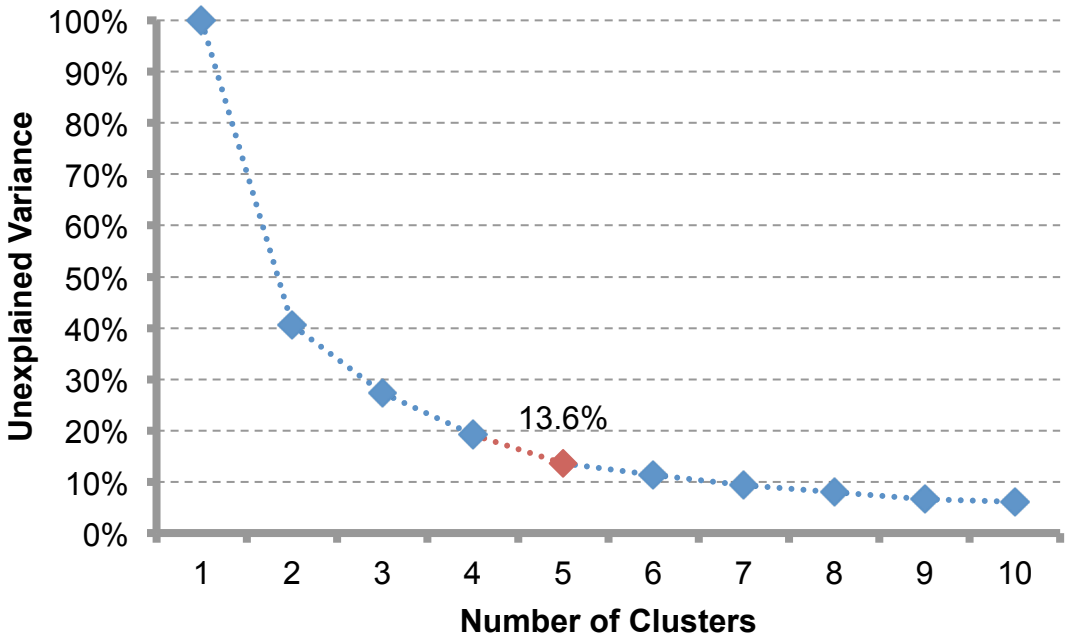

Figure 18 - Scree plot of unexplained variance by number of clusters (pre-adoption)

A five-cluster solution is determined to define the number of clusters formed in the pre-mobile banking adoption phase. 13.6% of the variance is unexplained with a five-cluster solution.

Appendix A provides the pre- and post-cluster memberships for each observation of the sample, together with demographic and transaction data.

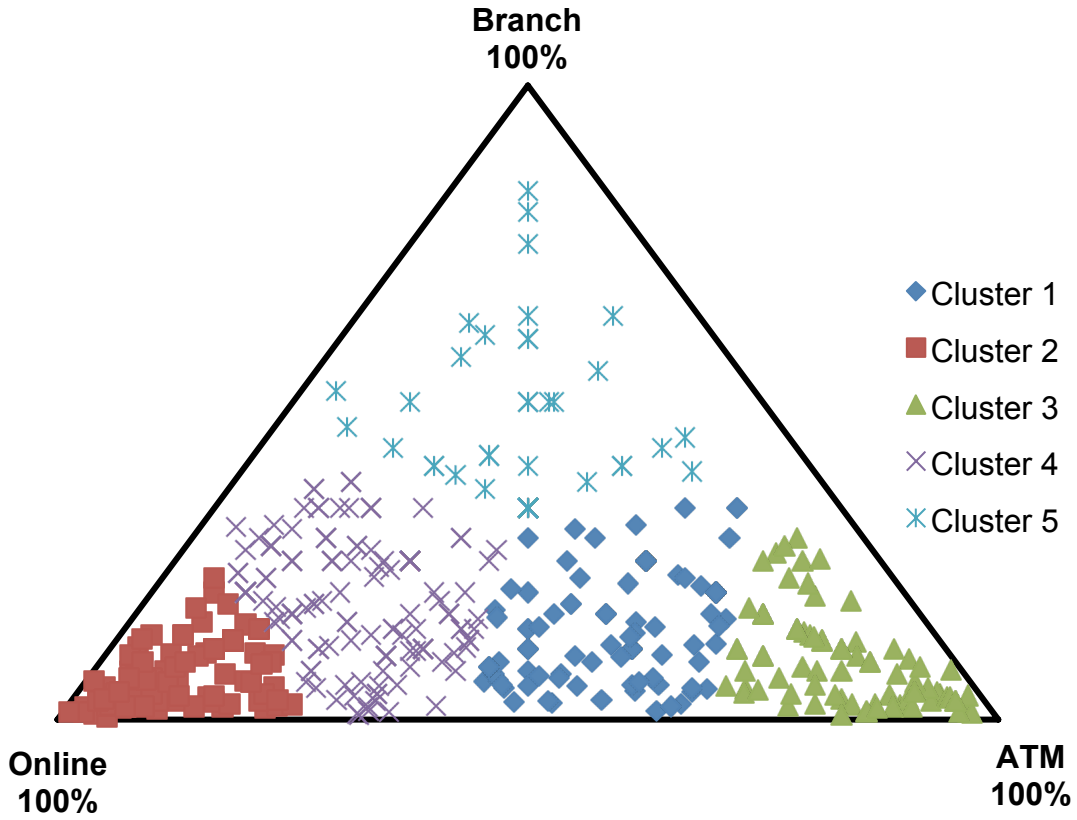

Figure 19 - Pre-mobile banking adoption clusters

The pre-adoption clusters (Figure 19) are further described by the number of samples per cluster and mean transaction volumes per channel in Table 10.

Table 10 – Descriptive statistics of pre-adoption clusters

Cluster	N	ATM Mean	Branch Mean	Online Mean
1	93	13	2	9
2	101	4	2	41
3	78	33	3	4
4	132	5	3	12
5	41	2	5	3

The clusters are verbally described in Table 11.

Table 11 - Description of pre-adoption clusters

Cluster	Description
1	Primarily transact on ATM channel, and sometimes on Online
2	Primarily transact on Online channel
3	Primarily transact on ATM channel
4	Primarily transact on Online channel, and sometimes on ATM
5	Transact on all channels and sometimes on Branch channel

4.4.2 Post-adoption cluster solution

The K-means cluster analysis approach, recording the distances from the cluster centroids, was applied to the post-adoption variables, ATM, branch, online and mobile volume of transactions.

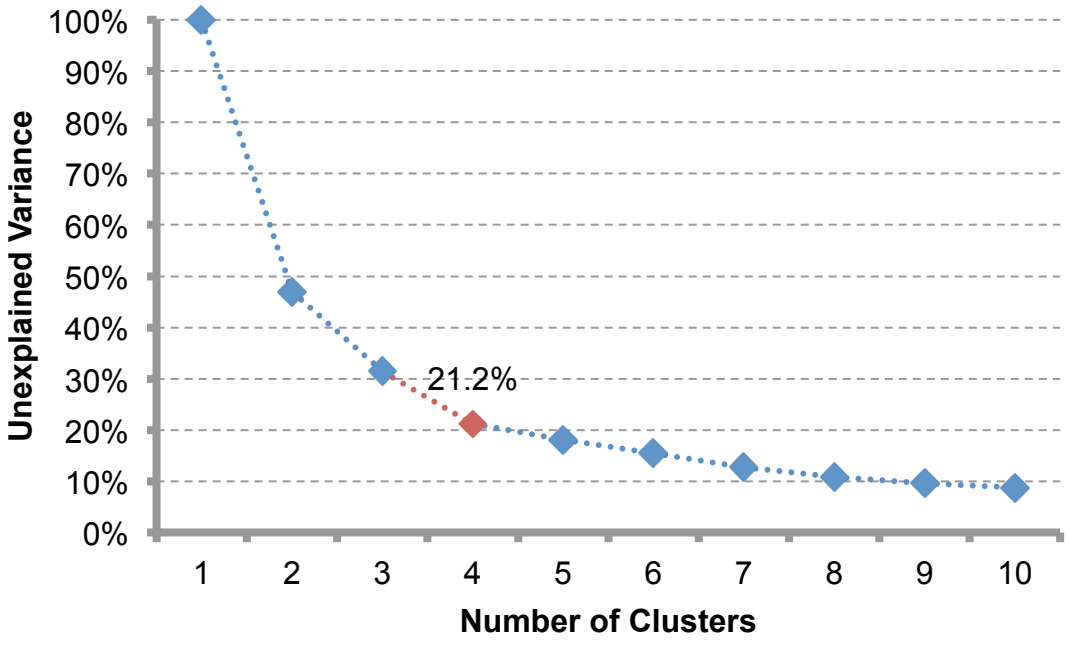

Figure 20 - Scree plot of unexplained variance by number of clusters (post-adoption)

A four-cluster solution is determined to define the number of clusters formed in the post-mobile banking adoption phase. 21.2% of the variance is unexplained with a four-cluster solution.

The significant channels used by the sample in the post adoption phase were ATM, online and mobile banking channels. Figure 21 shows the clusters formed

by the sample after the adoption of mobile banking in relation to the channels used.

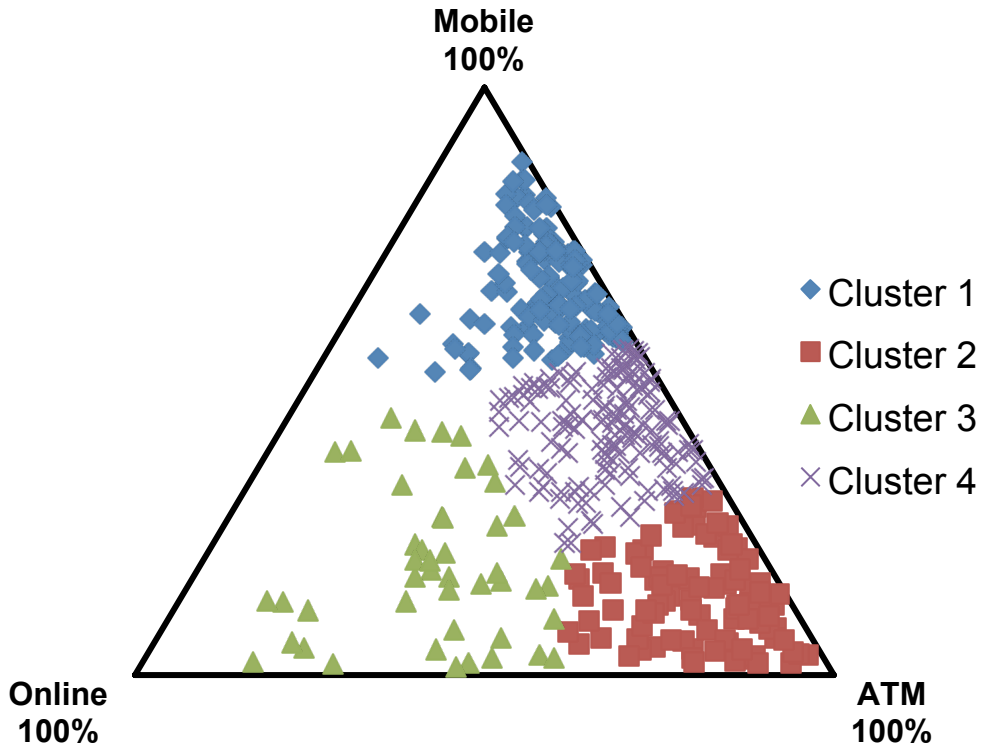

Figure 21 - Post-mobile banking adoption clusters

The post-adoption clusters (Figure 21) are further described by the number of samples per cluster and mean transaction volumes per channel in Table 12.

Table 12 - Descriptive statistics of post-adoption clusters

Cluster	N	ATM Mean	Mobile Mean	Online Mean	Branch Mean
1	159	37	93	9	2
2	96	66	12	9	2
3	46	41	27	71	2
4	144	53	48	11	2

The clusters are verbally described in Table 13.

Table 13 - Description of pre-adoption clusters

Cluster	Description
1	Primarily transact on Mobile channel, and sometimes on ATM
2	Primarily transact on ATM channel
3	Transact on all channels, and sometimes on Online channel
4	Transact equally on ATM and Mobile channels

4.5 Migration of clusters from pre- to post-mobile banking adoption

The five clusters found during the pre-adoption phase were reformed into four clusters in the post-adoption phase. Table 14 indicates the number samples that migrated from the pre-adoption clusters to the reformed post-adoption clusters.

Table 14 - Samples migrated from pre- to post-adoption clusters

		POST			
		MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	38	16	6	33
	ONL	28	14	29	30
	ATM	22	28	1	27
	ONL(ATM)	54	28	9	41
	BCH	17	10	1	13

Further describing the cluster movement from pre- to post-adoption, Table 14 indicates the percentage migration from pre-adoption clusters to the post-adoption clusters.

Table 15 - Row percentage description of cluster migration from pre- to post-adoption clusters

		POST			
		MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	41%	17%	6%	35%
	ONL	28%	14%	29%	30%
	ATM	28%	36%	1%	35%
	ONL(ATM)	41%	21%	7%	31%
	BCH	41%	24%	2%	32%

Table 15 indicates the percentage contribution to the post-adoption clusters from the pre-adoption clusters.

Table 16 - Column percentage description of cluster migration from pre- to post-adoption clusters

		POST			
		MOB	**ATM**	**ONL**	**ATM/MOB**
PRE	**ATM(ONL)**	24%	17%	13%	23%
	ONL	18%	15%	63%	21%
	ATM	14%	29%	2%	19%
	ONL(ATM)	34%	29%	20%	28%
	BCH	11%	10%	2%	9%

4.5.1 Expected frequencies

The expected frequencies for the migration of samples from pre- to post-adoption clusters are given in Table 16. The equation for calculating expected frequencies is given by, $E = \frac{row\ total \times column\ total}{sample\ total}$, for the number of samples migrated (**Error! Reference source not found.**).

The chi-square goodness of fit test conducted for the cluster migration is derived by the equation, $\chi^2 = \frac{(O-E)^2}{E}$, from the observed (Table 14) and expected values (**Error! Reference source not found.**), and is presented in **Error! Reference source not found.**.

The chi-square test for the clustering is found to be $p = 0.0000$ with $d_f = 12$.

4.6 Significance of demographic variables in cluster migration

The samples collected contained the demographic variable of Age, Income, Gender, Race and Marital Status. The results presented aim to determine whether these variables have an effect on the migration of behaviour from the pre- to post-adoption clusters.

4.6.1 One-way ANOVA test for age

A one-way analysis of variance test was conducted on the sample for the pre-adoption and post-adoption phases. The ANOVA results are presented in Table 17 and Table 18.

Table 17 – Pre-adoption ANOVA table for age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	427.493	4	106.873	0.861	0.487
Within Groups	54601.563	440	124.094		
Total	**55029.056**	**444**			

Table 18 - Post-adoption ANOVA table for age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3378.668	3	1126.223	9.616	0
Within Groups	51650.388	441	117.121		
Total	**55029.056**	**444**			

In the pre-adoption phase, there were no statistically significant differences in age between each of the clusters as determined by one-way ANOVA ($F(4,440) = 0.861$, $p = 0.48$).

In the post-adoption phase, there were statistically significant difference between the ages of the clusters as determined by one-way ANOVA ($F(3,441) = 9.616$, $p = 0.000$). A Tukey post-hoc test (

Table 27 - Age descriptives for post-adoption clusters

Cluster	N	$\bar{x}$	σ	95% Confidence Interval		Min.	Max.
				Lower Bound	Upper Bound		
1	159	37.25	9.673	35.74	38.77	18	58
2	96	44.39	10.913	42.17	46.6	23	74
3	46	41.3	14.082	37.12	45.49	21	77
4	144	38.51	10.783	36.74	40.29	20	74
Total	**445**	**39.62**	**11.133**	**38.58**	**40.66**	**18**	**77**

Table 28) revealed that the ages between clusters 1 (Mobile) and 2 (ATM) (44 +/- 11 years, p = 0.000) and clusters 2 (ATM) and 4 (Mobile/ATM) were statistically significantly different (38 +/- 11 years, p = 0.000).

The statistically significant differences between the post adoption clusters with respect to age are summarised in Table 19.

Table 19 - Post adoption Tukey HSD comparisons for age

(I) Post Cluster	(J) Post Cluster	*p-value*
Mobile	ATM	0
	Online	0.115
	Mobile/ATM	0.741
ATM	Mobile	0
	Online	0.387
	Mobile/ATM	0
Online	Mobile	0.115
	ATM	0.387
	Mobile/ATM	0.425
Mobile/ATM	Mobile	0.741
	ATM	0
	Online	0.425

4.6.2 One-way ANOVA test for income

A one-way analysis of variance test was conducted on the sample for the pre-adoption and post-adoption phases. The ANOVA results are presented in Table 17 and Table 18.

Table 20 - Pre-adoption ANOVA table for income

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.35245E+12	4	3.38112E+11	1.997	0.094
Within Groups	7.45017E+13	440	1.69322E+11		
Total	**7.58541E+13**	**444**			

Table 21 - Post-adoption ANOVA table for income

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.6482E+12	3	1.21607E+12	7.427	0
Within Groups	7.22059E+13	441	1.63732E+11		
Total	**7.58541E+13**	**444**			

In the pre-adoption phase, there were no statistically significant differences in income between each of the clusters as determined by one-way ANOVA ($F(4,440) = 1.997$, $p = 0.094$).

In the post-adoption phase, there were statistically significant difference between the incomes of the clusters as determined by one-way ANOVA ($F(3,441) = 7.427$, $p = 0.000$). A Tukey post-hoc test (

Table 29 - Income descriptives for post-adoption clusters

Cluster	N	$\bar{x}$	σ	95% Confidence Interval		Min.	Max.
				Lower Bound	Upper Bound		
1	159	169336.06	164572.887	143558.19	195113.94	0	991564
2	96	253576.85	369840.14	178640.28	328513.43	0	3000000
3	46	469973.5	1011816.171	169501.19	770445.81	9780	6000000
4	144	177656.9	248950.707	136648.66	218665.15	0	1920000
Total	**445**	**221279.07**	**413331.193**	**182771**	**259787.14**	**0**	**6000000**

Table 30) revealed that the incomes between clusters 1 and 3, 2 and 3, and 3 and 4, were statistically significantly different. There were no statistically significant differences between clusters 1 and 2, 1 and 4, and 2 and 4.

The statistically significant differences between the post adoption clusters with respect to income are summarised in Table 22.

Table 22 - Post adoption Tukey HSD comparisons for income

(I) Post Cluster	(J) Post Cluster	*p-value*
Mobile	ATM	0.374
	Online	0
	Mobile/ATM	0.998
ATM	Mobile	0.374
	Online	0.016
	Mobile/ATM	0.485
Online	Mobile	0
	ATM	0.016
	Mobile/ATM	0
Mobile/ATM	Mobile	0.998
	ATM	0.485
	Online	0

4.6.3 Chi-square test for race

The number of observations migrated from each cluster in the pre-adoption phase to each cluster in the post-adoption phase for race is shown per race category in Table 31,

Table 32, Table 33 and Table 34 in the appendix.

The expected frequencies of cluster migration per race are depicted in Table 35, Table 36,

Table 37 and Table 38, in the appendix.

The chi-squared contributions of cluster migration per race are depicted in Table 39, Table 40,

Table 41 and Table 42, in the appendix.

Notably, only the migrations of White people from the cluster 2 (Online) to cluster 3 (Online) was found to be statistically significant at the 5% level of significance (Table 46). The *p-values* of the chi-square test of independence per race is depicted in Table 23.

Table 23 - *p-value* of the Chi-square test of independence for Race

Race	***p-value***	***d.f.***
Black	0.000	12
Coloured	0.000	12
Indian	0.000	12
White	3.629×10^{-300}	12

4.6.4 Chi-square test for gender

The number of observations migrated from each cluster in the pre-adoption phase to each cluster in the post-adoption phase for gender is shown per gender category in Table 47 and Table 48, in the appendix.

The expected frequencies of cluster migration per gender are depicted in Table 49 and Table 50, in the appendix.

The chi-squared contributions of cluster migration per gender are depicted in Table 51 and Table 52, in the appendix.

Notably, only the migration of Males from the cluster 2 (Online) to cluster 3 (Online) was found to be statistically significant at the 5% level of significance (Table 53). The *p-values* of the chi-square test of independence per race is depicted in Table 24.

Table 24 - *p-value* of the Chi-square test of independence for Gender

Gender	***p-value***	***d.f.***
Male	0.000	12
Female	0.000	12

4.6.5 Chi-square test for marital status

The number of observations migrated from each cluster in the pre-adoption phase to each cluster in the post-adoption phase for marital status is shown per type in Table 55, Table 56, Table 57 and Table 58, in the appendix.

The expected frequencies of cluster migration per marital status are depicted in Table 59, Table 60, Table 61 and Table 62, in the appendix.

The chi-squared contributions of cluster migration per marital status are depicted in Table 63, Table 64, Table 65 and Table 66, in the appendix.

Notably, only the migration of Unmarried individuials from the cluster 2 (Online) to cluster 3 (Online) was found to be statistically significant at the 5% level of significance (Table 69).

4.7 Summary of the results

The sample used in this study was found to be representative of the population of South Africa in terms of the demographic profile of the sample.

The pre-adoption phase of observation showed that the online banking channel was most popular by the entire sample, followed by the ATM channel and then the branch channel. The post-adoption phase of observation found that the mobile banking channel was most popular, followed by the ATM, online and branch channels respectively.

When clustering the sample during the pre-adoption phase, five distinct clusters were formed, i.e. ATM users, ATM users with some online transactions, online users, online users with some ATM transactions, and branch users with some online and ATM transactions.

The sample was clustered in the post-adoption phase and four distinct clusters were formed, i.e. mobile users, mobile and ATM users, ATM users and online users with some mobile and ATM transactions.

The migration of users from pre- to post-mobile banking adoption was presented, and the chi-squared test for association was performed for the pre- and post-adoption clusters. The result was found to be statistically significant at $p<0.05$.

The ages of the samples were found to have no statistically significant relation between clusters in the pre-adoption phase. In the post-adoption phase there was a statistically significant relation with respect to age between cluster 1 (Mobile) and cluster 2 (Online), and cluster 2 (Online) and cluster 4 (ATM/Mobile).

The incomes of the samples were found to have no statistically significant relation between clusters in the pre-adoption phase. In the post-adoption phase there was a statistically significant relation with respect to income between cluster 1 (Mobile) and cluster 3 (Online), and cluster 2 (ATM) and cluster 3 (ATM/Mobile), and cluster 3 (Online) and cluster 4 (ATM/Mobile).

The chi-square test of independence was found to be statistically significant for the migrations of each race of the sample. Specifically White individuals were found to have a significant migration from pre-adoption Online to post-adoption Online.

The chi-square test of independence was found to be statistically significant for the migrations of each gender of the sample. Specifically Male individuals were found to have a significant migration from pre-adoption Online to post-adoption Online.

The chi-square test of independence was found to be statistically significant for the migrations of the marital status of the sample. Specifically Unmarried individuals were found to have a significant migration from pre-adoption Online to post-adoption Online.

CHAPTER 5. DISCUSSION OF THE RESULTS

5.1 Introduction

This chapter is intended to discuss, explain and interpret the results found from the cluster analysis that was presented in Chapter 4 in relation to the literature that was discussed in Chapter 2.

The discussion presents an interpretation of the results obtained from the cluster analysis conducted in Chapter 4, and from this the propositions raised in Chapter 2 will be evaluated. The confirmation or non-confirmation of the propositions is discussed with the help of additional research to provide possible explanations for similarities or differences.

5.2 Discussion of the pre-mobile banking channel behaviour

5.2.1 Introduction

In Chapter 2 it was determined that one of the drivers of continued traditional banking use would be the reliability of cash (King, 2010) as well as the reliance of cash by the under-banked population of the country (Maumbe, 2006). The observed behaviour of users prior to adopting mobile banking is discussed and compared to other studies that have been conducted in South Africa and abroad.

5.2.2 ATM

The pre-mobile banking adoption behaviour of this study does find a high degree of ATM reliance, with ATM forming the second highest channel of transaction by proportion. Anecdotally, it is assumed that the ATM would be a source of cash notes in terms of type of transaction conducted on this channel.

Hurwitz and Luiz (2007) found in a study of credit usage and over-indebtedness in South Africa, that 97% of the respondents in the study were active users of

the ATM channel. In the European market, Hoehle et al. (2012) found that 73% of banking customers made use of the ATM channel.

It would follow that given the socio-economic need for an informal economy that cash would be a high requirement for individuals in South Africa, considering the study of Neves and Toit (2013), that focuses on the informal economy of South Africa.

Within this study, ATMs were the most used channel by Clusters 3 and 1 (where cluster 1 also made some use of the Online channel), as depicted in Figure 19, which depicts the proportions of channel affinity per user.

It is assumed that Cluster 3 (n=78) would have a high degree of reliance on cash, due to needs such as public transport, living in lower income areas, thus utilizing informal shops and/or smaller convenience stores located within the areas that they live.

Cluster 1 (n=93) used the ATM channel to a higher degree than the online channel. It is assumed that although this cluster used a digital channel to transact, there remained a higher reliance for cash by this cluster due to the high use of the ATM.

5.2.3 Online banking

Online banking was found to be the most used channel, by proportion of channel usage, by the sample prior to the adoption of mobile banking (Table 8). The mean number of transactions performed by the sample on this channel was 16 transactions in a 6-month period.

Online banking was the most used channel by Clusters 2 and 4 (where cluster 4 also made some use of the ATM channel), as depicted in Figure 19.

It is assumed that Cluster 2 (n=101) would have a low reliance for cash due to a more advanced financial lifestyle, opting for non-cash based transactions.

Cluster 4 (n=132) used the online banking channel to a higher degree than the ATM channel. It is assumed that although this cluster used the ATM channel,

the proportion of usage was moderate compared to online banking, and likely due to incidental needs for cash for day-to-day purchases.

Online banking had been present in the market since the late 1990's and early 2000's (Aladwani, 2001), and it is thus inferred that this channel of banking would be widely acceptable to conduct day-to-day banking due to the savings in time, energy, and cost of travelling to physical branches to transact (Ahmad et al., 2010).

Masocha, Chiliya, and Zindiye (2011) found that 81% of respondents in that study had a preference toward banking technologies, as opposed to 19% which had a preference to bank employees to conduct transactions.

5.2.4 Branch

Branch banking was found to be the least used channel by the sample prior to the adoption of mobile banking (Table 8). The mean number of transactions performed by the sample on this channel was 3 transactions in a 6 month period, which is far lower than online banking ($\bar{x}$ = 16) and ATM ($\bar{x}$ = 11).

Branch banking was most used channel by Cluster 5 (n=41), as depicted in Figure 19. As per the study by Masocha et al. (2011), only 19% of respondents in that study had a preference toward bank employees to conduct transactions.

5.2.5 Conclusion of pre-mobile banking adoption behaviour

Wan et al. (2005) found that in Hong Kong the ranked order of preference for banking channels were, ATM, online banking and branch banking. This is similar to the findings of this study in that the proportions of ATM and online usage are much higher than the branch channel.

5.3 Discussion of the post-mobile banking channel behaviour

5.3.1 Introduction

In Chapter 2, proposition 1 suggested that the reliance on cash and trust of utilising cash will hold as a barrier of migration from traditional banking to mobile banking.

Proposition 2 suggested that due to perceived risk and lack of information about mobile banking, that although customers may have adopted mobile banking, existing banking practices (entrenched behaviour) would remain for certain customers.

This section analyses the post-adoption behaviour of customers from the sample, and aims to determine whether the propositions hold true or false for each of the clusters identified in the pre-adoption phase of the study.

5.3.2 Mobile banking

Mobile banking was found to be the most used channel by the sample after the adoption of mobile banking (Table 9). The mean number of transactions performed by the sample on this channel was 54 transactions in a six-month period, far exceeding ATM ($\bar{x} = 40$), online ($\bar{x} = 16$) and branch ($\bar{x} = 2$). The total volume of mobile transactions was higher than any other channel, i.e. 24,046, in the six-month period (Table 9).

Proportionally, mobile banking was the most used channel by Cluster 1 (n=159), as depicted in Figure 21. It is noted that no user in this cluster made close to 100% use of the channel, and rather had a small proportion of usage of the ATM channel as well. It is assumed that this cluster would prefer banking on the mobile channel, however due to day-to-day incidental expenses, there would be a need for cash, hence the use of the ATM channel.

Cluster 4 (n=144) represents a cluster with balanced use of both the mobile banking and ATM channels, by proportion of channel usage. It is assumed that

this cluster, although transacting on mobile banking, has a balanced financial behaviour need for cash based transactions.

Technology has been found to have a positive influence on the behaviour of consumers toward banking. Masocha et al. (2011) found that consumers had a preference to transacting via banking technologies.

5.3.3 ATM

The overall volume of ATM transactions was observed to increase in proportion to the volume of transactions prior to the adoption of mobile banking, i.e. 21,702 (Table 9) versus 4,991 (Table 8).

The adoption of mobile banking did not reduce the mean number of transactions per person for the ATM channel ($\bar{x}_{pre} = 11$) compared to post-adoption ($\bar{x}_{post} = 16$).

Proportionally, the ATM channel was the most used channel by Cluster 2 (n=96), as depicted in Figure 21. Unlike cluster 1 for mobile banking, some users in cluster 2 made almost full use of the ATM channel than the mobile or online channels. It is assumed that this cluster has high reliance on cash (Neves & Toit, 2013), due to the low proportion of use of the mobile or online channels.

Cluster 4 represents a cluster with balanced use of both the mobile banking and ATM channels, by proportion of channel usage.

5.3.4 Online banking

The overall volume of online banking transactions was observed to have marginally increased in proportion to the volume of transactions prior to the adoption of mobile banking, i.e. 7,238 (Table 9) versus 6,939 (Table 8).

The adoption of mobile banking had no effect on the mean number of transactions per person ($\bar{x}_{pre} = 16$) compared to post-adoption ($\bar{x}_{post} = 16$).

Proportionally, online banking was the most used channel by cluster 3 (n=46), as depicted in Figure 21. Similar to cluster 1 for mobile banking, no user in this cluster made close to 100% use of the channel, and rather had a small proportion of usage of the mobile banking and ATM channels as well. It is assumed that day-to-day expenses would still require cash, and therefore the use of the ATM channel.

5.3.5 Conclusion of post-mobile banking behaviour

Mobile banking had a significant change to the overall financial transaction behaviour of the sample. This channel recorded the highest overall volume of transactions in the six-month period after adoption.

A notable decrease in the use of the branch channel could be observed with a decrease in the mean number of branch transactions per user (Table 9).

The ATM channel experienced a large increase in overall transactions, becoming the second highest frequented channel after mobile banking.

Prior to mobile banking adoption, the online channel had the highest frequency of use, however the ATM channel overtook this in the post-mobile banking adoption phase.

Online banking did not experience a significant change in overall transaction volumes after the adoption of mobile banking.

5.4 Discussion of migration of clusters from pre- to post-mobile banking adoption

Five clusters were formed from the 445 observations in the sample during the pre-adoption phase, as depicted in Figure 19. The transactions volumes per channel were clustered using the K-Means clustering method in SAS. The distance from the cluster centres were noted for each cluster solution. The sum of squares was calculated per solution and the unexplained variance was calculated.

5.4.1 Mobile banking

Table 14 depicts a cross tabulation of the number of samples migrated from the pre-clusters to the post-clusters.

Table 16 shows the percentage contribution from pre-clusters that moved to the post-clusters. The cluster that primarily used mobile banking (cluster 1) was sourced from all clusters in the pre-adoption phase, viz. 24% from cluster 1, 18% from cluster 2, 14% from cluster 34% from cluster 4 and 11% from cluster 5. **Error! Reference source not found.** shows us that the chi-squared contributions to mobile banking (cluster 1) and mobile/ATM banking (cluster 4) are low, indicating that there is no significant pre-adoption cluster that would contribute to these post-adoption clusters.

It is therefore concluded that people who adopt mobile banking are not limited to any form of pre-mobile banking adoption behaviour, which is supported by the research conducted by Masocha et al. (2011), that banking technologies are preferred to traditional banking methods. Globally South Africa is ranked second in terms of the percentage of the population that uses mobile banking, where it was found that 43% of South Africans check balances via mobile banking (BusinessTech, 2014).

5.4.2 ATM banking

The pre-adoption ATM cluster (cluster 3) contributed 14% to mobile banking in the post-adoption phase (cluster 1), 29% to the ATM cluster (cluster 2) and 19% to the ATM/mobile cluster (cluster 4), as depicted in Table 16.

It is noted that the contribution to the post-adoption ATM cluster is significant based on the chi-squared test, as depicted in **Error! Reference source not found.**, where $\chi^2 = 7{,}42$.

It is therefore concluded that predominant ATM users are likely to remain as ATM users after the adoption of mobile banking. This finding supports proposition 1, that consumers that tend to rely on cash would not fully adopt

mobile banking due to the socio-economic needs for cash by this cluster of consumers (J. Coetzee, 2011; Kirsten, 2006; Maumbe, 2006).

5.4.3 Online banking

The pre-adoption online cluster (cluster 2) contributed 18% to mobile banking in the post-adoption phase (cluster 1), and 63% to the online cluster (cluster 3), as depicted in Table 16.

It is noted that the contribution to the post-adoption online cluster is significant based on the chi-squared test, as depicted in **Error! Reference source not found.**, where $\chi^2 = 32{,}99$.

It is therefore concluded that predominant online banking users are likely to remain as online banking users after the adoption of mobile banking. This finding supports proposition 2. Consumers who adopt mobile banking may not migrate to mobile banking due to habitual behaviour.

Ahmad et al. (2010) found that the habitual strength formed by a consumer using a specific type of technology would inhibit a change in behaviour, due to the markers of continued habitual use being, trust, confidence, and pricing associated to the existing technology. Following on from this finding, if mobile banking had provided sufficient motivation to this type of user, then a shift in behaviour could have been observed (Fogg, 2009).

5.4.4 Effect of age on behaviour change

A one-way analysis of variance (ANOVA) was calculated on the ages of the sample during the pre-adoption phase, and the post-adoption phase.

It was found that there was no significant difference in ages between clusters during the pre-adoption phase, leading to the assumption that each cluster was not biased to any specific age group.

During the post-adoption phase, significant differences in age between clusters was observed (Table 18). A Tukey post-hoc test was conducted to determine which clusters differed in ages (

Table 27 - Age descriptives for post-adoption clusters

Cluster	N	$\overline{x}$	σ	95% Confidence Interval		Min.	Max.
				Lower Bound	Upper Bound		
1	159	37.25	9.673	35.74	38.77	18	58
2	96	44.39	10.913	42.17	46.6	23	74
3	46	41.3	14.082	37.12	45.49	21	77
4	144	38.51	10.783	36.74	40.29	20	74
Total	**445**	**39.62**	**11.133**	**38.58**	**40.66**	**18**	**77**

Table 28), where it was found that significant differences in age were found between the Mobile ($\bar{x}$ = 37 years) and ATM ($\bar{x}$ = 44 years) clusters, and the ATM ($\bar{x}$ = 44 years) and Mobile/ATM ($\bar{x}$ = 39 years) clusters.

This observation would suggest that users that were younger would tend to use the Mobile channel, users aged 40 and above would tend to use more of the ATM channel than the mobile channel.

5.4.5 Effect of income on behaviour change

A one-way analysis of variance (ANOVA) was calculated on the incomes of the sample during the pre-adoption phase, and the post-adoption phase.

It was found that there was no significant difference in incomes between clusters during the pre-adoption phase, leading to the assumption that each cluster was not biased to any specific income level.

During the post-adoption phase significant differences in income levels between clusters was observed (Table 21). A Tukey post-hoc test was conducted to determine which clusters differed in income (Table 30), where it was found that significant differences in income were found between the Mobile ($\bar{x}$ = R169,336) and Online ($\bar{x}$ = R469,973) clusters, the ATM ($\bar{x}$ = R253,576) and Online ($\bar{x}$ = R469,973) clusters, and the Mobile/ATM ($\bar{x}$ = R248,950) and Online ($\bar{x}$ = R469,973) clusters.

This observation would suggest that users that earned a high income tended to prefer using the Online channel to transact, as opposed to users with a low income tended to use the ATM and Mobile channels.

This finding is supported by research conducted by Masocha et al. (2011); Maumbe (2006) where it was found that rural and poor communities in South Africa did not have access to internet banking due to the high cost barrier and availability of internet banking, however ATM and mobile banking were found to be electronic banking channels that rural and poor communities made use of.

5.4.6 Effect of race on behaviour change

A chi-square test was conducted to determine the effect of race for each of the cluster migrations, per race type. It was found that the only significant finding was that individuals that were White were likely to continue using Online Banking, if they previously used Online Banking during the pre-adoption phase of mobile banking (Table 42).

5.4.7 Effect of gender on behaviour change

A chi-square test was conducted to determine the effect of gender for each of the cluster migrations, per gender type. It was found that the only significant finding was that individuals that were Male were likely to continue using Online Banking, if they previously used Online Banking during the pre-adoption phase of mobile banking (Table 51).

5.4.8 Effect of Marital Status on behaviour change

A chi-square test was conducted to determine the effect of marital status for each of the cluster migrations, per type of marital status. It was found that the only significant finding was that individuals that were Unmarried were likely to continue using Online Banking, if they previously used Online Banking during the pre-adoption phase of mobile banking (Table 65).

5.5 Conclusion

During the pre-mobile banking adoption phase, the most used channel by the sample, by proportion, was the online banking channel followed closely by ATM and to a lower degree, branch banking. This was measured on the overall proportion of channel usage per user in a six-month period.

Five distinct clusters made up the pre-adoption phase with cluster 1 being a predominantly ATM channel with online banking transactions, cluster 2 being an online banking transaction channel primarily, cluster 3 being an ATM transaction channel primarily, cluster 4 being a branch transaction channel

primarily, and cluster 5 being a predominantly online banking channel with ATM transactions.

After the adoption of mobile banking, the mobile banking channel was the mostly utilised, by proportion of usage, followed closely by the ATM channel, and much less was online banking and branch banking.

Four distinct clusters made up the post-adoption phase with cluster 1 being a mobile transaction channel, cluster 2 being an ATM transaction channel, cluster 3 being an online banking transaction channel and cluster 4 being an ATM/mobile transaction channel group.

Proposition 1 was supported by the finding that ATM users before the adoption of mobile banking, tended to remain as ATM users after the adoption of mobile banking. This supports the proposition in that users that are reliant on cash in the informal economy would continue to rely on cash due to the socio-economic nature of their day-to-day lifestyle behaviour.

Proposition 2 was supported by the finding that online banking users would remain as online banking users due to habitual conditioning. Further it is proposed that since online banking is a digital channel, like mobile banking, and offering the same or similar transactions, that consumers would not change their existing behaviour for the same or similar outcome (Ahmad et al., 2010).

Mobile banking was found to be extremely popular, being the channel with the highest volume of transactions (Table 9). However, the source of the primary users of this channel could not be correlated to any specific cluster in the pre-adoption phase, suggesting that no specific pre-adoption channel preference could be attributed as a cluster that would preferably migrate to mobile banking.

The demographic analysis of the pre-adoption and post-adoption clusters revealed that age and income were not found to have a statically significant effect on the pre-adoption clusters. However, in the post-adoption phase, it was found that younger users tended to adopt mobile banking, whilst older users tended to prefer using the ATM channel (or combination of ATM and Mobile channel usage).

During the post-adoption phase it was evident that individuals with higher incomes tended to have a preference to the online banking channel to transact, whereas individuals with a lower income tended to prefer the Mobile and ATM channels to transact. This further support the proposition that the informal, rural socio-economic environment has an affinity for cash, and due to lack of access to computers, mobile banking was the preferred self-service digital channel.

Further findings were that White, Male, and Unmarried users were likely to not migrate away from online banking to any other channel. These individuals were likely to continue using online banking after the adoption of mobile banking as the preferred banking channel.

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

This chapter summarises the research findings in the first part, which presents the conclusions and provides recommendations with regard to the ex-post facto behaviour changes of customers that adopt mobile banking in South Africa.

The second part will focus on suggestions for future research that could potentially add value to the thinking and insights into this body of knowledge, and to that of Sankar (2009) and Brown et al. (2003).

6.2 Conclusions of the study

This study set out to accomplish two tasks, first to profile clusters of banked customers using demographic characteristics of their banking behaviour prior to the adoption of mobile banking. The second part of this study was to measure the post-adoption behaviour of these customers in relation to their pre-adoption practices.

Two propositions were put forward in the literature review, in terms of the expected outcomes for these clusters.

- Proposition1 held that due to the informal economy of South Africa, and the reliance of cash by most people, that the adoption of mobile banking would have no effect on the use of traditional banking channels for purposes of using cash.

- Proposition 2 held that the adoption of mobile banking would not cause consumers to change existing and entrenched banking practices. The adoption of a new technology requires a decision by a person to continue using the newly adopted channel.

6.2.1 Sample

The sample for the study was obtained from a major South African retail bank, from the period of 1 January 2013 to 30 June 2014. The sample was measured in the pre-mobile banking adoption phase by the number of transactions concluded per banking channel from 1 January 2013 to 30 June 2013. The sample set had registered for mobile banking during July 2013. The sample's transaction behaviour was recorded again from 1 January 2014 to 30 June 2014.

The demographic profile of the sample was analysed to determine how representative the sample is of the South African population.

6.2.2 Proposition 1 - Cash reliance would inhibit mobile banking adoption

Proposition 1 put forward that cash would be a driver of continued traditional banking use after the adoption of mobile banking. Most rural and poor South Africans rely on cash (banknotes) for transactions due to the guarantee that cash provides Neves and Toit (2013).

The studies of Batista et al. (2012); King (2010) stated that KYC (Know your customer) would also remain a driver for traditional banking. KYC is a face-to-face verification requirement to prevent fraud and associated criminal activities.

It was found that users of cash (pre-adoption ATM users) did remain as ATM users predominantly after the adoption of mobile banking. This was found to be statistically significant.

6.2.3 Proposition 2 - Habitual behaviour would inhibit mobile banking adoption

Proposition 2 put forward that due to habitual behaviour, adopters of mobile banking would continue to primarily transact on a traditional channel as opposed to adopting mobile banking as a primary channel.

In determining the factors for behaviour change, the Technology Acceptance Model (J & D, 1986) outlined motivation factors for users to change behaviour. Brown et al. (2003) and Sankar (2009) found that the factors, perceived value, trialability, perceived complexity and perceived risk were barriers to entry.

In this study all respondents had adopted mobile banking, however with varying degrees of use in conjunction with other channels. It is therefore concluded that the barriers to adoption highlighted in the Technology Acceptance Model were overcome.

Although respondents did adopt mobile banking, the behaviour changes since the adoption is the focus of this study. Two additional areas of literature reviewed thus put forward the basis for the second proposition.

Fogg (2009) developed the Fogg Behaviour Model, which states that a target behaviour would be accomplished if the target user was sufficiently motivated and the ability to change behaviour was high. The higher the ability and motivation were, the more likely a person would achieve the target behaviour.

Logie-MacIver et al. (2012) defined the Stages of Change model which would require a person to go through the stages of pre-contemplation, contemplation, determination, action (in this case, the adoption of mobile banking), relapse and maintenance. It is due to the relapse or maintenance stages that a person could abandon the new behaviour in favour of past behaviour.

In this study it was found that the online banking cluster during the pre-adoption phase, mostly remained as online banking users after the adoption of mobile banking. This was found to be statistically significant.

6.2.4 Mobile banking

It was found in this study that mobile banking was the mostly used channel (by proportion of transactions across channels) after the adoption of mobile banking. This would support the migration strategies of banks to migrate people out of high operational cost channels such as branches and ATM (Mols, 1998).

It was further found that those that did mostly adopt mobile banking did not have a significant cluster of origination in the pre-adoption phase.

6.2.5 Effect of demographic variables on cluster migration

The effect of the demographic variables was measured for each of the cluster migrations from the pre- to post-adoption phases. The continuous variables were evaluated using the one-way ANOVA analysis and the categorical variables were evaluated using chi-square tests.

It was found that younger individuals tended to have an affinity to mobile banking, and older individual tended to use the ATM channel (with some people using both ATM and Mobile channels).

Individuals with higher incomes were found to have an affinity for Online banking, whilst low-income individuals tended to use mobile and ATM channels after the adoption of mobile banking.

When evaluating the race, gender and marital status of the sample, it was found that White, Unmarried and Male individuals that used online banking prior to the adoption of mobile banking, tended to maintain a preference to continue using online banking predominantly.

6.3 Recommendations

In Chapter 1 it was suggested that the significance of this study would be to fill a gap in that more of the post-adoption behaviour of mobile banking customers could be understood. Banks in South Africa, particularly senior management, marketers and strategists, would gain insight in the effect that mobile banking has on the behaviour of customers that have recently adopted mobile banking, and the effect that it would have had, or not had, on the existing use of traditional banking channels.

The key findings and recommendations of this study are,

- Primary online banking users are likely to remain as online banking users, unless sufficiently motivated to adopt mobile banking. This could be due to the convenience of mobile banking being available anywhere and at any time.
- Primary ATM users are likely to remain as ATM users due to the reliance of cash by this cluster. A suitable replacement of cash could solve this problem, or adding services to the mobile banking platform that reduces the users' need for cash.
- Mobile banking customers are likely to have any type of banking channel behaviour prior to the adoption of mobile banking. It is therefore imperative to advertise and educate customers of mobile banking at each of these transaction channels, i.e. posters at ATMs, inside branches and on the website of the bank.
- Younger individuals are more likely to use mobile banking, whilst older users tended to maintain a preference for the ATM channel (although some had mixed use of both ATM and mobile channels)
- Higher income individuals preferred using online banking after the adoption of mobile banking, whilst lower income individuals had an preference to ATM and mobile channels after the adoption of mobile banking.
- From a race perspective, the only significant observation was that White individuals that previously had an affinity to online banking, tended to continue using online banking after the adoption of mobile banking.
- From a gender perspective, the only significant observation was that Males that previously had an affinity to online banking, tended to continue using online banking after the adoption of mobile banking.
- From a marital status perspective, the only significant observation was that Unmarried individuals that previously had an affinity to online banking, tended to continue using online banking after the adoption of mobile banking.

For increased usage of mobile banking services, particularly among low-income and rural users, additional means of education must be employed such as physical mediators to educate and drive usage.

For higher income individuals that continued to have a preference for online banking, the features of mobility, speed and convenience would be required to be highlighted for these users to shift behaviour away from online banking.

If banks were to move users into becoming primary mobile banking users, the awareness should be driven via education, mediation, bank charge savings and security aspects of these channels (Masocha et al., 2011).

6.4 Suggestions for further research

This research was helpful to better understand the ex-post facto behavior characteristics of individuals that adopted mobile banking to determine the cross-channel patterns of usage before and after the adoption of mobile banking. This section presents topics to further enhance the findings of this research, and research upon which this study is based on.

6.4.1 Mobile banking migration from older to newer technologies

This research would aim to investigate the difference in mobile channel usage, between app, mobile web and USSD banking channels.

App based banking is available on smartphones, mobile web on phones capable of internet browsing, and USSD banking is available on any mobile phone, primarily used by owners of feature phones.

USSD banking was initially available in South Africa since the mid-2000's, mobile internet banking since the later 2000's (Sankar, 2009), and app banking since 2011 (Shezi, 2014).

In the past decade South Africans have started to adopt smartphones (Goldstuck, 2012), which allows for services not previously available on feature phones, such as apps which allows for app banking to performed by the user.

It is proposed that early adopters of USSD and mobile internet banking, when upgrading to newer smartphones, would be resistant to adopt app based

banking as a newer mobile banking technology due to factors of habitual behavior strength of the existing USSD and mobile internet banking channels.

Analysis would be required to be conducted on a sample of users that had entrenched use of USSD and mobile web channels, that adopted app banking, to determine whether transactional behaviour shifted to the app banking channel.

6.4.2 Mobile banking as a payment alternative

Person-to-person and person-to-business payments originated with barter systems, and progressed to money based systems. Cash has continued to prevail as legal tender and is exchanged daily for products and services from one party to another.

With the introduction of digital banking, payments from person-to-person or person-to-business (from one bank account to another) introduced methods to facilitate the exchange of money virtually without the use of cash.

Mobile banking was a step further, introducing newer payment systems such as wallets (e.g. M-Pesa in Kenya) where payments from person-to-person would be facilitated from a cellphone and using the recipients cellphone number as a recipient “account”. Receivers could exchange the virtual currency for cash at exchange merchants, shops and ATMs. Further enhancements of these wallets allowed for virtual product purchases, such as mobile airtime credit.

Newer payment technologies exist, e.g. Near Field Communications, Geographical awareness, and Quick Response (QR) codes, among others. Facilitated via apps and smartphones, users could simply touch one device to another, scan for a device nearby or scan a 2-dimensional code on the screen of another device to effect a payment to the recipient device (or account linked to that device).

The aim of this study would be to evaluate these newer payment technologies as a replacement of cash to effect person-to-person or person-to-business transactions.

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APPENDIX A

Table 25 - Expected frequencies of cluster migration

		POST			
		MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	33.23	20.06	9.61	30.09
	ONL	36.09	21.79	10.44	32.68
	ATM	27.87	16.83	8.06	25.24
	ONL(ATM)	47.16	28.48	13.64	42.71
	BCH	14.65	8.84	4.24	13.27

Table 26 - Chi-squared contributions of cluster migration

		POST			
		MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.68	0.82	1.36	0.28
	ONL	1.81	2.78	32.99	0.22
	ATM	1.24	7.42	6.19	0.12
	ONL(ATM)	0.99	0.01	1.58	0.07
	BCH	0.38	0.15	2.47	0.01

Table 27 - Age descriptives for post-adoption clusters

Cluster	N	$\overline{x}$	σ	95% Confidence Interval		Min.	Max.
				Lower Bound	Upper Bound		
1	159	37.25	9.673	35.74	38.77	18	58
2	96	44.39	10.913	42.17	46.6	23	74
3	46	41.3	14.082	37.12	45.49	21	77
4	144	38.51	10.783	36.74	40.29	20	74
Total	**445**	**39.62**	**11.133**	**38.58**	**40.66**	**18**	**77**

Table 28 – Post adoption Tukey HSD Multiple Comparisons of Age

(I) Post Cluster	(J) Post Cluster	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-7.134	1.399	0	-10.74	-3.53
	3	-4.053	1.812	0.115	-8.73	0.62
	4	-1.262	1.245	0.741	-4.47	1.95
2	1	7.134	1.399	0	3.53	10.74
	3	3.081	1.941	0.387	-1.92	8.09
	4	5.872	1.426	0	2.19	9.55
3	1	4.053	1.812	0.115	-0.62	8.73
	2	-3.081	1.941	0.387	-8.09	1.92
	4	2.79	1.833	0.425	-1.94	7.52
4	1	1.262	1.245	0.741	-1.95	4.47
	2	-5.872	1.426	0	-9.55	-2.19
	3	-2.79	1.833	0.425	-7.52	1.94

Table 29 - Income descriptives for post-adoption clusters

Cluster	N	$\bar{x}$	σ	95% Confidence Interval		Min.	Max.
				Lower Bound	Upper Bound		
1	159	169336.06	164572.887	143558.19	195113.94	0	991564
2	96	253576.85	369840.14	178640.28	328513.43	0	3000000
3	46	469973.5	1011816.171	169501.19	770445.81	9780	6000000
4	144	177656.9	248950.707	136648.66	218665.15	0	1920000
Total	**445**	**221279.07**	**413331.193**	**182771**	**259787.14**	**0**	**6000000**

Table 30 - Post adoption Tukey HSD Multiple Comparisons of Income

(I) Post Cluster	(J) Post Cluster	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-84240.791	52300.169	0.374	-219115.25	50633.66
	3	-300637.437	67743.345	0	-475337.57	-125937.3
	4	-8320.84	46548.821	0.998	-128363.41	111721.73
2	1	84240.791	52300.169	0.374	-50633.66	219115.25
	3	-216396.646	72559.925	0.016	-403518.03	-29275.26
	4	75919.951	53315.801	0.485	-61573.67	213413.57
3	1	300637.437	67743.345	0	125937.3	475337.57
	2	216396.646	72559.925	0.016	29275.26	403518.03
	4	292316.597	68530.487	0	115586.54	469046.66
4	1	8320.84	46548.821	0.998	-111721.73	128363.41
	2	-75919.951	53315.801	0.485	-213413.57	61573.67
	3	-292316.597	68530.487	0	-469046.66	-115586.54

Table 31 - Samples migrated from pre- to post-adoption for Race, Black

		POST			
	Black	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	29	10	3	28
	ONL	24	9	15	20
	ATM	18	17	0	22
	ONL(ATM)	40	17	5	28
	BCH	15	6	0	8

Table 32 - Samples migrated from pre- to post-adoption for Race, Coloured

		POST			
	Black	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	29	10	3	28
	ONL	24	9	15	20
	ATM	18	17	0	22
	ONL(ATM)	40	17	5	28
	BCH	15	6	0	8

Table 33 - Samples migrated from pre- to post-adoption for Race, Indian

		POST			
	Indian	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	1	3	1	2
	ONL	0	0	1	1
	ATM	1	4	0	0
	ONL(ATM)	5	1	1	5
	BCH	0	1	0	0

Table 34 - Samples migrated from pre- to post-adoption for Race, Black

		POST			
	White	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	6	3	2	2
	ONL	3	3	10	4
	ATM	2	4	1	4
	ONL(ATM)	6	8	2	6
	BCH	1	3	1	4

Table 35 - Expected frequencies of cluster migration for Race, Black

		POST			
	Black	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	28.089	13.153	5.127	23.631
	ONL	27.287	12.777	4.981	22.955
	ATM	22.873	10.710	4.175	19.242
	ONL(ATM)	36.115	16.911	6.592	30.382
	BCH	11.637	5.449	2.124	9.790

Table 36 - Expected frequencies of cluster migration for Race, Coloured

		POST			
	Coloured	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	1.204	0.564	0.220	1.013
	ONL	4.414	2.067	0.806	3.713
	ATM	2.006	0.939	0.366	1.688
	ONL(ATM)	3.210	1.503	0.586	2.701
	BCH	0.803	0.376	0.146	0.675

Table 37 - Expected frequencies of cluster migration for Race, Indian

		POST			
	Indian	**MOB**	**ATM**	**ONL**	**ATM/MOB**
PRE	**ATM(ONL)**	2.809	1.315	0.513	2.363
	ONL	0.803	0.376	0.146	0.675
	ATM	2.006	0.939	0.366	1.688
	ONL(ATM)	4.815	2.255	0.879	4.051
	BCH	0.401	0.188	0.073	0.338

Table 38 - Expected frequencies of cluster migration for Race, White

		POST			
	White	**MOB**	**ATM**	**ONL**	**ATM/MOB**
PRE	**ATM(ONL)**	5.217	2.443	0.952	4.389
	ONL	8.025	3.758	1.465	6.752
	ATM	4.414	2.067	0.806	3.713
	ONL(ATM)	8.828	4.134	1.611	7.427
	BCH	3.611	1.691	0.659	3.038

Table 39 - Chi-squared contributions of cluster migration for Race, Black

		POST			
	Black	**MOB**	**ATM**	**ONL**	**ATM/MOB**
PRE	**ATM(ONL)**	0.030	0.756	0.883	0.808
	ONL	0.396	1.117	20.154	0.380
	ATM	1.038	3.694	4.175	0.395
	ONL(ATM)	0.418	0.000	0.385	0.187
	BCH	0.972	0.056	2.124	0.327

Table 40 - Chi-squared contributions of cluster migration for Race, Coloured

		POST			
	Coloured	**MOB**	**ATM**	**ONL**	**ATM/MOB**
PRE	**ATM(ONL)**	0.527	0.564	0.220	0.000
	ONL	2.641	0.002	5.976	0.446
	ATM	0.505	4.519	0.366	0.280
	ONL(ATM)	0.014	0.164	0.293	0.182
	BCH	0.049	0.376	0.146	0.156

Table 41 - Chi-squared contributions of cluster migration for Race, Indian

		POST			
	Indian	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	1.165	2.158	0.463	0.056
	ONL	0.803	0.376	4.973	0.156
	ATM	0.505	9.970	0.366	1.688
	ONL(ATM)	0.007	0.698	0.017	0.222
	BCH	0.401	3.510	0.073	0.338

Table 42 - Chi-squared contributions of cluster migration for Race, White

		POST			
	White	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.118	0.127	1.153	1.300
	ONL	3.147	0.153	49.726	1.121
	ATM	1.320	1.808	0.047	0.022
	ONL(ATM)	0.906	3.616	0.094	0.274
	BCH	1.888	1.013	0.176	0.304

Table 43 - Level of statistical significance of cluster migration for Race, Black

		POST			
	Black	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.0%	0.0%	0.0%	0.0%
	ONL	0.0%	0.0%	93.6%	0.0%
	ATM	0.0%	1.2%	2.0%	0.0%
	ONL(ATM)	0.0%	0.0%	0.0%	0.0%
	BCH	0.0%	0.0%	0.1%	0.0%

Table 44 - Level of statistical significance of cluster migration for Race, Coloured

		POST			
	Coloured	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.0%	0.0%	0.0%	0.0%
	ONL	0.2%	0.0%	8.3%	0.0%
	ATM	0.0%	2.8%	0.0%	0.0%
	ONL(ATM)	0.0%	0.0%	0.0%	0.0%
	BCH	0.0%	0.0%	0.0%	0.0%

Table 45 - Level of statistical significance of cluster migration for Race, Indian

		POST			
	Indian	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.0%	0.1%	0.0%	0.0%
	ONL	0.0%	0.0%	4.1%	0.0%
	ATM	0.0%	38.1%	0.0%	0.0%
	ONL(ATM)	0.0%	0.0%	0.0%	0.0%
	BCH	0.0%	0.9%	0.0%	0.0%

Table 46 - Level of statistical significance of cluster migration for Race, White

		POST			
	White	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.0%	0.0%	0.0%	0.0%
	ONL	0.6%	0.0%	100.0%	0.0%
	ATM	0.0%	0.0%	0.0%	0.0%
	ONL(ATM)	0.0%	1.1%	0.0%	0.0%
	BCH	0.0%	0.0%	0.0%	0.0%

Table 47 - Samples migrated from pre- to post-adoption for Gender, Male

		POST			
	Male	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	26	11	3	22
	ONL	17	9	20	18
	ATM	13	20	1	18
	ONL(ATM)	28	18	4	25
	BCH	6	7	1	8

Table 48 - Samples migrated from pre- to post-adoption for Gender, Female

		POST			
	Female	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	12	5	3	11
	ONL	11	5	9	12
	ATM	9	8	0	9
	ONL(ATM)	26	10	5	16
	BCH	11	3	0	5

Table 49 - Expected frequencies of cluster migration for Gender, Male

		POST			
	Male	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	20.291	14.655	6.538	20.516
	ONL	20.945	15.127	6.749	21.178
	ATM	17.018	12.291	5.484	17.207
	ONL(ATM)	24.545	17.727	7.909	24.818
	BCH	7.200	5.200	2.320	7.280

Table 50 - Expected frequencies of cluster migration for Gender, Female

		POST			
	Female	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	12.582	5.653	3.100	9.665
	ONL	15.018	6.747	3.700	11.535
	ATM	10.553	4.741	2.600	8.106
	ONL(ATM)	23.135	10.394	5.700	17.771
	BCH	7.712	3.465	1.900	5.924

Table 51 - Chi-squared contributions of cluster migration for Gender, Male

		POST			
	Male	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	1.606	0.911	1.915	0.107
	ONL	0.743	2.482	26.016	0.477
	ATM	0.949	4.835	3.666	0.037
	ONL(ATM)	0.486	0.004	1.932	0.001
	BCH	0.200	0.623	0.751	0.071

Table 52 - Chi-squared contributions of cluster migration for Gender, Female

		POST			
	Female	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.027	0.075	0.003	0.184
	ONL	1.075	0.452	7.592	0.019
	ATM	0.229	2.240	2.600	0.099
	ONL(ATM)	0.355	0.015	0.086	0.176
	BCH	1.402	0.062	1.900	0.144

Table 53 - Level of statistical significance of cluster migration for Gender, Male

		POST			
	Male	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0%	0%	0%	0%
	ONL	0%	0%	99%	0%
	ATM	0%	4%	1%	0%
	ONL(ATM)	0%	0%	0%	0%
	BCH	0%	0%	0%	0%

Table 54 - Level of statistical significance of cluster migration for Gender, Female

		POST			
	Female	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0%	0%	0%	0%
	ONL	0%	0%	18%	0%
	ATM	0%	0%	0%	0%
	ONL(ATM)	0%	0%	0%	0%
	BCH	0%	0%	0%	0%

Table 55 - Samples migrated from pre- to post-adoption for Marital Status, Divorced

		POST			
	Divorced	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	3	0	0	2
	ONL	1	0	3	0
	ATM	0	1	1	1
	ONL(ATM)	3	1	1	1
	BCH	0	0	1	0

Table 56 - Samples migrated from pre- to post-adoption for Marital Status, Married

		POST			
	Married	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	10	9	3	10
	ONL	8	10	11	12
	ATM	9	11	0	8
	ONL(ATM)	11	14	3	13
	BCH	4	6	0	4

Table 57 - Samples migrated from pre- to post-adoption for Marital Status, Unmarried

		POST			
	Unmarried	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	24	7	3	21
	ONL	18	4	15	18
	ATM	13	16	0	18
	ONL(ATM)	39	11	4	24
	BCH	12	4	0	9

Table 58 - Samples migrated from pre- to post-adoption for Marital Status, Widowed

		POST			
	Widowed	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	1	0	0	0
	ONL	1	0	0	0
	ATM	0	0	0	0
	ONL(ATM)	1	2	1	3
	BCH	1	0	0	0

Table 59 - Expected frequencies of cluster migration for Marital Status, Divorced

		POST			
	Divorced	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	1.842	0.526	1.579	1.053
	ONL	1.474	0.421	1.263	0.842
	ATM	1.105	0.316	0.947	0.632
	ONL(ATM)	2.211	0.632	1.895	1.263
	BCH	0.368	0.105	0.316	0.211

Table 60 - Expected frequencies of cluster migration for Marital Status, Married

		POST			
	Married	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	8.615	10.256	3.487	9.641
	ONL	11.038	13.141	4.468	12.353
	ATM	7.538	8.974	3.051	8.436
	ONL(ATM)	11.038	13.141	4.468	12.353
	BCH	3.769	4.487	1.526	4.218

Table 61 - Expected frequencies of cluster migration for Marital Status, Unmarried

		POST			
	Unmarried	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	22.423	8.885	4.654	19.038
	ONL	22.423	8.885	4.654	19.038
	ATM	19.162	7.592	3.977	16.269
	ONL(ATM)	31.800	12.600	6.600	27.000
	BCH	10.192	4.038	2.115	8.654

Table 62 - Expected frequencies of cluster migration for Marital Status, Widowed

		POST			
	Widowed	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.400	0.200	0.100	0.300
	ONL	0.400	0.200	0.100	0.300
	ATM	0.000	0.000	0.000	0.000
	ONL(ATM)	2.800	1.400	0.700	2.100
	BCH	0.400	0.200	0.100	0.300

Table 63 - Chi-squared contributions of cluster migration for Marital Status, Divorced

		POST			
	Divorced	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.728	0.526	1.579	0.853
	ONL	0.152	0.421	2.388	0.842
	ATM	1.105	1.482	0.003	0.215
	ONL(ATM)	0.282	0.215	0.423	0.055
	BCH	0.368	0.105	1.482	0.211

Table 64 - Chi-squared contributions of cluster migration for Marital Status, Married

		POST			
	Married	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.223	0.154	0.068	0.013
	ONL	0.836	0.751	9.550	0.010
	ATM	0.283	0.457	3.051	0.023
	ONL(ATM)	0.000	0.056	0.482	0.034
	BCH	0.014	0.510	1.526	0.011

Table 65 - Chi-squared contributions of cluster migration for Marital Status, Unmarried

		POST			
	Unmarried	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.111	0.400	0.588	0.202
	ONL	0.872	2.685	23.001	0.057
	ATM	1.981	9.311	3.977	0.184
	ONL(ATM)	1.630	0.203	1.024	0.333
	BCH	0.321	0.000	2.115	0.014

Table 66 - Chi-squared contributions of cluster migration for Marital Status, Widowed

		POST			
	Widowed	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0.900	0.200	0.100	0.300
	ONL	0.900	0.200	0.100	0.300
	ATM	0.000	0.000	0.000	0.000
	ONL(ATM)	1.157	0.257	0.129	0.386
	BCH	0.900	0.200	0.100	0.300

Table 67 - Level of statistical significance of cluster migration for Marital Status, Divorced

		POST			
	Divorced	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0%	0%	0%	0%
	ONL	0%	0%	0%	0%
	ATM	0%	0%	0%	0%
	ONL(ATM)	0%	0%	0%	0%
	BCH	0%	0%	0%	0%

Table 68 - Level of statistical significance of cluster migration for Marital Status, Married

		POST			
	Married	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0%	0%	0%	0%
	ONL	0%	0%	34%	0%
	ATM	0%	0%	0%	0%
	ONL(ATM)	0%	0%	0%	0%
	BCH	0%	0%	0%	0%

Table 69 - Level of statistical significance of cluster migration for Marital Status, Unmarried

		POST			
	Unmarried	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0%	0%	0%	0%
	ONL	0%	0%	97%	0%
	ATM	0%	32%	2%	0%
	ONL(ATM)	0%	0%	0%	0%
	BCH	0%	0%	0%	0%

Table 70 - Level of statistical significance of cluster migration for Marital Status, Widowed

		POST			
	Widowed	MOB	ATM	ONL	ATM/MOB
PRE	ATM(ONL)	0%	0%	0%	0%
	ONL	0%	0%	0%	0%
	ATM	0%	0%	0%	0%
	ONL(ATM)	0%	0%	0%	0%
	BCH	0%	0%	0%	0%