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Factors influencing the adoption of M-Pesa in South Africa

Kiren Singh

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

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ABSTRACT

There are a large percentage of unbanked South Africans, namely South Africans who have access to mobile telephones but do not qualify for a bank account. And then there are banked South African's, who prefer to use mobile banking due to the convenience and added advantages the facility offers. Banking services and the various channels have evolved considerably over the last few years. Mobile Money has been touted as an effective solution and has proved highly successful in other countries: particularly Kenya and Tanzania. However, the South African Mobile Money market is relatively untapped and the service has been unsuccessful to date. Vodacom (Pty) Ltd is a telecommunications company that primarily provides voice and data services in South Africa and other African countries. The Mobile Money service: M-Pesa - is a product of Vodacom and has been explored in this study in an effort to understand the factors that affect user adoption of such technological services. There is a large gap in the research of Mobile Money, specifically in the South African context, with newer, more robust technology adoption models available, that have yet to be investigated.

A review of the literature discovered the *Unified Technology Acceptance User Technology Model* as the best technology adoption model for studying m-banking adoption due to its comprehensive and modern nature. The Unified Technology Acceptance User Technology Model, combined with specific features of technology characteristics such as: ease of use, age and gender, have been tested in a quantitative study. This paper examined the adoption factors influencing the customer's propensity to use m-banking. The questionnaire (which consisted of 30, 5 point, Likert-scale style questions) was completed by 189 respondents and assessed using descriptive statistics from Qualtrics and SAS. A Gaussian distribution and data analysis was completed, prior to running Factor Analysis, Discriminate Analysis and Linear Regression on the dependent variables of M-Pesa and Mobile Money.

The key findings of the study identified that the factors influencing the customer are *Perceived Financial Cost, Perceived Self-Efficacy* and *Behavioural Intention* which are statistically the strongest constructs. Other constructs are also illustrated as a factor in the adoption of M-Pesa and Mobile Money.

The study found that the main factors which affected *Behavioural Intention* to adopt M-Pesa in South Africa are:

- Facilitating Conditions;
- Perceived Credibility;
- Social Influence; and
- Performance Expectance.

Age and gender were found to be influences that affect adoption of M-Pesa and Mobile Money. Primarily, people aged between the following categories: high (> 55 years old) and low – medium (25 – 34 years old) followed by gender which had the greatest influence on *Behavioural Intention*. This study could be useful to telecommunications and banking companies that have Mobile Money products and hope to achieve better market penetration and user adoption. The study recommends, inter alia:

- Greater customer focus;
- Use of the latest, most efficient technology to simplify user interaction;
- Improvement of the social significance of the product; and
- Reduction of costs.

It is submitted that Mobile Money, and specifically M-Pesa, can be successful in South Africa, if stakeholders improve on the factors that truly influence user adoption and develop a clear, concise strategy to improve the environment and product around these user adoption factors.

DECLARATION

I, Kiren Singh, 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.

Kiren Singh

Signed at ……

On the …….. day of …… 20…..

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CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

The purpose of this research report is to investigate the factors that influence the adoption of the South African Mobile Money product: M-Pesa. This research covers the factors of influence that made the system successful in Kenya and the barriers to its success in South Africa; including technology characteristics and the perceived ease of use of M-Pesa. User age and gender were tested as factors that influence the adoption of M-Pesa.

1.2 Context of the study

1.2.1 *Financial services and access in SA*

There are many individuals in the developing world without access to formal financial services, mainly due to poor infrastructure and high cost, while many of them have mobile telephones (Dermish, Kneiding, Leishman, & Mas, 2011). Many people in the developing world experience scarcity towards financial services which stimulates economic activity (Mutsune, 2015). South Africa is an emerging economy whereby the public favour the use of informal avenues; resulting in a great unbanked population (Lawack, 2012). There are approximately 10 million unbanked economically active people in South Africa (Townsend & Dagada, 2012). Telecommunications companies are unable to provide complete financial services directly to customers as regulations published by the South African Reserve Bank dictate that a banking licence is required to conduct financial transactions, specifically deposits, in South Africa (Townsend & Dagada, 2012). The South African government introduced standards to address the large unbanked population with banks offering low cost products and reduced barriers to bank accounts, but the usage of these products remain low and there still exists a large percentage of South Africans without bank accounts (Ismail & Masinge, 2012). The GSMA provides annual reports on the mobile money industry for further information.

1.2.2 *Telecommunications sector*

South Africa has a vibrant mobile market (which consists of four major operators: the Vodacom Group, MTN, Telkom and Cell C) with the general South African mobile telephone population at 50 million (Townsend & Dagada, 2012). According to the CreamerMedia (2015) telecommunications report: South Africa has a mobile penetration rate of 152 per cent, as at June 2014.

Vodacom, South Africa's leading mobile operator, by market share and revenue, launched M-Pesa in South Africa as part of its data services offering following its initial success in Kenya. Aiming to serve the considerable majority of South Africa's unbanked population (Townsend & Dagada, 2012).

Vodacom provides mobile voice services, data, mobile messaging and converged services to its customers (Townsend & Dagada, 2012). In a robust and dynamic industry like the telecommunications industry, companies have to constantly develop new strategies to build long-term customer relationships as the telecommunications industry has undergone a rapid transformation recently due to increased demands from customers and technological innovation (Gitu, 2013). Mobile Money services are moving from traditional banks to mobile operators that are able to utilise technology and lower cost services to gain market share (Gitu, 2013). Vodacom and other mobile operators are searching for new revenue streams as traditional revenue lines continue to decline. M-Pesa was initially launched as a partnership with Vodacom and Nedbank, in August 2010, with a surprisingly slow uptake.

1.2.3 Mobile Money

Mobile Money takes advantage of high mobile penetration and widespread network coverage (Schulze, 2014). Branchless banking allows individuals to conduct electronic payments, deposit and withdraw cash using their mobile telephones and a nearby retail store (Dermish et al., 2011).

Mobile banking is still in its early stages in South Africa although numerous parties with a sufficient user base have unsuccessfully attempted to establish it as a standard (Lawack, 2012). According to Winn and De Koker (2013), the major benefits of Mobile Money are:

- Aids the decrease of dependency on cash; which is a barrier to financial inclusion;
- Produces data that is influential to the wellbeing and development of financial inclusion and reliability; as well as
- Acceleration of the rate of unbanked South Africans adopting the use of banking accounts; which is fundamental to financial inclusion.

According to the CreamerMedia (2015) telecommunications report; 58 per cent of mobile users in sub-Saharan Africa have exhibited an interest in Mobile Money. Mobile Money can drive revolutionary change as it becomes more efficient and cheaper for consumers (Bettman & Harris, 2014).

1.2.4 *M-PESA*

Vodacom was convinced that M-Pesa had potential but first needed to overcome the numerous challenges for Mobile Money to work in South Africa (Townsend & Dagada, 2012). M-Pesa was very successful in Kenya as it transfers more than 43 per cent of Kenyan GDP each year (Schulze, 2014). M-Pesa allows person-to-person transfers without the need for a formal bank account (Lawack, 2012). In this low cost high-volume model, Vodacom acts as the service provider and Nedbank (later replaced by Bidvest) received a banking license fee. The distribution agents and retail stores, earned a commission on the number of transactions (Townsend & Dagada, 2012). Vodacom has 32 million active customers as at 2014 and aims to target one quarter of them with M-Pesa (Mahlaka, 2014). There are approximately 4 million unbanked South Africans that are Vodacom customers (Mahlaka, 2014). Vodacom re-launched M-Pesa in August 2014; expecting ten million sign ups in the initial five years but only attracted 72 000 active consumers (NewsCentral, 2015).

According to its chief executive officer, Shameel Joosub, Vodacom is studying the factors that hindered this service adoption in South Africa (NewsCentral, 2015). Mobile Money uses the following technologies:

- Short Message Service (SMS);
- Unstructured Supplementary Service Data (USSD); and
- Wireless Application Protocol (WAP) (Patel, Kunche, Mishra, Bhaiyat, & Joshi, 2015).

M-Pesa works over USSD, which is supported on mobile telephones not equipped with data services, but it is tedious and can sometimes be problematic to conduct transactions (Nyamtiga, Sam, & Laizer, 2013) as it can be slow and network dependent (Patel et al., 2015). Customers are able to send and receive money, as well as collect and deposit cash at approved outlets. No monthly fees are charged and they receive lower transaction fees upon registering for the service which is at no cost (Townsend & Dagada, 2012).

Although M-Pesa has been very successful in Kenya (as a means of financial inclusion and it provides valuable banking services to the formally unbanked sector of the population), the same system has failed to take off in South Africa due to reasons explored in this report (Dermish et al., 2011).

Of the three quarters of the sub-Saharan Africa population which are described to lack access to formal banking services; only sixteen per cent use Mobile Money (Gitu, 2013). Vodacom Tanzania has half its customer base registered for M-Pesa and contributes more than US $1 billion in activity per month (Mahlaka, 2014). Mobile Money has a positive impact on households especially in rural and semi-rural areas (Kikulwe, Fischer, & Qaim, 2014). Jain (2014), describes the rising trends of Mobile Money in emerging markets which implores the question of why Mobile Money, and specifically M-Pesa, has not been successful in South Africa.

1.2.5 *Technology acceptance models*

A leading Technology Acceptance Model (TAM) provided by Davis (1989) is used to study information technology acceptance and considers psychological practices of a person's intentions to use a technology to assess behaviour, perceived practicality and apparent ease of use, among other aspects (Bagozzi, 2007). This model aids in decision making by individuals in isolation (Bagozzi, 2007). A critique of the Technology Acceptance Model was provided by Bagozzi (2007) to aid in the understanding of the adoption of M-Pesa. Other models such as the Theory of Planned Behaviour, Innovation Diffusion Theory and Theory of Reasoned Action were also investigated. This study endeavoured to include the broader aspects of cultural and group aspects of technology acceptance (Bagozzi, 2007).

The Unified Theory of Acceptance and Use of Technology model, established by Venkatesh, Morris, Davis, and Davis (2003) was used as the principal model in this study.

1.2.6 *Regulatory*

According to Caluwaerts (2015) Mobile Money includes a complex eco-system which lacks global standards and has disjointed regulatory regimes. South African regulators have a supportive framework for Mobile Money, but it is not an entirely inclusive framework (Winn & De Koker, 2013). New technologies such as Near Field Communication, launched by Apple and Samsung as a form of convenient payment; introduced a new variable into the field (Patel et al., 2015).

The South Africa policy environment is less open to non-banking entrants and this has eroded the financial feasibility for the major mobile operators (Porteous, 2006). According to Winn and De Koker (2013), an environment of rational economic policies and governance is required for successful Mobile Money innovation.

There is a greater need for inter-operability standards and common platforms along the entire value chain (Townsend & Dagada, 2012).

Mobile Money has to serve customers with effective controls and security measures to prevent financial integrity risks (Winn & De Koker, 2013). Lawack (2012), argues that the regulatory framework in South Africa needs an improved balance between the directives of risk and access.

1.3 Problem statement

1.3.1 *Main problem*

The research problem is to analyse and evaluate the factors that influence the adoption of Mobile Money, specifically M-Pesa, in South Africa and determine the factors, including age and gender, for M-Pesa to be successfully replicated in South Africa.

The scarcity of uptake with regard to the use of M-Pesa in South Africa appears to indicate the requirement for research in this field. There is a gap in the literature on this topic.

1.3.2 *Sub-problems*

The first sub-problem is to analyse and evaluate the factors that influence the adoption of the Mobile Money service, M-Pesa in South Africa.

The second sub-problem is to evaluate if age and gender influence the framework for M-Pesa to be successfully replicated in South Africa.

1.4 Significance of the study

The study aims to analyse the reasons that impact consumers on the uptake of M-Pesa. The study provides guidance to help understand the following:

- How the success of M-Pesa in Kenya can be effectively replicated in South Africa; and

- The degree to which the telecommunications market dominance plays a role and the influence of the regulatory environment towards technology adoption.

The study reviews the effect of intense competition from banks and other mobile operators. The research assesses the impact of m-banking on the ecosystem visa vie telecommunications operators (e.g. MTN's Mobile Money), banks, independent companies (e.g. Wizzit), regulators (government and ICASA), the customers (in terms of technology adoption frameworks) and recently introduced products by handset manufacturers such as Apple and Samsung (Dermish et al., 2011). This includes an understanding of the impact of these players on the environment of M-Pesa.

The study determines the degree of technological and technical conformity as well as the extent to which cost of the service plays a factor in its success; as there is a greater value chain in South Africa (Lawack, 2012). This includes how the technology can be enhanced to inter-relate with the prevailing economic and social environments. The study covers both the banked and unbanked South African population. The study endeavours to shed light on additive, transformational and innovative models associated with m-banking, as well as how m-banking can be moved to primarily cover a transformational model with the aid of a more enabling environment (Porteous, 2006).

The study provides insight into the finance, management and technology aspects of m-banking and how to promote its cause in South Africa. In addition, the study may provide benefit to the telecommunications and banking industries. These industries may derive use from the study as it hopes to analyse the factors that affect the uptake or decline in the service as well as its ability to provide effective banking to the unbanked South African population.

1.5 Delimitations of the study

The study covers the following:

- Various components of the M-Pesa model;
- Factors that affect the adoption of the technology;
- Factors that made the system successful in other countries;
- Level of competition in South Africa and an introduction into the various competing products; and
- An overview of what needs to be done in South Africa to ensure successful implementation of M-Pesa.

The study will not cover the following:

- The economic impact of M-Pesa on households;
- The impact of using your mobile telephone for internet banking;
- Other macro and micro factors related to technology adoption such as company specific micro factors, competition and the regulatory environment;
- The impact of Mobile Money on the economy;
- The customer service levels associated with M-Pesa;
- The type of financial products that can be provided via M-Pesa; and
- The risk of undocumented migrants to financial security.

1.6 Definition of terms

ICASA - The Independent Communications Authority of South Africa is the supervisor for South African communications (ICASA, 2015).

m-payments – financial transactions, debits and credits are completed using mobile equipment i.e. a mobile telephone (Porteous, 2006).

m-banking – incorporates m-payments and includes a broader range of services such as savings products typically found at a bank (Porteous, 2006).

M-financial services – mobile financial services and financial products that are enabled using a mobile telephone.

USSD – Unstructured Supplementary Service Data is a fast and effective real-time communication technology used for sending messages over a GSM network similar to an SMS (Nyamtiga et al., 2013).

1.7 Assumptions

The following assumptions were made:

- The respondents answered questionnaires without bias to the mobile operator and questionnaires were completed in a fair and appropriate manner regarding the service of M-Pesa as a stand-alone product offering. This is a reasonable assumption as users were asked to provide feedback on M-Pesa only. The data was not overly sensitive to this assumption, but may prove a hindrance in the uptake of M-Pesa as a Vodacom product.
- Respondents completed questionnaires whilst having a basic understanding of how M-Pesa works. This is a reasonable assumption as mobile operators have completed the required marketing in order to raise awareness of the product. Marketing brochures were readily available to respondents.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the literature concerning the factors that influence the adoption of M-Pesa. It evaluates the predominant technological models used to assess adoption behaviour. The adoption factors from these models are then reviewed. The various environmental factors that led to M-Pesa being successful in Kenya are included with a brief background of the various role players in the Mobile Money eco-system. Age and gender are investigated as potential factors which affect adoption.

2.2 Background discussion

According to Donner and Tellez (2008), and as outlined in Chapter 1, traditional banking methods have been unsuccessful in providing the huge population of unbanked South Africans with access to financial services. Winn and De Koker (2013), define Mobile Money as the use of a mobile telephone to deposit, withdraw or transfer funds. It stimulates financial inclusion to spread basic banking services to the unbanked market by offering a practical and cost-effective channel (Winn & De Koker, 2013). Mobile banking provides a feasible solution for these challenges as the convergence of financial and telecommunications services offer efficiency, convenience and time savings (Ismail & Masinge, 2012). This relatively new technology has to be widely diffused and used in order for the benefits of economic growth to take place (Hall & Khan, 2003). It is expressed by Yu (2012) that the degree of understanding on the reasons that impact customers to adopt a technology ultimately governs the final success of the new service. M-Pesa provides the prospect of developing financial services to low income unbanked segments of the population, but uncertainty occurs around the factors that lead to customer adoption in order to improve on the number of people using the service (Ismail & Masinge, 2012).

Vodacom and other companies that offer Mobile Money may then tailor products and strategies to optimise uptake by effectively understanding M-Pesa user adoption behaviour (Ismail & Masinge, 2012).

Donner and Tellez (2008), who studied m-banking, economic development and its adoption, as well as its impact and use, acknowledge that there are insufficient studies which appropriately theorise the reasons m-banking is adopted by the unbanked population. The current body of knowledge for m-banking consists of studies that:

- Evaluate its impact on people and economies,
- Evaluate its effectiveness in cultural, economic and social contexts Morawczynski and Pickens (2009); and
- Seek to explain the adoption of m-banking systems (Donner & Tellez, 2008).

Tobbin (2012), who studied the main factors that impact the acceptance of m-banking by the rural unbanked, maintains that using surviving technology innovation acceptance models such as the Technology Acceptance Model (Davis, 1989) and theories such as Rogers' Innovation Diffusion Theory (Rogers, 1983) is relatively uncommon to use in studying m-banking user adoption. There have also been many studies into the success and the implications of the achievement of M-Pesa in Kenya (Ismail & Masinge, 2012). The technology acceptance models highlighted in this report are used to determine the specific factors that influence M-Pesa adoption in South Africa.

A multi-country assessment of mobile payment adoption, conducted by Au and Zafar (2008), states that there are distinctive patterns of adoption and multi-faceted global structures that each country experiences. It is these unique features that warrant a detailed examination of the factors specific to the country of adoption (Au & Zafar, 2008). Donner and Tellez (2008), concur with this assessment and suggest that adoption based on likely behaviour and social norms will evolve and fluctuate in various countries of adoption. Therefore, it can be concluded that there is a gap in the research of the adoption factors that lead to the success or relative failure of M-Pesa in South Africa.

South African banking regulation requires a banking licence for deposits, unlike in Kenya. This has resulted in collaboration between telecommunications operators and banking institutions. Which has resulted in a longer, less profitable value chain (Ismail & Masinge, 2012). According to Au and Zafar (2008) population characteristics, infrastructure, and regulations vary greatly in different countries as these elements are entrenched in various areas such as economics, sociology, psychology and information technology.

Tobbin (2012), recommends the promotion of savings and loans to be added to mobile services as requests for Mobile Money by the unbanked population is related to requests for savings and loan facilities.

The regulatory environment and governmental institutions have a strong impact on technology adoption (Hall & Khan, 2003). Regulatory factors have an huge effect on adoption and product success as government regulators consider security and taxation implications of the technologies (Donner & Tellez, 2008). Mobile banking operators and policy makers have to encourage usage and attain strong investment yields by understanding consumer needs (Ismail & Masinge, 2012). The Central Bank of Kenya as well as the Communications Commission of Kenya are regulators that created an environment that made it simpler for the services to take place effortlessly (Gitu, 2013). Must and Ludewig (2010), stated that prevalent adoption of Mobile Money is limited by initial investment barriers and regulatory constraints. Must and Ludewig (2010), recommend that due to the potential benefits of Mobile Money, governments should adopt effective policies and promote the development of Mobile Money infrastructure. Regulation has to find a balance by finding sufficient stringency levels to avoid fraud and money laundering whilst maintaining flexibility to allow m-banking to be extensively available and utilised (Must & Ludewig, 2010). Economic development, culture or geography may also play an important role in adoption of a technology (Hall & Khan, 2003).

Lawack (2012) who authored '*Mobile Money, financial inclusion, and financial integrity: The South African case,*' professes that the regulatory structure in South Africa warrants a risk based approach through improved implementation as it is not favourable to greater financial inclusion.

Winn and De Koker (2013) who studied '*Mobile Money in Developing Countries: Financial Inclusion and Financial Integrity*,' suggest that regulatory obstacles need to be removed in order for Mobile Money to improve financial inclusion and integrity-as this will facilitate innovative Mobile Money models and decrease barriers to inter-operability. Increasing the number of participants in the formal financial framework should not come at the expense of effective controls in a situation of good governance and sound economic guidelines, as m-banking can increase the risks of criminal activity (Winn & De Koker, 2013). Schulze (2014), recognises that the success of Mobile Money is an obligation to the regulator as it helps create a stronger middle class. Government support can add credibility to Mobile Money services through effective collaboration with telecommunications companies (Yatin, Abhijit, & Sujata, 2015).

2.3 M-Pesa environment

Even though not peer reviewed, some popular and informative articles from the practitioners space Dermish et al. (2011); Mas and Radcliffe (2010); Porteous (2006), disclose valuable information and insight into M-Pesa adoption (Tobbin, 2012). The following paragraph outlines some company specific strategies that have contributed to the success of M-Pesa. According to Gitu (2013) (who studied Safaricom M-Pesa strategies, with regard to enhancing Mobile Money transfer services in Kenya), the success of Mobile Money transfer services in Kenya is due to its:

- Fast, consistent and convenient services;
- Respectable network access; and
- Extensive agent network.

Additional contributing factors to the success of the M-Pesa were the market positioning of the product, as well as the suitable capitalization of the Kenyan culture (Gitu, 2013). The product was positioned to target the unbanked in the lower income segment; whilst being effortlessly and conveniently accessible (Gitu, 2013).

M-Pesa was differentiated through superior value, product quality, features such as easily understandable interfaces and after-sale support (Gitu, 2013). Other factors such as market share of customers and management of the agent network were important factors in its success (Mas & Morawczynski, 2009). Safaricom used a specific strategy to keep agents motivated by offering different promotions that were only available for participating agents and this included higher commissions than competitor's offer (Gitu, 2013).

Safaricom's M-PESA agent network is a two-tier structure with master agents who control liquidity as the primary connection between Safaricom and sub-agents i.e. the store(s) under their supervision (Gitu, 2013). The registration process was simple and efficient. Must and Ludewig (2010), advocate that Mobile Money needs the development of a decentralized network of reliable Mobile Money agents as they are required for expedient and scalable distribution networks. However third-party agents are limited (Must & Ludewig, 2010). There have been partnerships to enable international money transfers which further aided user adoption. Another contributing factor was that Safaricom controlled nearly 80 per cent of the market (Gitu, 2013). Gajjala and Tetteh (2014), show that marketing and online communication practices via social media play an important role in enhancing M-Pesa participation. According to Priyo et al. (2015) effective branding and complex regulatory factors are some of the critical factors required to be in place for guaranteed success and acceleration of M-Pesa growth and technology disruption. Yatin et al. (2015), agrees that marketing and advertising channels, as well as technical usability and "cash-backs" or rewards are important towards increasing Mobile Money usage.

South Africa's WIZZIT, a subsidiary of the South African Bank of Athens, launched a 'pay-as-you-go' model mobile telephone banking system to the unbanked in South Africa and attracted 250,000 customers in more than four years of operation (Ismail & Masinge, 2012; Mas & Morawczynski, 2009). MTN partnered with Standard Bank to launch its own Mobile Money service 'Mo Money' with varying degrees of success (Ismail & Masinge, 2012). Other retailers such as Shoprite Checkers and Spar have their own cash transfer services that also affect the success of M-Pesa.

South Africa is now a market with many players and does not have the head start Safaricom had when it launched M-Pesa; therefore it has to adapt to the market (Mas & Morawczynski, 2009).

A steady and protected customer base is a significant factor for technology adoption (Hall & Khan, 2003). M-Pesa has a network effect because the value of the technology to a consumer grows as the amount of aggregate users in the network increases (Hall & Khan, 2003). Supply behaviour such as technology improvements after its introduction has an effect on adoption (Hall & Khan, 2003). A poor alternate for making money transfers and the uneven structure of the Kenyan economy (which has similarities to the South African economy) was also a key adoption factor (Mas & Morawczynski, 2009).

According to Mas and Morawczynski (2009), the success of M-Pesa in Kenya is due to a number of factors such as:

- Robust branding and modest messaging for a simple user service;
- Regular and consistent monitoring of retail agents;
- Scalable agent distribution arrangement for liquidity management;
- Solid communication of the service with the agent record;
- Simple and fast customer registration;
- Transparent retail pricing; and
- Ability to send money to non-customers.

These factors cumulatively contributed to a balanced development of customers and retail agents.

2.4 Factors that affect adoption (theory and models)

This section comprises of a literature review of numerous innovative frameworks and technology adoption models predominantly applied today.

The adoption of m-banking was inspected from a wide knowledge base using social psychology, communications research and information systems (Tobbin, 2012).

These models and theories, as outlined by Ismail and Masinge (2012), are the Theory of Reasoned Action (Fishbein & Ajzen, 1975), the Technology Acceptance Model (Davis, 1989), the Theory of Planned Behaviour by (Ajzen, 1991), the Innovation Diffusion Theory (Rogers, 1995), the Extended Technology Acceptance model (the Technology Acceptance Model 2) (Venkatesh & Davis, 2000), and the Unified Technology Acceptance User Technology (UTAUT) (Venkatesh et al., 2003).

2.4.1 *Technology Adoption model*

The Theory of Reasoned Action as developed by Fishbein and Ajzen (1975) uses social psychology to determine that one's beliefs are influenced by an one's attitude and subjective norms (Jhina, 2012). The Technology Acceptance Model was conceived by Davis (1989) using the Theory of Reasoned Action model and the Theory of Planned Behaviour by Ajzen (1991) (Au & Zafar, 2008).

This information Technology Acceptance Model states that user *Behavioural Intentions* i.e. adoption and use is based on *Perceived Usefulness* and *Perceived Ease of Use* (Davis, 1989). Davis (1989) further defines *Perceived Usefulness* as the level to which an individual believes that using a certain system will improve their job performance and *Perceived Ease of Use* as the degree to which the individual believes that using the system will be void of effort. Since its inception the Technology Acceptance Model has been comprehensively tested, is one of the most prominent adoption models in understanding consumer behaviour and has been extended and modified by many authors such as (Luo, Li, Zhang, & Shim, 2010; Tobbin, 2012; Venkatesh & Davis, 2000; Wu & Wang, 2005). However, the Technology Acceptance Model has been criticized by Bagozzi (2007) for not being comprehensive enough as it does not include group, social and cultural aspects of decision making.

This includes specified qualifications of the *Perceived Usefulness* and *Perceived Ease of Use* concepts including the emotional and social aspects of user behaviour (Bagozzi, 2007).

According to Au and Zafar (2008), the Technology Acceptance Model is inadequate to explain m-banking adoption as it assumes only a single technology is available, does not contemplate *Social Influence*, and assumes there are no preventative barriers to using the system. According to Chan, Kim, and Gupta (2007), the Technology Acceptance Model is more suitable in traditional technologies whereby adoption is mandatory - such as in a company. Tobbin (2012), is one of the most recent users of the Technology Acceptance Model. Tobbin (2012), used the Technology Acceptance Model as a foundation to examine the acceptance of m-banking by rural unbanked customers during their adoption process. Kim, Mirusmonov, and Lee (2010) and Schierz, Schilke, and Wirtz (2010), use the Technology Acceptance Model to examine the acceptance of Internet and mobile related technologies, i.e. mobile banking, mobile payments and m-commerce.

Venkatesh and Davis (2000), formed an extended version of the Technology Acceptance Model by adding social and organisational characteristics for instance impression, subjective norms, work relevance and quality of output, known as the 'Technology Acceptance Model 2'. The factors included in the 'Technology Acceptance Model 2' are Perceived Risk, Perceived Cost and Trust (Venkatesh & Davis, 2000).

Other variations to the original Technology Acceptance Model include additions by Wu and Wang (2005) as well as Luarn and Lin (2005). Wu and Wang (2005) combined the 'Technology Acceptance Model 2' with compatibility constructs from Innovation Diffusion Theory to examine the drivers of mobile commerce using *Perceived Usefulness*, *Perceived Ease of Use*, Perceived Risk and Cost (Ismail & Masinge, 2012). Luarn and Lin (2005) merge the Technology Acceptance Model and the Theory of Planned Behaviour and include two resource-based paradigms and a trust-based paradigm whilst studying factors that affect the social intentions of mobile banking users in Taiwan (Ismail & Masinge, 2012; Yu, 2012).

These authors discovered that Perceived Usefulness, *Perceived Ease of Use*, *Perceived Credibility*, *Perceived Financial Cost* and *Perceived Self-Efficacy* had constructive effects on users' *Behavioural Intentions* to adopt the technology (Ismail & Masinge, 2012; Yu, 2012). Chan et al. (2007), established the Value-based Adoption Model whilst observing customers M-Internet adoption patterns as well as by studying economics and marketing research, which consisted of the theory of consumer choice and decision making. They discovered that perceived value is an essential factor of adoption. Yu (2012), combined the Decomposed Theory of Planned Behaviour and Innovation Diffusion Theory to investigate mobile banking user adoption. It was discovered that the opportunity to utilise mobile banking and the amount of banking services available, as well as compatibility, perceived risk and perceived advantages have important roles to play (Yu, 2012).

2.4.2 *Key adoption models*

Innovation Diffusion Theory begins from the choice to adopt new technology and happens as a slow continuous process which eventually manages the speed of economic growth over innovation and is based on the ambiguity of the benefits verses the cost of adopting it (Hall & Khan, 2003). The Bass Diffusion model declares that mass media and inter-personal word-of-mouth communication medians are factors that influence adopters and S-shaped diffusion curves are used to express this adoption rate (Yu, 2012). The models used to describe the S-shape curve are the adopter heterogeneity and adopter learning models (Hall & Khan, 2003). These describe the adoption procedure as a slow process that progressively increases as the cost declines. A greater amount of people become accustomed to it, until the market reaches saturation levels and the curve levels out again (Hall & Khan, 2003). The rate of adoption will be sluggish if the technology is time-consuming, costly to acquire or needs complex new skills (Hall & Khan, 2003).

Contingency theory includes environmental influences, cultural, social and economic features (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008).

This includes jurisdiction, regulation and standardisation factors in the mobile payment services environment (Dahlberg et al., 2008). This is useful in the mobile payments arena, as it caters for situational factors such as different regulation (which is relatively high in South Africa) as well as payment technology infrastructure (Dahlberg et al., 2008).

Actor Network Theory by Au and Zafar (2008) is used to recognise the stakeholders and this interaction within the environment. It includes the relationship of micro and macro actors that contribute to the difference of m-money adoption in various countries. The macro and micro actors respectively are: companies, technologies, infrastructure, regulators and consumers, mobile device etc. (Au & Zafar, 2008).

2.4.3 *Unified Theory of Acceptance and Use of Technology Model*

Venkatesh et al. (2003) developed the Unified Theory of Acceptance and Use of Technology model by incorporating the theory of Reasoned Action, the Technology Acceptance Model and the 'Technology Acceptance Model 2', the Theory of Planned Behaviour and the Decomposed Theory of Planned Behaviour, joining the Motivational Model, Model of PC utilisation and the Theory of Planned Behaviour, Innovation Diffusion Theory, and Social Cognitive Theory. Yu (2012), uses the Unified Theory of Acceptance and Use of Technology model to observe the influences that affect people to adopt mobile banking. The study discovers that the factors, in increasing influence, are *Social Influence*, *Perceived Financial Cost*, *Performance Expectancy*, and *Perceived Credibility*. Individual Intention and *Facilitating Conditions* significantly moderated the effects of performance (Yu, 2012).

Venkatesh, Thong, and Xu (2012) formulated 'Unified Theory of Acceptance and Use of Technology model 2' to investigate acceptance and use of technology in a customer user environment by incorporating three additional factors hedonic motivation, price value, and habit. This extended the applicability of the Unified Theory of Acceptance and Use of Technology model. Hedonic motivation is the pleasure derived from using a technology (Venkatesh et al., 2012).

The Price Value (or cost) is the monetary cost to use the service, not covered as in an organisational setting which may have an important role on adoption (Venkatesh et al., 2012). Experience and habit, which is the familiarity to use the technology from the users' initial use and voluntariness was excluded (Venkatesh et al., 2012). A limitation of this study was its ability to be generalised to other less technologically advanced countries compared to Hong Kong (Venkatesh et al., 2012).

This study used these models to help explain the behaviour of consumers that adopted M-Pesa in South Africa. The significant models for the context of this study are the Technology Acceptance Model, the 'Technology Acceptance Model 2' and Unified Theory of Acceptance and Use of Technology models. This empirically tested Unified Theory of Acceptance and Use of Technology model consists of the critical features of these models to predict users' intentions to adopt a technology. It has been confirmed to be an improvement to other dominant opposing models (Venkatesh et al., 2003) and therefore was used as the theoretical groundwork to develop the proposition (Yu, 2012). The key factors of Perceived Usefulness, *Perceived Ease of Use*, Trust, *Perceived Cost* and *Perceived Risk* are covered hereunder.

Performance Expectancy, *Effort Expectancy*, *Perceived Credibility*, *Perceived Self-efficacy*, *Perceived Financial Cost*, *Social Influence*, *Facilitating Conditions* and *Behavioural Intention* (Venkatesh et al., 2003) are the key indicators used in this investigation. Yu (2012), established the validity and generalisability of Unified Theory of Acceptance and Use of Technology model in the environment of mobile banking adoption. According to Yu (2012), the Unified Theory of Acceptance and Use of Technology model has a higher predictive power for technology adoption than the Technology Acceptance Model/'the Technology Acceptance Model 2', the Theory of Planned Behaviour/Decomposed Theory of Planned Behaviour, and the Innovation Diffusion Theory.

According to Venkatesh et al. (2003), *Performance expectancy* is the level to which a customer considers that utilising the system will increase job performance. It is partly derived from Perceived Usefulness (the Technology Acceptance Model/'the Technology Acceptance Model 2') and is the most substantial forecaster of intention (Venkatesh et al., 2003). Luarn and Lin (2005) acknowledge Perceived Usefulness as a critical factor in the likelihood that m-banking would be adopted if there was a higher perceived advantage (Yu, 2012).

According to Venkatesh et al. (2003), *Effort Expectancy* is the level of ease related to the use of the system. These concepts were derived from Perceived Ease of Use (the Technology Acceptance Model/'the Technology Acceptance Model 2'), complexity (Model of PC utilization) and ease of use (Innovation Diffusion Theory).

Luarn and Lin (2005), conducted studies of m-banking adoption and found that it supported the concept of *Perceived Ease of Use* as a key factor. *Technology characteristics/ Perceived Ease of Use* are prevalent in the literature as a key factor and subsequently added to the UTAUT model as a construct in this analysis.

Venkatesh et al. (2003), describe *Social Influence* as the extent to which an individual identifies that it is significant; others consider that they should use the new system. *Social Influence* is realised as a direct factor of *Behavioural Intention* and is characterised as the subjective norm in Theory of Reasoned Action, the 'Technology Acceptance Model 2' and the Theory of Planned Behaviour/Decompose Theory of Planned Behaviour. Singh, Srivastava, and Srivastava (2010), claim that family and friends affect a one's decision to adopt mobile financial services. Customers' beliefs and social concerns with the mental concept of virtual money, need to be addressed, as a mobile telephone is not yet a wallet and this presents risks (Donner & Tellez, 2008).

Luarn and Lin (2005), specify that some individuals are reluctant to use m-banking primarily due to *Perceived Credibility*.

Luarn and Lin (2005), establish empirically that *Perceived Credibility* considerably affects a person's resolve to adopt m-banking. Luarn and Lin (2005), maintain security and privacy are two imperative factors in *Perceived Credibility*.

Perceived Credibility is represented by: individual security, trust, privacy and risk concerns about m-banking adoption (Yu, 2012). Wu and Wang (2005), include consumer perceptions of risks as a factor in adoption. Perceived Risk which covers financial, performance, social and security may influence the adoption of M-Pesa (Ismail & Masinge, 2012).

Luarn and Lin (2005), statistically recognise that *Perceived Financial Cost* has an adverse effect on an individual's *Behavioural Intention* to adopt m-banking. As outlined in 'Unified Theory of Acceptance and Use of Technology model 2' by Venkatesh et al. (2012), customer contexts, contrasting workplace situations, and users themselves are liable for the expenses which can dictate consumer adoption decisions. Including a construct related to cost will complement the Unified Theory of Acceptance and Use of Technology model's existing resource considerations (Venkatesh et al., 2012).

According to Venkatesh et al. (2003), *Facilitating Conditions* are the level at which a person believes that an organisational and technical structure is active in order to preserve use of the system. These constructs are intended to remove barriers for aspects of the technological and organisational environment (Venkatesh et al., 2003). The speed of diffusion of a new technology is affected by possible risks related with the use, development and marketing as well as insecurity about its benefits (Hall & Khan, 2003). Complementary contributions in the diffusion of technology such as training courses are vital to customer adoption (Hall & Khan, 2003).

Venkatesh et al. (2003), refers to *Self-Efficacy* as a secondary element of adoption. Luarn and Lin (2005), maintain that '*Perceived Self-Efficacy*' is a factor in prompting user adoption. Luarn and Lin (2005) use trust to predict m-banking adoption in Taiwan, whilst Porteous (2006) and Donner and Tellez (2008) suggest that trust plays a major factor of *Behavioural Intention* as customers prefer certain levels of face-to-face contact.

Hong and Zhonghua (2015), assert that mobile operators need to facilitate trust, as it is a significant factor in user adoption. Trust concerns are a big hindrance to the use of m-banking and resolving this is fundamental for telecommunications operators (Tobbin, 2012) that have the objective of increasing user adoption of m-banking.

According to Venkatesh et al. (2003) the Unified Theory of Acceptance and Use of Technology model contended and demonstrated that *Behavioural Intention* has a substantial positive impact on technology practice. Integrating habit into the Unified Theory of Acceptance and Use of Technology model will supplement the theory's emphasis on intentionality as the principal instrument, as well as that of being a crucial driver of behaviour (Venkatesh et al., 2012).

Proposition 1: The potential customer's adoption behaviour with the use of M-Pesa in South Africa is significantly influenced by:

- Performance Expectance
- Effort Expectation
- Technology Characteristics/Perceived Ease of Use
- Social Influence
- Perceived Credibility
- Perceived Self-Efficacy
- Financial Cost
- Facilitating Conditions
- Behavioural Intention

2.4.4 *Age and gender as a factor in adoption*

Morris and Venkatesh (2000), used the Theory of Planned Behaviour in their study titled: '*Age differences in technology adoption decisions: Implications for a changing work force*' to observe the effects of age on technology adoption. The results illustrated a difference with an individual's age and its influence on technology adoption with regards to attitude and behaviour particularly over the short term period, but less so over a prolonged time period (Morris & Venkatesh, 2000).

Morris, Venkatesh, and Ackerman (2005), extended the Theory of Planned Behaviour by including gender and age in their study about Employee Decisions in the Workplace in order to increase the understanding of the principal behaviour. Their study acknowledged that gender affects individual adoption based on age, particularly among older workers (Morris et al., 2005). They also pointed out that age and gender are important demographics for technology were a unisex pattern appear amongst younger workers (Morris et al., 2005).

In 2006 Hong and Tam (2006) completed a study on: '*Understanding the Adoption of Multi-purpose Information Appliances: The Case of Mobile Data Services*' which included age and gender, as they were factors shown to have influencing characteristics on technology adoption. This study showed that only gender has a small effect on technology adoption (Hong & Tam, 2006).

In 2012 Yousafzai and Yani-de-Soriano (2012) established a new framework for their study on '*Understanding customer specific factors underpinning Internet banking adoption'* by including demographic variables such as age and gender with the Technology Acceptance Model. They discovered that age and gender affected an individual's beliefs on technology (Yousafzai & Yani-de-Soriano, 2012).

According to Yu (2012), gender and age significantly moderate the effects of performance in Mobile Money adoption. Venkatesh et al. (2012), postulated an association concerning *Facilitating Conditions*, which is qualified by age, and gender with *Behavioural Intention* which was added to his updated model. Venkatesh et al. (2012), also discussed the effects of demographics specifically age and gender on new technology adoption. Yu (2012), discovered that *Perceived Financial Cost* stood limited towards consumers aged less than thirty or above fifty years; and the consequence of effort expectancy was considerably improved for older consumers.

Proposition 2: The potential customer's adoption behaviour with the use of M-Pesa in South Africa is affected by the following motivating factors:

- Age
- Gender

2.5 Conclusion of Literature Review

The Unified Theory of Acceptance and Use of Technology model emphasises the most important individual level influences that affect technology adoption and classifies the possibilities that moderate the properties of these influences (Venkatesh et al., 2003). This paper aims to determine the factors that significantly affect people to adopt M-Pesa in South Africa using the extended Unified Theory of Acceptance and Use of Technology model. The two additional constructs, *Perceived Credibility* and *Financial Cost*s are included from the literature (Yu, 2012). Age and gender are seen as factors that are critical to the factors influencing technology adoption.

The micro-environment, competition and regulatory factors in Kenya played a key role in the rapid and successful adoption of M-Pesa in Kenya. These conditions need to be similarly recreated to ensure a framework for M-Pesa adoption is to be successfully replicated in South Africa.

Proposition 1: The potential customer's adoption behaviour with the use of M-Pesa in South Africa is significantly influenced by:

- Performance Expectance
- Effort Expectation
- Technology Characteristics/Perceived Ease of Use
- Social Influence
- Perceived Credibility
- Perceived Self-Efficacy
- Financial Cost
- Facilitating Conditions
- Behavioural Intention

Proposition 2: The potential customer's adoption behaviour with the use of M-Pesa in South Africa is affected by the following motivating factors:

- Age
- Gender

CHAPTER 3. RESEARCH METHODOLOGY

This chapter discusses the design and methods as well as the methodology that was applied to complete the study. The quantitative research method is discussed and analysed as the preferred method for this study. The objectives of this chapter were to understand the research process and techniques to aid in determining the factors of influence for the adoption of M-Pesa in South Africa as well as the aspects that contribute to its successful implementation. The following sections provide the population, sample and sampling procedures utilised. The data collection and analysis that were employed in collecting the data is provided. The data analysis and statistical techniques used are deliberated. The chapter is concluded with an analysis of the limitations, reliability and validity of these tools and procedures.

3.1 Research methodology

The research utilised a quantitative research methodology. The study aims to recognise if the independent variables are numerically important influences in the adoption of M-Pesa (Kalof, Dan, & Dietz, 2008). A quantitative study highlights quantification whist being empirical and impartial in the gathering and analysis of data (Bryman, 2012). This study discovers which constructs impact the adoption of M-Pesa in South Africa and examines the environmental factors which form a structure for successful implementation. Qualitative studies were completed by practitioners (Mas & Morawczynski, 2009; Morawczynski & Pickens, 2009) to examine M-Pesa in Kenya, but these only provided suggestive evidence and were not able to quantify the impact of M-Pesa. These findings were also critiqued to have been restricted by the small sample size (Mbiti & Weil, 2011). The research paradigm applied and followed for this study is, therefore, a quantitative research method approach.

A quantitative analysis is appropriate for this data as the various factors have to be measured for significance and not on general opinions of the technology from key participants; which may/may not have a company bias.

Quantitative research is a logical process because it involves investigating the relationships among variables and realising causal links between variables such as understanding variation, test causal relationships and identify distribution (Kalof et al., 2008). It is for these reasons that quantitative research was selected as the preferred method for this study. A quantitative research approach and technique offer the researcher specific insight into the adoption factors using the Unified Theory of Acceptance and Use of Technology model. According to Onwuegbuzie and Johnson (2004) the advantage of quantitative research is testing and constructing already constructed theories with hypotheses, as well as the ability to generalise its findings. The disadvantages are that hypothesised theories are not indicative of participants' understanding; a respondent may exhibit a confirmation bias; and it may be too general for specific situations (Onwuegbuzie & Johnson, 2004).

3.2 Research Design

Research design refers to a framework for the gathering and analysis of data. It also reveals decisions about the importance of the range of the research process (Bryman, 2012). The research was completed using information and data collected in a questionnaire format as this format is most suitable for a quantitative research approach. A questionnaire is an assortment of questions administered to respondents (Bryman, 2012). The questionnaire established if the sample population believe if the technology adoption factors have an effect in South Africa and whether the necessary structures provide an enabling environment. Field data for this research was collected from potential customers and authentic active customers.

According to Kalof et al. (2008) a structured questionnaire format is most appropriate for understanding patterns of variation and the examination of relationships between variables and was, therefore, selected as the best tool for quantitative research.

Data collection was completed using Qualtrics, a web-based self-administered questionnaire system.

This was selected due to convenience and the powerful data capturing features of the tool. A tablet/form was used to administer the questionnaire in the field for respondents that did not have access to a computer.

Cross sectional design was used in this study. This is defined by Bryman (2012) as a research design that involves the collection of data on many instances and at a single point in time so as to gather a body of quantifiable data in linking with many variables which were further inspected for patterns of association.

3.3 Population and sample

3.3.1 *Population*

The population is the creation of units from which a sample is to be nominated (Bryman, 2012). The population in this research was defined as all potential M-Pesa customers, the banked and the unbanked, within Gauteng, South Africa, varying in ages and occupations. This may have been people who had registered for M-Pesa in South Africa and those that had not. It catered for those with access to formal and informal banking. The same applied to inclusive banking accounts normally used for basic savings or for receiving of social grants. There were no limitations as to the race, education or background of respondents.

The population excluded anyone under the age of 18 years, although they form a vital part of society and the financial patterns; they were not included due to privacy and legal restrictions.

3.3.2 *Sample and sampling method*

The sample is the section of the population that was chosen for study i.e. a subset of the population (Bryman, 2012). This study used a convenience sample namely a designated sample because of its availability to the researcher and because it is a form of a non-probability sample (Bryman, 2012). The sampling error was minimised by visiting different companies and locations.

The sample of the research was drawn from Vodacom World visitors, students from the University of the Witwatersrand as well as employees of Vodacom, Investec and Ice-Cell services. This was to assess a wide variety of participants from high level income earners, to technology savvy and Base of the Pyramid respondents. Ismail and Masinge (2012), define the Base of the Pyramid as individuals with an income lower than R5000 per month or the South African Living Standard Measure (LSM) of 5 or less. This provided an appropriate view of the M-Pesa market. The sample respondents were active members of society that received an income, as included in the questionnaire.

Any customer that had an M-Pesa account was labelled as active at the point in time at which the survey was administered. Active in this study is defined as a customer that used/performed at least one transaction in the last three months.

The researcher hoped to attain a minimum of 150 valid responses. Participation was completely voluntarily to avoid any privacy issues, bias or false answers due to the prospect of a prize.

3.4 The research instrument

A Qualtrics questionnaire was used to complete the research. Most questions concerning the measurement of factors were adapted from earlier studies, and indicated as such (Ismail & Masinge, 2012; Yu, 2012). This was used to safeguard content validity of the questionnaire used; with it discreetly re-worded to fit M-Pesa in South Africa (Yu, 2012). The questionnaire was structured into three sections, containing a total of 30 questions. The first section contains demographic questions collecting information relating to the respondent; section two requested information on the factors of *Performance Expectance*, *Perceived Credibility*, *Perceived Financial Cost*, *Perceived Self-Efficacy*, *Effort Expectance*, *Social Influence*, *Facilitating Conditions*, and *Behavioural Intention*; and the third section contains questions pertaining to sub-problem two (Ismail & Masinge, 2012; Luarn & Lin, 2005; Yu, 2012). A small pilot study, typically 8 respondents, was conducted to receive feedback on the ease of understanding and time consumed on the questionnaire.

A covering letter was adapted from the University of the Witwatersrand template and Mutuku (2011) motivating the potential respondent to participate.

3.5 Procedure for data collection

The research data was collected utilising a questionnaire in a structured questionnaire format. Respondents were approached randomly at Vodacom World, University of the Witwatersrand Business School and Ice-Cell services with participation being strictly voluntary. The researcher initially corresponded by e-mail to personal contacts within each of the companies (Vodacom, Investec and Ice-Cell); described the research topic and the purpose of questionnaire, along with the questionnaire and requested consent.

The questionnaire was distributed in two phases. The first phase was via email to potential user groups. The respondents were requested to complete the questionnaire within two weeks and a follow up reminder communication was sent after one week; and then again two days before the deadline. Responses received by the researcher after the deadline was not considered as sufficient responses were received and the likelihood of receiving a completed response after the time elapsed was slim. A response rate of 75% was hoped for from the first phase. The second phase was in the field utilising a tablet/ hard copy paper based form to obtain and record responses from respondents in the Base of the Pyramid or unbanked segment.

The questionnaire (Please refer to Appendix A) aimed to discover the degree of the relative importance of each of the factors on a five point Likert scale and through general demographics questions.

3.6 Data analysis and interpretation

The techniques that were used to analyse the data were descriptive statistical analysis with Multivariate and factor analysis. A Gaussian distribution was applied to convert the 5-point Likert scale into a format more suitable for multivariate analysis.

Discriminate Analysis and Linear Regression was used to analyse the data. Graphs illustrating useful demographic information were used from Qualtrics.

Descriptive statistics describe and organise the sample by using data which summarises the content into numbers or graphical techniques (Fisher & Marshall, 2009; Thompson, 2009). Inferential statistics were used to observe differences between various samples and within the larger target population by using numbers (Thompson, 2009). According to Bryman (2012), Factor analysis is a numerical method utilised to determine if there is a propensity for clusters of huge figures of variables to be inter-related. Factor analysis is frequently utilised with several indicator measures to determine if there is an inclination with the indicators to form clusters, referred to as factors (Bryman, 2012). Williams, Brown, and Onsman (2012), describe factor analysis as a multivariate statistical technique which has confirmatory factor analysis and exploratory factor analysis. It is used to condense a large number of variables into a smaller set of variables, creates essential dimensions between measured variables and suppressed constructs, and offers construct validity evidence of self-reporting scales (Williams et al., 2012).

Statistical analysis such as Principle Component Analysis (PCA) and Discriminant Analysis (DA) enables the data to be reduced into a summarised number which can be used to produce score plots from which analysis can be completed (Fisher & Marshall, 2009; Stewart, Ivy, & Anslyn, 2014). Regression Analysis was completed to aid in the explanation of the results obtained and supplement the Discriminate and Factor Analysis (Bryman, 2012).

Rigdon (2012), defines Partial Least Squares (PLS) as using the ideal properties of ordinary least squares regression to estimate results from factor-based structural equation modelling, in order to save on computational time and uses limited distributional assumptions.

3.7 Limitations of the study

Limitations for this particular study include the following:

- The research relied on participants' honesty and opinions;
- The questionnaire was conducted in English which could have had a negative effect on user understanding;
- Results from the research are only applicable in a South African context;
- Participants of the study were not a fair reflection of the rural population which limits the ability to generalise the study to non-urban areas; and
- There is the risk that respondents completed the questionnaire for the sake of it and did not indicate their true opinions.

3.8 Validity and reliability

Bryman (2012), describes validity as an apprehension with the integrity of the deductions that are produced from a study. The constructs and question were adapted from prior studies, as indicated above, in order to guarantee adequate reliability and convergent validity (Luarn & Lin, 2005).

Statistical significance tests were used in this study. This permitted the author to estimate that the confidence levels with the results, stemming from research based on an arbitrarily nominated sample; are in fact generalisable (Bryman, 2012).

3.8.1 *External validity*

Bryman (2012), defines external validity as an apprehension with the question of whether a measure seems to reproduce the content of the model in question. The researcher used face validity which is described as an apprehension with the question of whether the measure seems to reflect the content in question (Bryman, 2012).

The researcher encourages that the study should be replicated using samples in various areas and companies, as well as other countries, to establish if similar results are achieved.

The data can be generalised as the samples will be taken over a representative population of the various M-Pesa target markets.

3.8.2 *Internal validity*

Bryman (2012), describes internal validity as unease with the question of whether a conclusion that integrates a causal relationship between many variables is comprehensive. The questionnaire was adapted from peer reviewed articles based on the original authors of the Unified Theory of Acceptance and Use of Technology model to ensure they are valid.

3.8.3 *Reliability*

Bryman (2012), defines reliability as the level to which a measure of a theory is steady; and internal reliability as the level to which the measures which collate the scale are consistent.

The measurement model was not analysed to test the reliability and validity of the questionnaire instrument (Luarn & Lin, 2005) as one was adapted from peer reviewed articles. Cronbach Alpha is a measure of internal consistency and reliability (Omar, 2011). The Cronbach Alpha was used to test reliability as it is the most prevalently used measure of internal consistency (Luarn & Lin, 2005). The questionnaires were completed by various respondents over a month to ensure reliability and SAS was used to run the results.

3.9 Demographic profile of respondents

This section describes the profile of the sample, which consisted of 189 respondents according to the respective demographic characteristics of gender, income, age and race. This included whether the sample of customers was registered for M-Pesa and the attributes which contributed to its use or potential use. These sample attributes are demonstrated in the next chapter with a series of graphs, taken from the Qualtrics software tool, for each of the characteristics.

There was a good representation of gender and age as can be seen in the graphs presented in the next chapter. The researcher planned to obtain respondents more representative of the South African population in terms of race and monthly income. However, there was a disproportionate number of Indians in the sample which is not in line with the race distribution in South Africa.

Therefore, the race proportion is neither according to scale nor a fair distribution. A similar occurrence with regards to monthly income occurred with a very high number of respondents earning over R7000.00 per month. A sample that incorporated a higher percentage of the rural population would also have been advantageous to the study. A larger percentage of respondents without access to a formal bank account would have served to illustrate a greater need for M-Pesa, but this information was not known in advance and would have required a much larger sample. Therefore, this study should be replicated in other geographical locations in South Africa to determine its true generalisability.

This research data for users of Mobile Money was divided into adopters, potential adopters and non-adopters to determine if there were any predispositions associated with the UTAUT model criteria. Data from users who were 'happy with the service' and users 'who were unhappy with the service' was combined to form the adopters.

The pilot study highlighted numerous issues such as the extensive number of questions which increased the time required to complete the survey. Some questions were reworded in order to make it easier to understand. The Likert scale was changed from strongly agree to strongly disagree as it was more in line with popular surveys. The scale was also changed from most likely to strongly agree, which made certain questions easier to answer. The questionnaire was restructured to 'force response' which ensured minimal missing data, although this is likely to have increased the 'drop off' rate of the questionnaire. To prevent introducing additional complexity into the questionnaire, there were no reversed items utilised as this would have hindered the respondents that were not fluent in English or who were at the Base of Pyramid ability from answering questions appropriately.

CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents and describes the results from the questionnaire concerning the factors that influence the adoption of M-Pesa outlined in the previous chapter. The data sample and statistical techniques used to analyse the data are descriptive statistical analysis and multivariate analysis techniques, primarily Discriminate Analysis, Exploratory Factor Analysis and Linear Regression as described in chapter three above. The questionnaire was completed by 189 respondents. This chapter uses these descriptive statistics, tabulated or presented graphically, for each of the propositions concentrating on the results of the research. The results were completed using Qualtrics and SAS software tools, supported with Microsoft Excel. Figures 1 – 12 contain the demographics of the sample.

The following steps were taken in the statistical analysis:

1. Pre-processing of the data was completed on all raw data which included running a Gaussian distribution fit algorithm (Appendix C, Annexure 1) and re-scaling the data;
2. A factor analysis was run to receive the most important factors to the results and to confirm the addition of ‘questions’. The Cronbach Alpha of each construct question was determined to ensure validity. The rotated factor pattern (attached in Appendix C, Annexure 2) shows minimal cross loading. An exploratory factor analysis was completed on PE1 to BI3 to create a factor series. Appendix C, Annexure 2 contains the rotated factor pattern, illustrating minimal cross loading;
3. Discriminate analysis was completed using ‘Mobile Banking’ as the dependent variable;
4. Discriminate analysis was completed using ‘M-Pesa’ (Vodacom) as the dependent variable; and
5. Linear regression was completed using BI as a dependent variable.

6. A discriminate analysis and linear regression was completed using age and gender to determine their effects on ‘Mobile Money’ and ‘M-Pesa’.

4.2 Demographic Results

4.2.1 *Gender representation of sample*

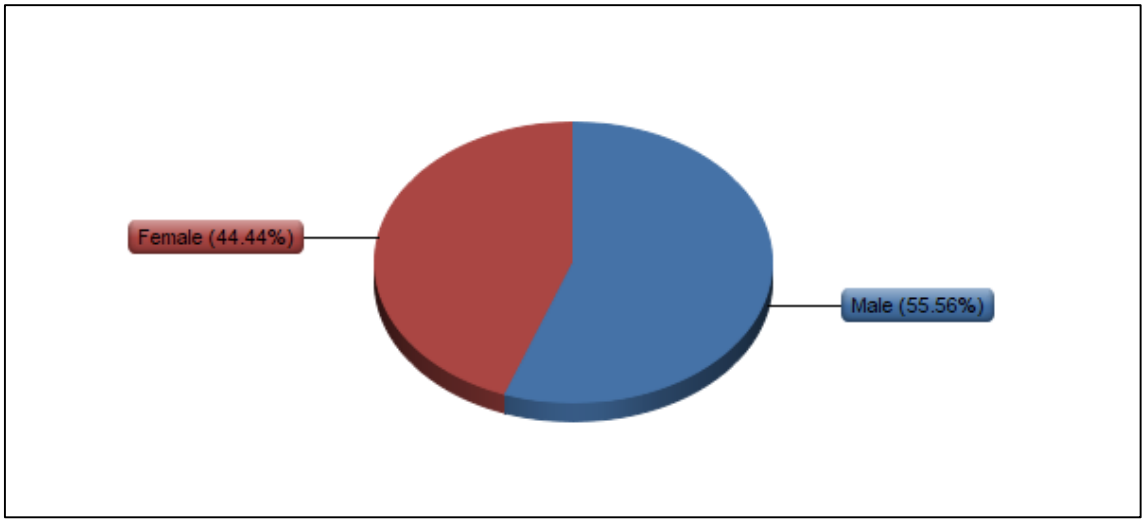


Figure 1: Profile by gender graph of sample.

There were marginally more males (56%) than females (44%) in the sample as depicted in Figure 1 above.

4.2.2 *Racial representation of sample*

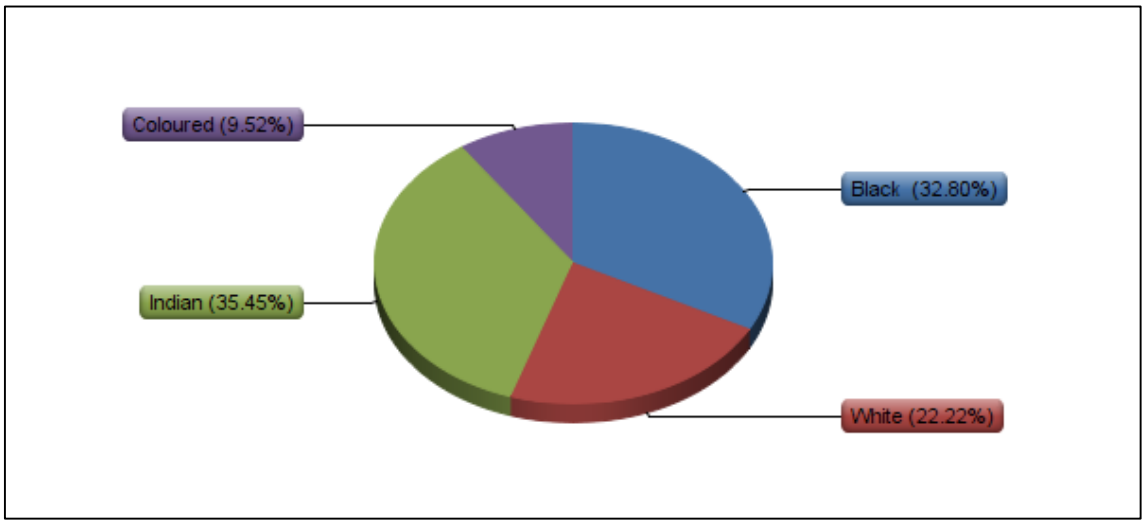


Figure 2: Profile by race for sample.

Indians and blacks formed the majority of the sample followed by whites and coloureds.

4.2.3 *Age profile of sample*

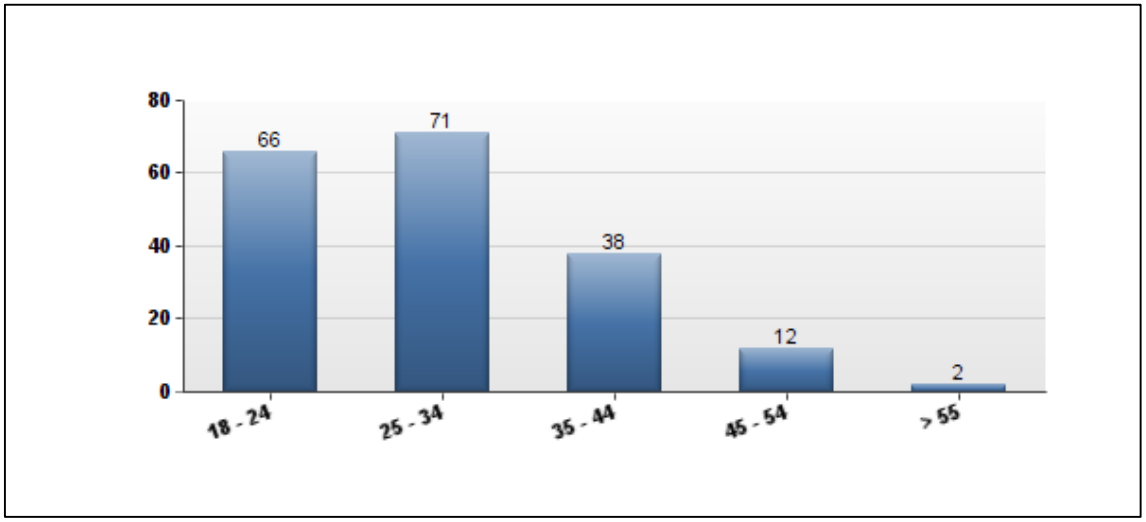


Figure 3: Profile by age graph of sample.

The majority of the respondents were between the ages of 18 – 34 which formed 73% while the 35 – 44 segments formed 20% of the sample.

4.2.4 *Employment status of sample*

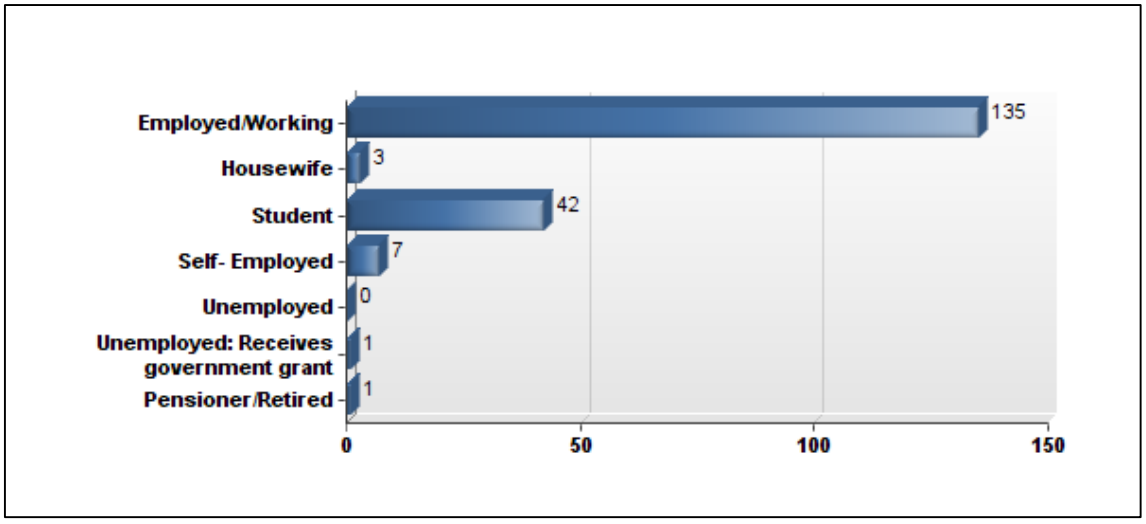


Figure 4: Employment status of respondents.

This illustrates that the majority of respondents were employed-making up 71% of the sample followed by students, at 22%.

4.2.5 *Income level of sample*

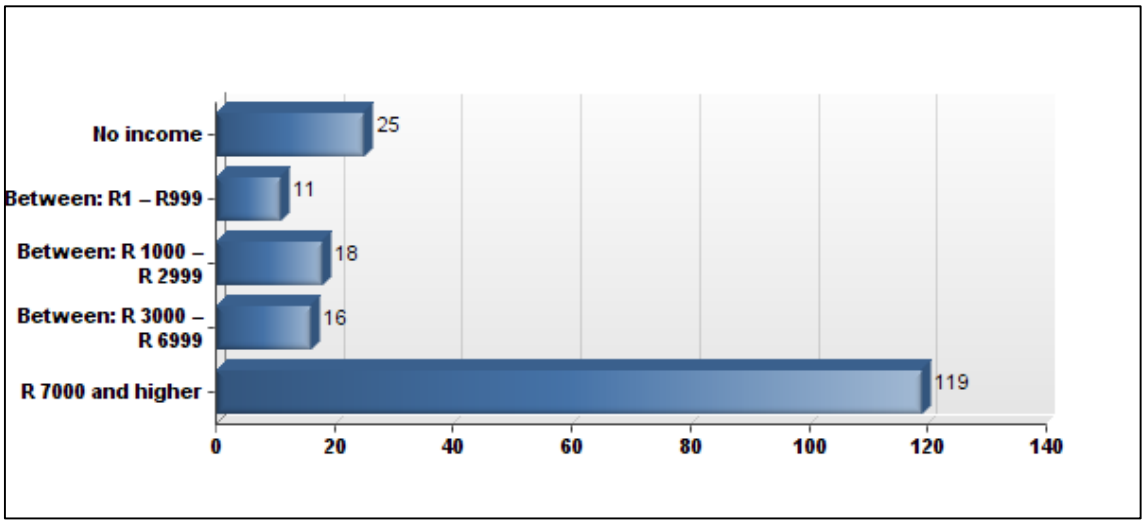


Figure 5: Income level of respondents.

The majority of the respondents earned more than R7000.00 per month, which formed 63% of the sample as seen in figure 5. A small percentage (13%) earned no income and 8% of respondents earned between R3000.00 and R 6999.00 per month.

4.2.6 *Levels of education of sample*

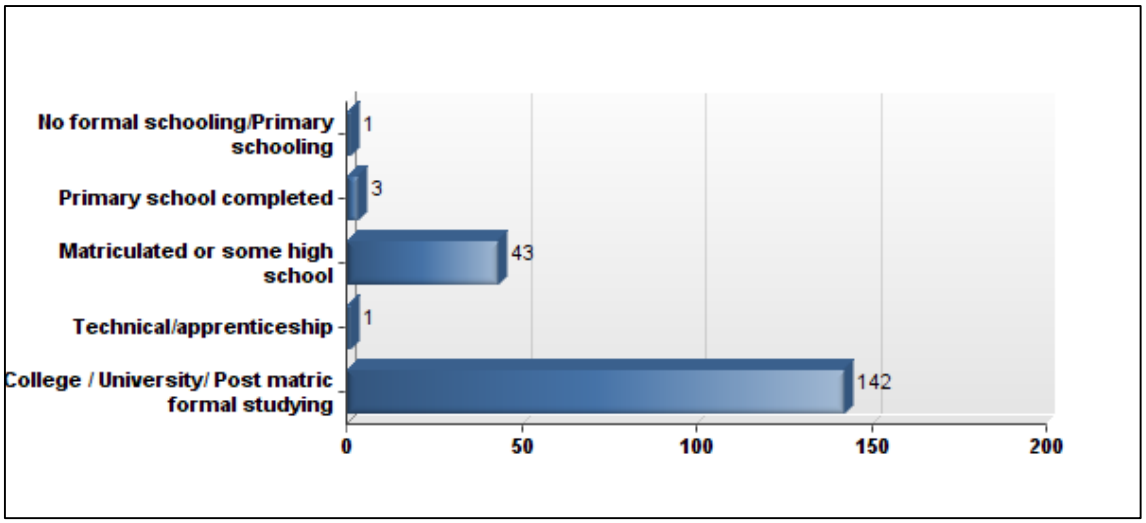


Figure 6: Education level of respondents.

The majority of respondents (75%) completed (or experienced some form of) post matric studies, whilst 23% received some kind of high school training as depicted in figure 6.

4.2.7 *Use of mobile telephones*

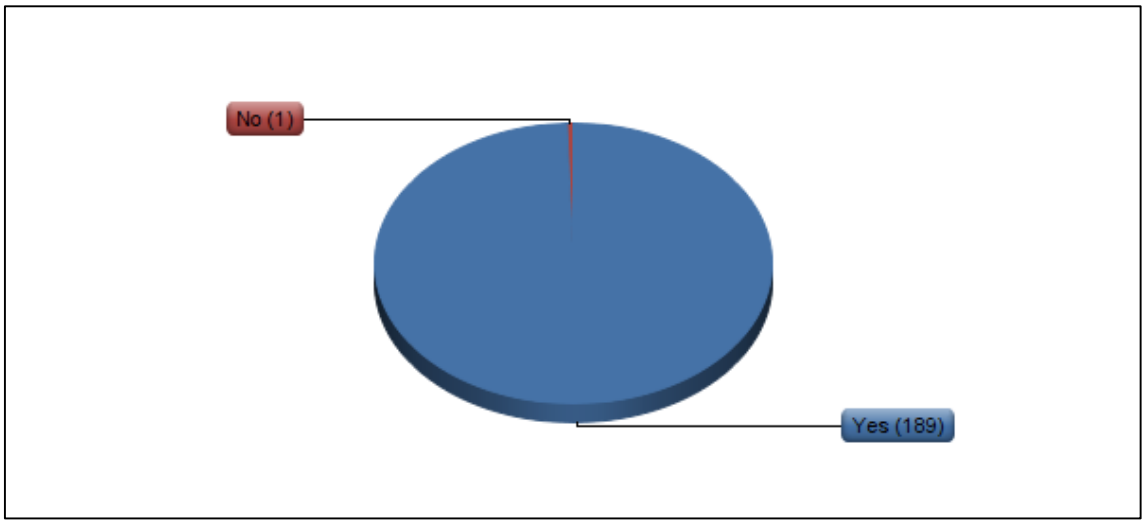


Figure 7: Respondents with a mobile telephones.

99% of respondents owned a mobile telephone. Only one response of “not owning a mobile telephone” was received.

4.2.8 Banked respondents

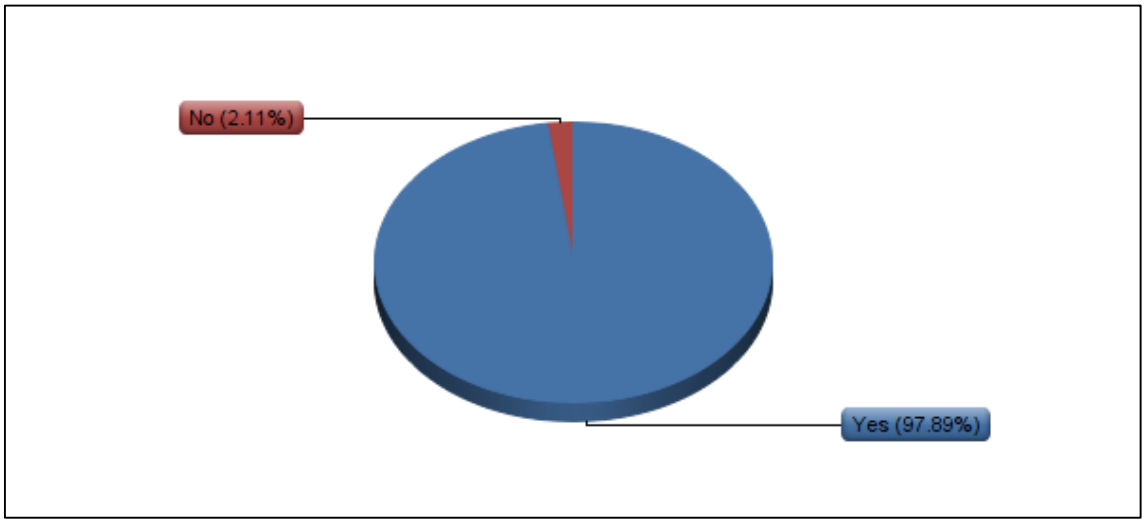


Figure 8: Profile of respondents with a formal bank account.

Bank accounts are held by 98% of the sample, whilst 4 of the respondents claimed not to have bank accounts.

4.2.9 Travel time to banking facilities

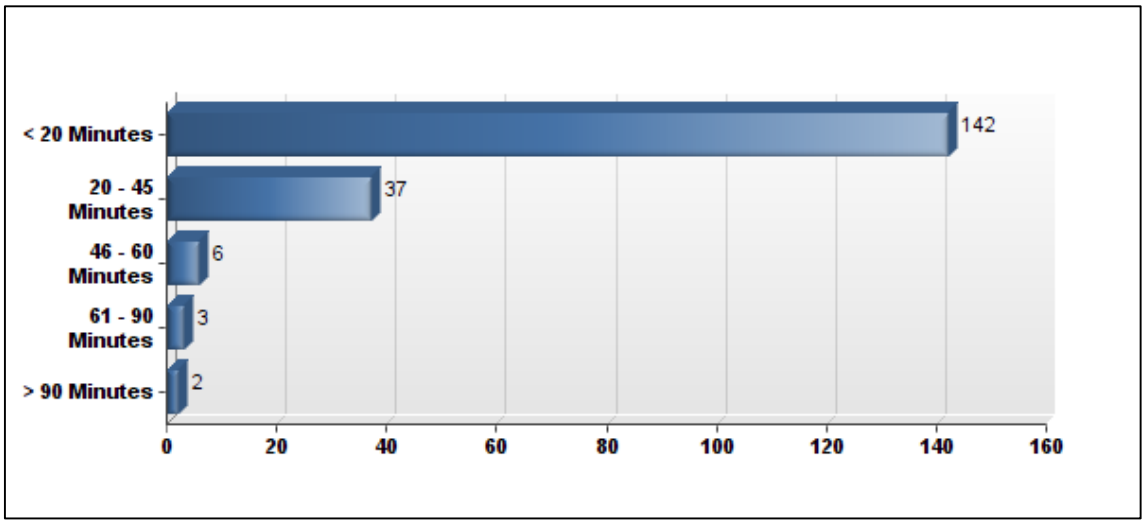


Figure 9: Respondents' travel time to nearest banking branch.

Respondents reported various travelling times in terms of the distances between their nearest banking facility and their place of residence - 75% of respondents indicated that they had less than 20 minutes travelling time to the nearest branch of their bank from their place of residence.

4.2.10 Use of mobile banking services

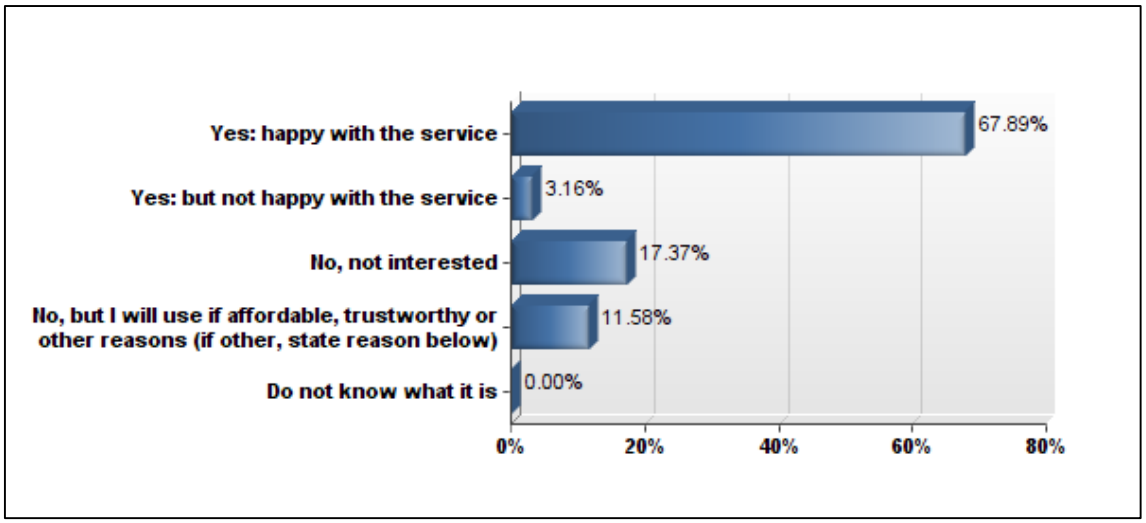


Figure 10: Responses about the use of m-banking.

Many of the respondents indicated that they use m-banking and 68% of them indicated that they were happy with; it whilst 17% indicated that they were not interested in using the service, and 12% indicated they would be keen on utilising the service if it was trustworthy, affordable, easier to use, or if they had a better smart telephone or received good service. This is depicted in figure 10 above. All respondents (100%) indicated that they were aware of the service.

4.2.11 Respondents with M-Pesa accounts

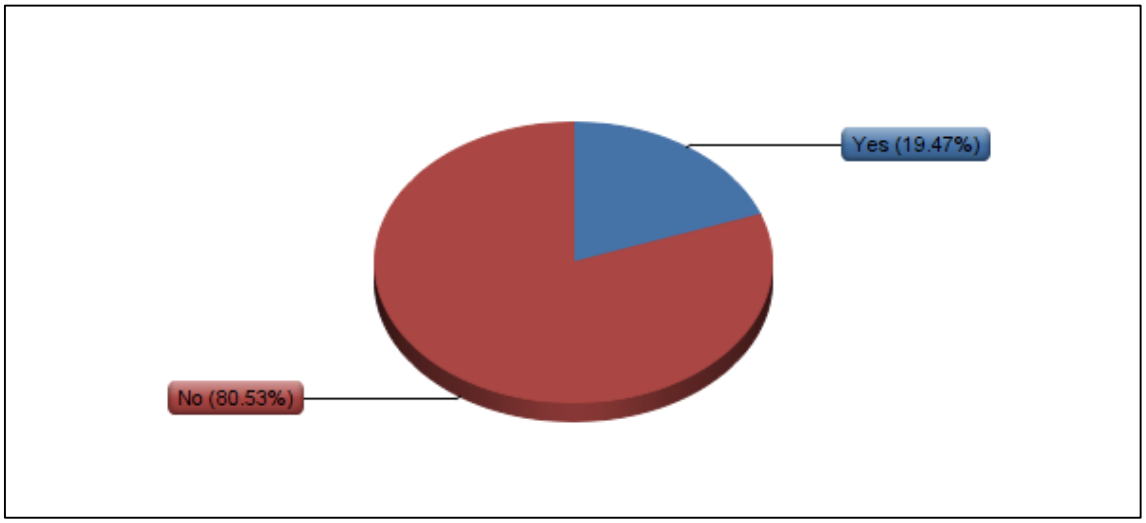


Figure 11: Respondents M-Pesa accounts.

There were 68% of respondents listed as using m-banking yet only 19% had an M-Pesa account.

4.2.12 Utilisation of M-Pesa

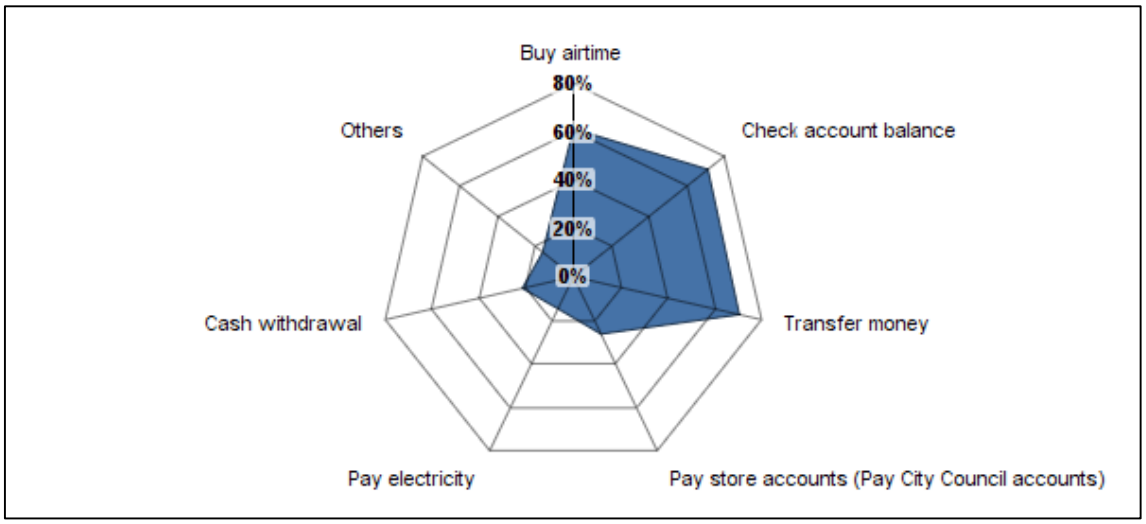


Figure 12: Spider diagram of various methods M-Pesa is utilised.

Transferring money (75%) and checking account balances (78%) were the main uses reported by the respondents for their M-Pesa accounts.

4.3 Major constructs of the Unified Technology Acceptance User Technology model influencing M-Pesa and mobile banking

The potential customer's adoption behaviour with the use of M-Pesa in South Africa is significantly influenced by:

- Performance Expectance;
- Effort Expectation;
- Technology Characteristics/Perceived Ease of Use;
- Social Influence;
- Perceived Credibility;
- Perceived Self-Efficacy;
- Financial Cost.
- Facilitating Conditions; and
- Behavioural Intention.

Proposition 1 relates to the factors that influence the potential customer's adoption behaviour with the use of M-Pesa in South Africa.

The factors were tested across a range of determinants such as *Performance Expectance*, *Effort Expectation*, *Technology Characteristics/ Perceived Ease of Use*, *Social Influence*, *Perceived Credibility* and *Perceived Self-Efficacy*, *Financial Cost*, *Facilitating Conditions* and *Behavioural Intention* as discussed in Chapter 2. Figure 13 illustrates a Scree plot depicting that 10 of the factors that explain most of the variability. Figures 14 – 18 and tables 1 – 8 show the SAS output from the analysis.

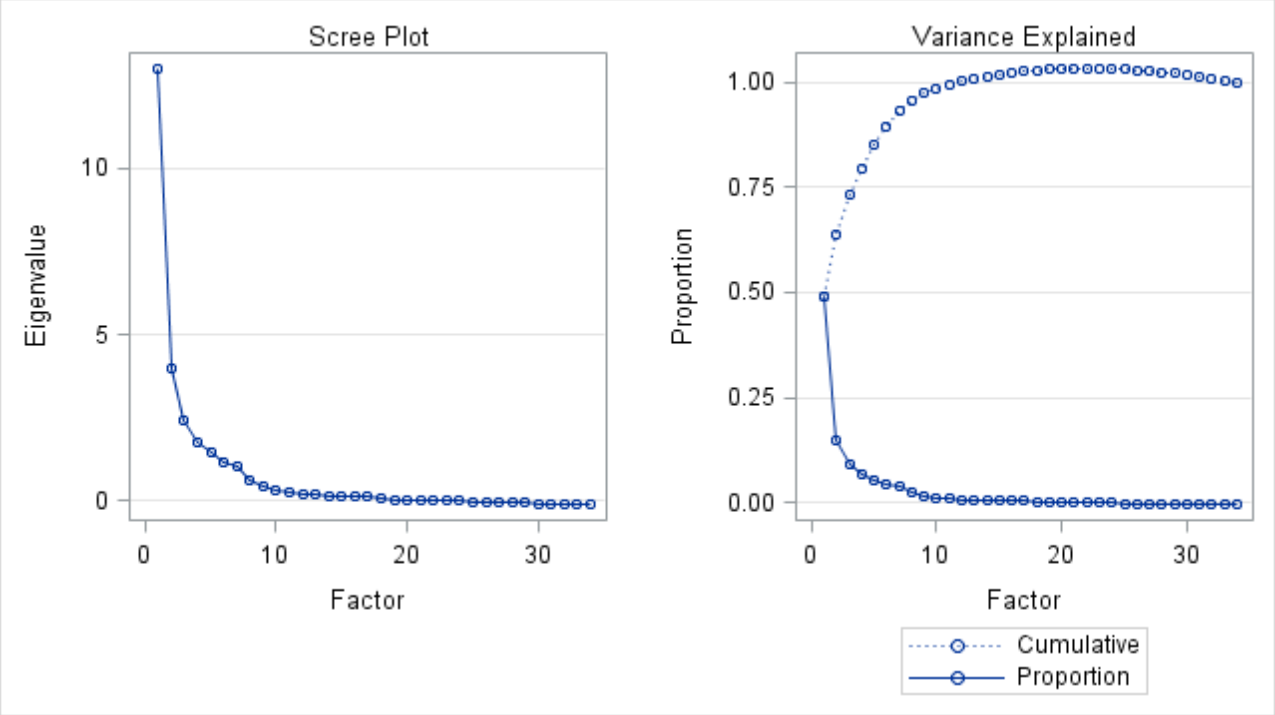


Figure 13: Scree plot showing factor structure.

4.3.1 Factor analysis on combined data

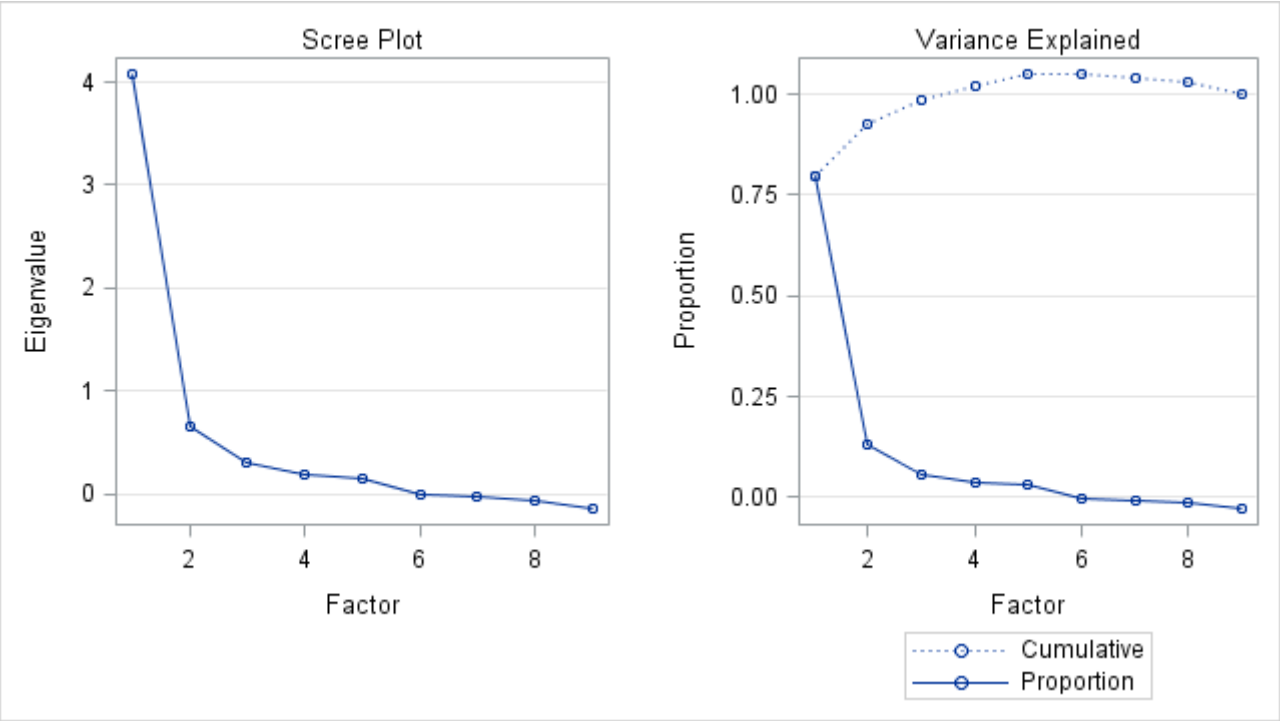


Figure 14: Scree plot run on limited factors.

Table 1: Factor pattern.

Factor Pattern				
	Factor1	Factor2	Factor3	Factor4
PE	0.75840	-0.11717	0.22415	0.14634
EE	0.77897	-0.35559	0.19410	0.05698
TEC	0.83332	-0.07539	0.08151	-0.30336
SI	0.67589	0.37187	-0.01483	-0.04444
PC	0.70932	0.10100	-0.22240	-0.13487
PFC	0.01533	0.36492	0.27966	-0.01951
FC	0.73218	-0.12612	-0.07512	0.05772
PSE	0.31666	0.46166	0.07067	0.10343
BI	0.77813	0.05943	-0.24804	0.19073

Table 2: Linear discriminate function.

Discriminate analysis with mobile banking:

1) Linear Discriminant Function for Mobile			
Variable	**1**	**3**	**4**
Constant	-1.15500	-1.37793	-0.67290
PE	0.18690	-0.39113	-0.37846
EE	0.59077	0.45889	0.17101
TEC	0.59087	0.53787	0.03024
SI	-1.26840	-0.43731	-0.68222
PC	-0.31406	-0.87956	-0.66354
PFC	-1.53085	-1.48483	-1.25863
FC	0.04523	0.51727	0.16520
PSE	0.37492	0.48230	0.70570
BI	0.36736	-1.31600	0.44332

Table 3: Discriminate function accuracy.

Number of Observations and Percent Classified into Mobile				
From Mobile	**1**	**3**	**4**	**Total**
1	75	23	31	129
	58.14	17.83	24.03	100.00
3	1	21	9	31
	3.23	67.74	29.03	100.00
4	4	5	12	21
	19.05	23.81	57.14	100.00
Total	80	49	52	181
	44.20	27.07	28.73	100.00
Priors	0.33333	0.33333	0.33333	

Table 4: Model accuracy.

Error Count Estimates for Mobile				
	1	**3**	**4**	**Total**
Rate	0.4186	0.3226	0.4286	0.3899
Priors	0.3333	0.3333	0.3333	

Table 5: Linear Discriminate function

(Discriminate analysis with M-Pesa).

Linear Discriminant Function for M-Pesa		
Variable	**1**	**2**
Constant	-1.23026	-0.91057
PE	-0.22299	0.01266
EE	0.48515	0.49571
TEC	0.56123	0.46913
SI	-0.80948	-1.04439
PC	-0.44855	-0.50281
PFC	-1.82276	-1.40840
FC	-0.18633	0.23981
PSE	1.10998	0.31437
BI	0.57283	-0.08080

Table 6: Discriminate function accuracy.

2) Number of Observations and Percent Classified into M-Pesa			
From M-Pesa	**1**	**2**	**Total**
1	26	9	35
	74.29	25.71	100.00
2	40	106	146
	27.40	72.60	100.00
Total	66	115	181
	36.46	63.54	100.00
Priors	0.5	0.5	

Table 7: Model accuracy.

Error Count Estimates for M-Pesa			
	1	**2**	**Total**
Rate	0.2571	0.2740	0.2656
Priors	0.5000	0.5000	

Table 8: Linear regression with BI as the dependent variable.

Summary of Stepwise Selection								
Step	Variable Entered	Variable Removed	Number Vars In	Partial R-Square	Model R-Square	C(p)	F Value	Pr > F
1	FC		1	0.3714	0.3714	73.5111	105.74	<.0001
2	PC		2	0.1233	0.4947	26.3788	43.43	<.0001
3	SI		3	0.0374	0.5321	13.4572	14.16	0.0002
4	PE		4	0.0258	0.5579	5.1862	10.26	0.0016

Variable PE Entered: R-Square = 0.5579 and C(p) = 5.1862

Table 9: Analysis of variance.

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	87.74303	21.93576	55.52	<.0001
Error	176	69.53867	0.39511		
Corrected Total	180	157.28171			

Table 10: Key Linear Regression variables.

Variable	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	0.09690	0.05884	1.07141	2.71	0.1014
PE	0.23884	0.07456	4.05385	10.26	0.0016
SI	0.26977	0.08412	4.06318	10.28	0.0016
PC	0.29198	0.07430	6.10099	15.44	0.0001
FC	0.37493	0.07505	9.86232	24.96	<.0001

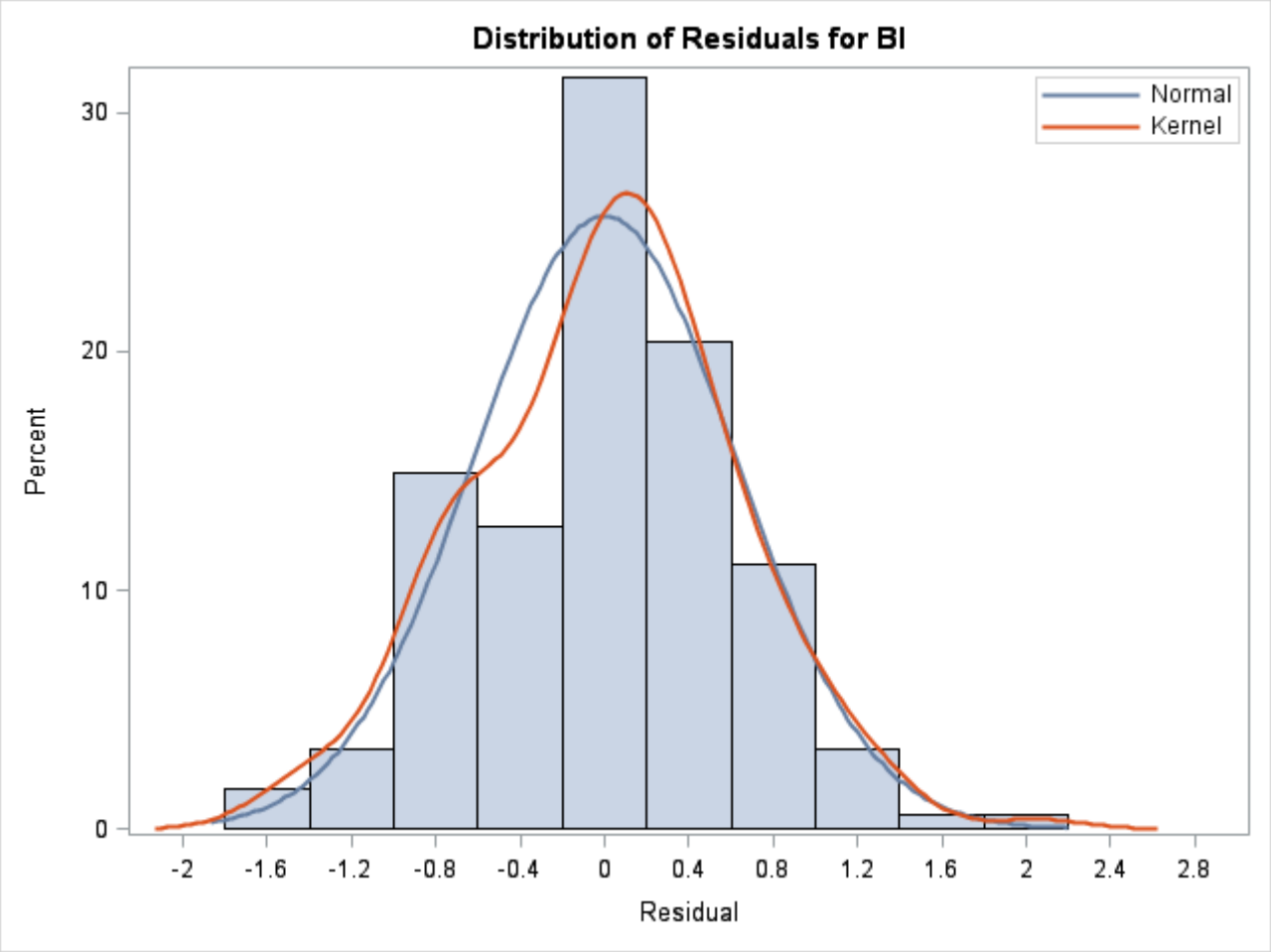


Figure 15: Distribution of Residuals for BI.

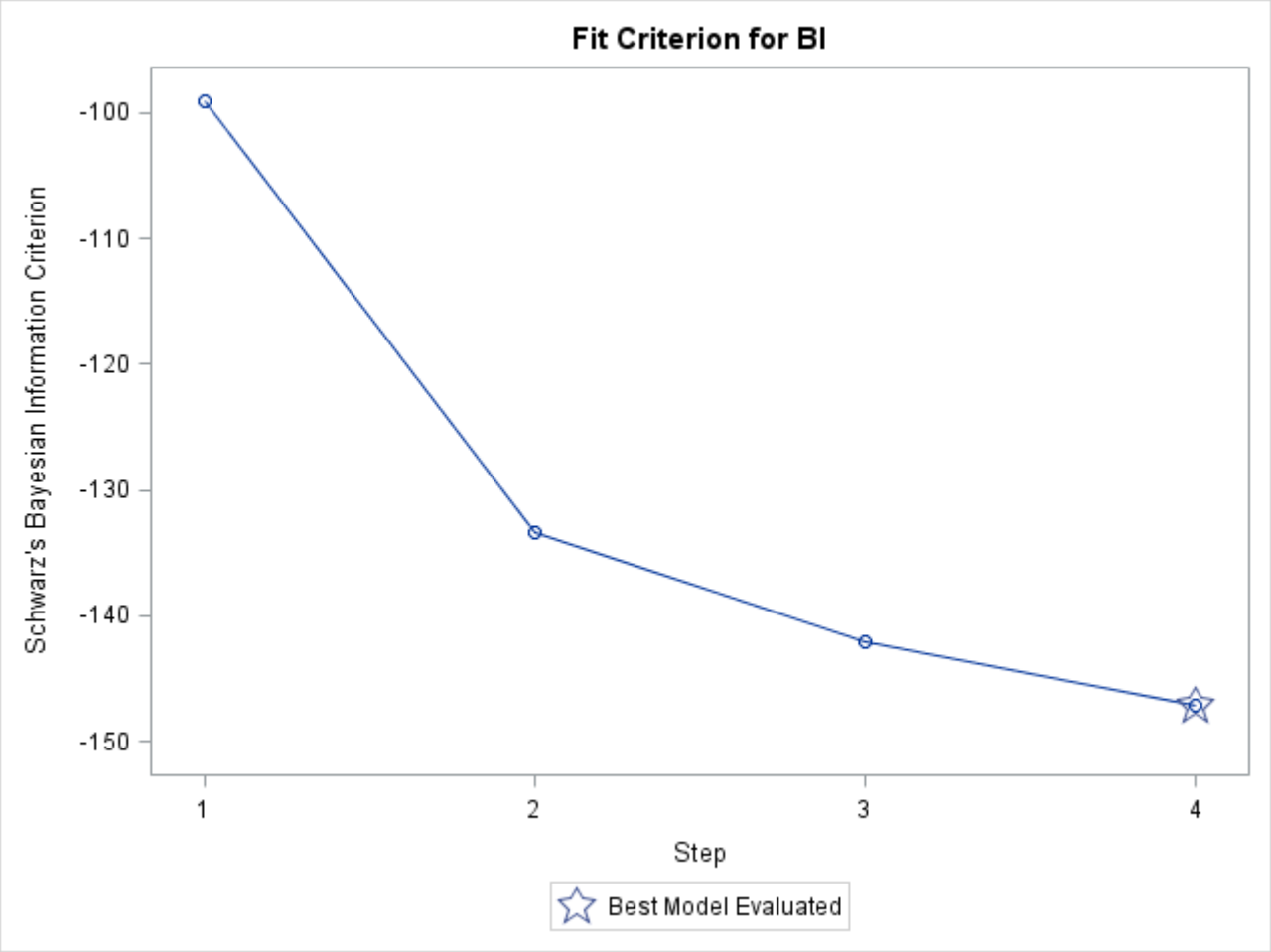


Figure 16: Fit Criterion for BI.

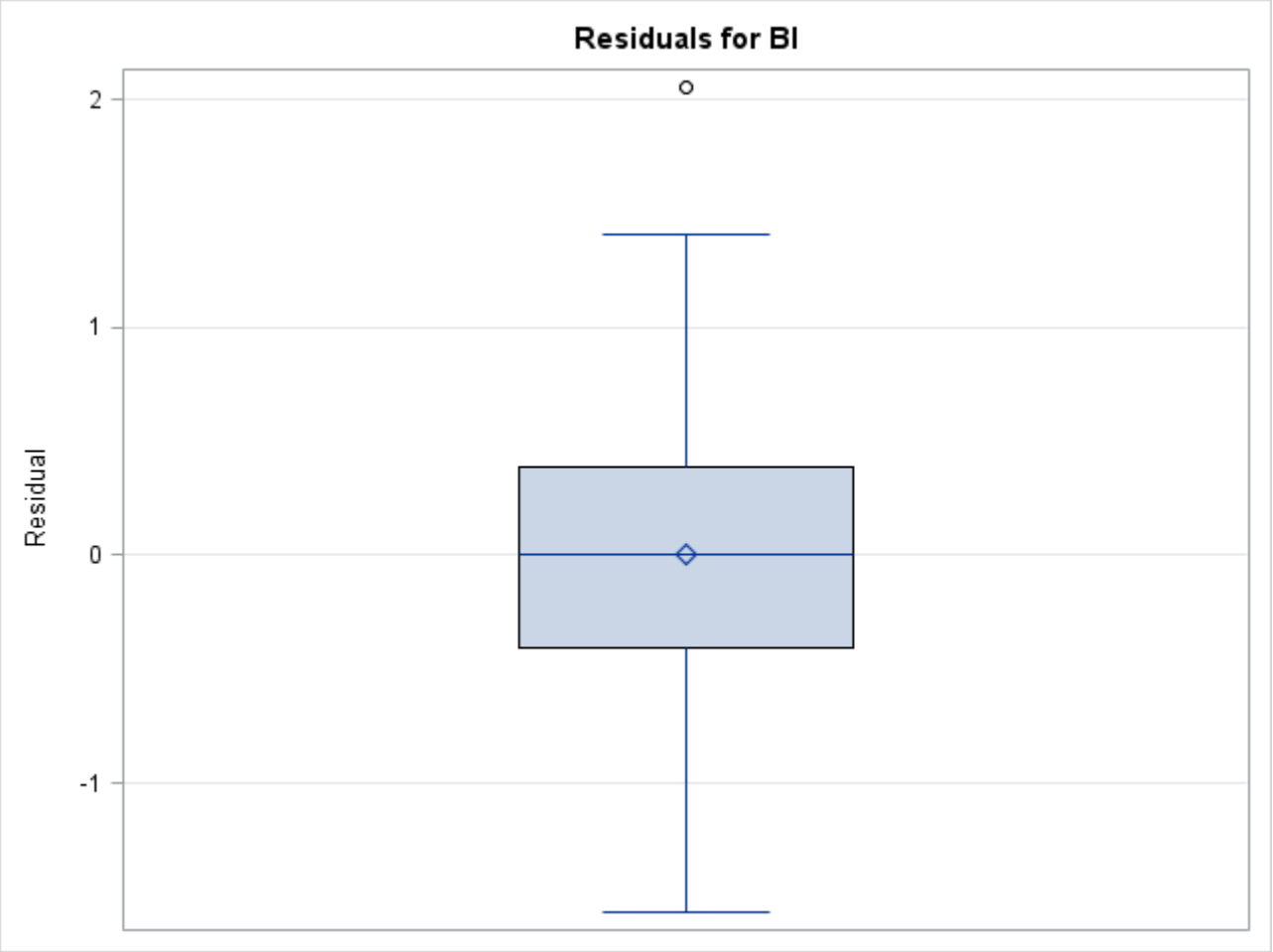


Figure 17: Residuals for BI.

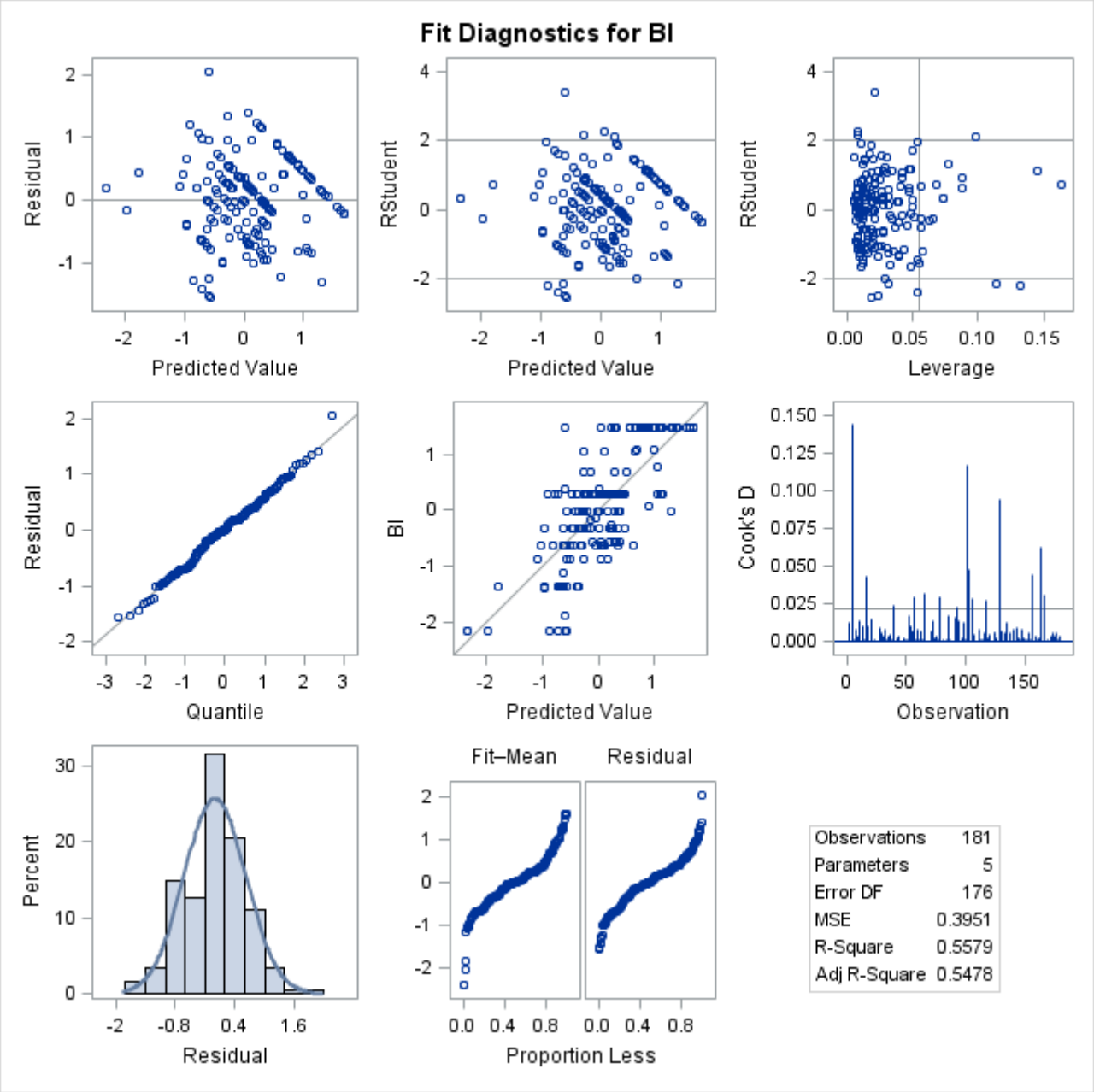


Figure 18: Fit diagnostics for BI.

4.4 Minor constructs of age and gender influencing M-Pesa and m-banking

The potential customer's adoption behaviour with the use of M-Pesa in South Africa is affected by the following motivating factors:

- Age; and
- Gender.

Proposition 2 tests whether the potential customer's adoption behaviour, with the use of M-Pesa in South Africa, is affected by age and gender. Tables 9 – 15 illustrate the SAS output from the analysis.

4.4.1 *Age and Gender results*

Table 11: Linear Discriminate function for Mobile Banking.

Linear Discriminant Function for Mobile banking			
Variable	1	3	4
Constant	-60888853	-60888854	-60888853
Gender	6.00428	6.75674	5.74228
AGE_low	121777698	121777698	121777698
AGE_lowmed	121777698	121777698	121777697
AGE_med	121777699	121777699	121777699
AGE_medhigh	121777697	121777699	121777701
AGE_high	121777700	121777703	121777699

Table 12: Discriminate function accuracy.

Number of Observations and Percent Classified into mobile banking				
From mobile banking	1	3	4	Total
1	71	55	3	129
	55.04	42.64	2.33	100.00
3	10	18	3	31
	32.26	58.06	9.68	100.00
4	12	4	5	21
	57.14	19.05	23.81	100.00
Total	93	77	11	181
	51.38	42.54	6.08	100.00
Priors	0.33333	0.33333	0.33333	

Table 13: Model accuracy.

Error Count Estimates for mobile banking				
	1	3	4	Total
Rate	0.4496	0.4194	0.7619	0.5436
Priors	0.3333	0.3333	0.3333	

Table 14: Linear Discriminate function for M-Pesa Account.

Linear Discriminant Function for M_Pesa_Account		
Variable	1	2
Constant	-60379621	-60379623
Gender	5.46646	6.32380
AGE_low	120759235	120759236
AGE_lowmed	120759236	120759235
AGE_med	120759237	120759237
AGE_medhigh	120759235	120759236
AGE_high	120759237	120759239

Table 15: Linear Discriminate accuracy.

Generalized Squared Distance to M_Pesa_Account		
From M_Pesa_Account	1	2
1	0	0.31867
2	0.31867	0

Table 16: Model accuracy.

Error Count Estimates for M_Pesa_Account			
	1	2	Total
Rate	0.4857	0.2808	0.3833
Priors	0.5000	0.5000	

Table 17: Linear regression function for age and gender.

Summary of Stepwise Selection								
Step	Variable Entered	Variable Removed	Number Vars In	Partial R-Square	Model R-Square	C(p)	F Value	Pr > F
1	AGE_high		1	0.0273	0.0273	4.7178	5.02	0.0263
2	AGE_lowmed		2	0.0142	0.0415	4.0568	2.65	0.1056
3	Gender		3	0.0172	0.0587	2.8504	3.23	0.0741

4.5 Summary of the results

This chapter provided the results of the quantitative research analysis covering proposition 1 and 2 with interpretation of the results to follow in the next chapter. Descriptive statistics and relevant graphs covering the demographics of the sample were presented from Qualtrics. SAS was used to complete a more detailed and rigorous analysis consisting of Factor Analysis, Discriminate analysis and Linear Regression. A Gaussian distribution and data manipulation was completed in Excel prior to the data being run in SAS (Appendix C). These results were presented in a methodical manner illustrating the progression of the analysis.

For proposition 1, the results were presented for the adoption constructs from the UTAUT model and including *Technology Characteristics/Perceived Ease of Use* from the literature covering both Mobile Money and M-Pesa products specifically in order to achieve a deeper understanding of the Mobile environment.

For proposition 2, the results of the impact of age and gender on M-Pesa, Mobile Money and *Behavioural Intention* were presented.

The substantial findings have been discussed in the context of the literature and follow in the next chapter.

CHAPTER 5. DISCUSSION OF THE RESULTS

5.1 Introduction

This chapter provides an in-depth analysis of the results presented in the previous chapter. An explanation of these results is provided in the context of the factors that influence the adoption of M-Pesa in South Africa. The adoption of Mobile Money is also described as it relates to M-Pesa. Each of the results from the various analysis completed, is evaluated using the predominant UTAUT model to assess adoption behaviour. The adoption factors are then reviewed for each proposition as listed above with details provided on the major contributing factors. The objectives of this chapter are to determine how the results presented relate to the literature in determining the factors of influence for the adoption of M-Pesa in South Africa and the aspects that will contribute to its successful implementation.

5.2 Demographic profile of respondents

The demographic profile of the sample consisted of 71% employed individuals of which 63% earned more than R7000.00 per month. This has an effect of Perceived *Financial Cost* verses a sample more inclined towards the Base of Pyramid individuals.

There were marginally more males (56%) in the sample than females (44%) which is a fairly balanced sample. However, the majority of the respondents were between the ages of 18 – 34 which formed 73% of the sample, while the 35 – 44 age group formed 20% of the sample. This forms an interesting dynamic for proposition 2; as approximately 90% of the sample is between the ages of 18 – 44 years old. This may skew the results and impact on the generalisability of the results.

5.3 General analysis and data manipulation

The factor analysis established that there was minimal cross loadings and therefore the numerous questions pertaining to each factor could be added together into a single factor as per construct. This clean factor structure allowed for the combining of the questions into a single data column. This was further confirmed, as the Cronbach Alphas for each factor was higher than 0.6, which ensured sufficient reliability and convergent validity.

Convenience was removed as a construct, as it only applied to respondents who previously used mobile banking and subsequently had missing data. Therefore, it was decided that it should only be used as a construct for future study that would only target existing Mobile Money users. Mutuku (2011) agreed that perceived convenience had an impact on mobile banking adoption which is in line with Mbogo (2010) who maintained convenience as an influencing factor in adoption.

The data was analysed in Excel and the results are attached in Appendix C.

This research determines the applicability of the UTAUT model towards M-Pesa uptake in S.A. The UTAUT model exhibited a 61% accuracy in prediction of mobile banking and M-Pesa according to the results which was lower than the 71% seen by Yu (2012). The empirical results support the theory and previous literature on the UTAUT model in forecasting user adoption behaviour. Zhou, Lu, and Wang (2010), received a variance of user adoption at approximately 46% for the UTAUT model for a Mobile Money adoption study in China. Pearson's R is a descriptive and inferential statistic that explains the association between two variables (Thompson, 2009). Venkatesh et al. (2003), found an adjusted R squared of 69%. The UTAUT model is much more inclusive and provides greater predictability due to its increased factors than some of the other models as described in Chapter 2 especially compared to the TAM model (Venkatesh et al., 2003). This may be improved by using the UTAUT2 model as discussed in Chapter 2.

5.4 Discussion pertaining to the Unified Technology Acceptance User Technology model influencing M- Pesa and mobile banking

Proposition 1: The potential customer's adoption behaviour with the use of M-Pesa in South Africa is significantly influenced by:

- Performance Expectance;
- Effort Expectation;
- Technology characteristics/Perceived Ease of Use;
- Social Influence;
- Perceived Credibility;
- Perceived Self-Efficacy;
- Financial Cost;
- Facilitating Conditions; and
- Behavioural Intention.

5.4.1 *Analysis of M-Pesa*

After examining the SAS results from Chapter 4 with the Discriminate and Linear Regression analysis for M-Pesa and Mobile Money the following section provides the interpretation and explanation of these results.

The model from running discriminate analysis correctly classified 'M-Pesa' as approximately: 74% correctly classified into 'interested in using Mobile Money, 72% correctly classified into 'not interested in using Mobile Money'. The model is 74% accurate.

Performance Expectance showed a negative relationship with use of having an M-Pesa account. Venkatesh et al. (2003), established *Performance Expectance* as a key factor in the UTAUT model.

Effort Expectance suggested a positive relationship for having and not having an M-Pesa account. Venkatesh et al. (2003), supported *Effort Expectance* as a construct.

Technology Characteristics/ Perceived Ease of Use illustrated it was an important factor in both having and not having an M-Pesa account with a small inclination towards having an M-Pesa account. Luarn and Lin (2005), discovered that Technology Characteristics or Perceived Ease of Use positively influence mobile banking adoption. Zhou et al. (2010), acknowledged that *Technology Characteristics/ Perceived Ease of Use* as an important indicator to mobile banking adoption.

Social Influence showed a negative relationship between having and not having an M-Pesa account. Venkatesh et al. (2003), determined this as an important improvement in the UTAUT model. Singh et al. (2010), claimed that family and friends affected a person's decision to adopt mobile financial services. This was also illustrated in the literature by Donner and Tellez (2008).

Perceived Credibility identified a negative relationship for having and not having an M-Pesa account. This is consistent with the results of Luarn and Lin (2005) who empirically established that *Perceived Credibility* considerably affected a person's resolve to adopt mobile banking as covered in Chapter 2. Wu and Wang (2005), also concluded that various risks in the process affect the credibility of Mobile Money. Ismail and Masinge (2012), further analysed risk by segmenting the various risks and testing them individually.

Perceived Financial Cost affirmed a strong negative relationship for the options of, Mobile Money as well as M-Pesa adoption, with a higher relationship towards contributing to an M-Pesa account. In 2005 Luarn and Lin (2005) statistically recognised that *Perceived Financial Cost* has an adverse effect on an individual's *Behavioural Intention* to adopt mobile banking which is in accordance with findings in this study (Yu, 2012). There was corroboration from Luarn and Lin (2005) that Perceived *Financial Cost* was a substantial barrier to Mobile Money adoption. It was highlighted by Venkatesh et al. (2012) that price value in consumer decision making is also to be considered.

Facilitating Conditions indicated a negative relationship for having an account and a positive for not having an account.

Venkatesh et al. (2003) as well as Hall and Khan (2003) discovered that *Facilitating Conditions* were a key factors in mobile banking adoption; which is consistent with the findings in this study.

Perceived Self-Efficacy contributed to strong relationship towards having an M-Pesa account. Venkatesh et al. (2003), postulated Self-Efficacy as a secondary element of adoption but the results showed a strong relationship towards M-Pesa Adoption. It was also established by Luarn and Lin (2005) that *Perceived Self-Efficacy* was an important criterion in mobile banking adoption. Hong and Zhonghua (2015) and Tobbin (2012) illustrated that trust has a strong determinant towards self-efficacy and that this should be increased in order to increase mobile banking adoption.

Behavioural Intention contributed strongly toward the result for having an M-Pesa account. This is similar to Venkatesh et al. (2003) and Yu (2012) who stated that *Behavioural Intention* has a considerable positive impact on technology adoption.

Linear Regression analysis recognised that customer commitment to adopt M-Pesa and mobile banking was considerably influenced and ranked in order of highest strength by *Facilitating Conditions*, *Perceived Credibility*, *Social Influence* and *Performance Expectance*. This was similar to the study completed by Yu (2012) which showed the factors were affected by *Social Influence*, *Perceived Financial Cost*, *Performance Expectance* and *Perceived Credibility*. It is interesting to note that in this study *Facilitating Conditions* was shown as the most important factor and *Perceived Financial Cost* was not among the main influencing factors. This could be attributed to the higher income of the majority of the sample, as well as the nature of M-Pesa to only charge for transactions above a certain amount, as well as the low uptake of the product. *Facilitating Conditions* was shown by Yu (2012) to influence the actual user behaviour and Yu (2012) discovered that *Perceived Self-Efficacy* was not established as a significant measure in user adoption behaviour which is in contrast to M-Pesa adoption; as it indicated a strong relationship towards having an account and contributed to users not knowing about Mobile Money as a service. This may be due to the different environments and culture of the user behaviour in the various countries.

Venkatesh et al. (2003), supported that *Perceived Self-Efficacy* did not significantly influence adoption. Luarn and Lin (2005), discovered that *Perceived Self-Efficacy* was revealed as an important measure in the adoption of mobile banking. Zhou et al. (2010), found that *Performance Expectance*, *Social Influence* and *Facilitating Conditions* have considerable influence on mobile banking adoption.

Luarn and Lin (2005), stated that *Perceived Credibility* had a stronger influence on mobile banking adoption than traditional TAM factors which was also observed in this study. This study discovered a substantial direct relationship between *Perceived Credibility* and *Behavioural Intention*; which is in line with Luarn and Lin (2005). This study discovered that Effort Expectancy was exhibited as a key measure in user adoption (Luarn & Lin, 2005). This was not the case in (Yu, 2012).

The study shows that mobile banking, and specifically M-Pesa, is likely to be adopted and used by customers if they think that it will enhance the currently negatively perceived banking service environment, if it is a credible and trustworthy service, used within an individual's social circles and has a high degree of performance.

The results show that 71% of respondents is currently using mobile banking and that 11.6% is interested in using it in the future (provided the service and product improves in the categories surveyed). Therefore, the study shows that Mobile Money, and specifically M-Pesa, can be successful if Mobile Money vendors appropriately meet customer expectations with the criteria tested. The study did not take into account the amount of activity on the user's M-Pesa account. It is worthwhile to point out that the sample consisted of a high number of respondents from the South African urban population and that results may differ if a greater number of respondents were sampled from rural areas (respondents may not be as technology inclined, and technology may not be as readily available to rural respondents as to urban respondents) is taken into account despite the high levels of advertising and marketing. This can also be attributed to the low levels of M-Pesa uptake and use in S.A. versus other parts of the world such as Kenya.

The majority of respondents that currently use M-Pesa typically use the service for buying airtime, checking account balances and transferring money and not for withdrawing cash; as there are often easier, more convenient methods available. Bosire (2012), provided a helpful paper on M-Pesa in Kenya and the factors that contributed to its success.

5.4.2 *Analysis of Mobile Money*

This section provides the findings of the Discriminate and Linear regression analysis with mobile banking results, as presented in Chapter 4. It provides greater insight into M-Pesa adoption by observing and analysing the overall Mobile Money environment.

Performance Expectance identified a positive relationship with use of mobile banking and a high negative relationship for not using or knowing about the service. *Effort Expectance* displayed a good positive relationship for using mobile banking but also a relatively high relationship for not using the service.

Technology Characteristics/ Perceived Ease of Use illustrated it was an important factor in both using and not using the service. It was revealed by Tobbin (2010) that Perceived Ease of Use and Perceived Usefulness were the most significant determinants to adoption, while studying Mobile Money adoption in Ghana using the TAM model.

Social Influence revealed an exceedingly strong negative relationship using the service. *Perceived Credibility* exhibited a strong negative relationship for not using the service. *Perceived Financial Cost* indicated a strong negative relationship across all three factors. It was demonstrated by Jack and Suri (2014) that transaction costs have a significant impact on Mobile Money usage. *Facilitating Conditions* showed a strong relationship for not using the service. *Perceived Self-Efficacy* contributed to not the aspect of not knowing about the service. *Behavioural Intention* contributed quite strongly for not using the service. These results were very similar to M-Pesa adoption as expected.

The model correctly classified the average percentage into ‘Mobile Money’ as approximately: 58% correctly classified into “interested in using Mobile Money”, 68% correctly classified into “not interested in using Mobile Money” and 57% as correctly classified into “not sure what Mobile Money is”. The model is 61% accurate.

The results for Linear Regression for Mobile Money; using a stepwise selection for Linear Regression are presented hereunder:

Facilitating Conditions, *Perceived Credibility*, *Social Influence* and *Performance Expectance* displayed the greatest influence on *Behavioural Intention* to adopt mobile banking which was the same as M-Pesa adoption. *Perceived Financial Cost*, and *Perceived Self-Efficacy* were also supported to influence mobile banking by Ismail and Masinge (2012). This study illustrated that similar results as obtained from respondents at the base of the pyramid are also true for a more general sample. Mutuku (2011), stated that M-Pesa is viable and its level of success will depend on customer service.

5.5 Discussion pertaining to the minor constructs age and gender influencing M-Pesa and mobile banking

Proposition 2: The potential customer’s adoption behaviour with the use of M-Pesa in South Africa is affected by the following motivating factors:

- Age
- Gender

The model correctly classified percentage into ‘Mobile banking’ as approximately: 55% correctly classified into ‘interested in using Mobile Money, 58% correctly classified into ‘not interested in using Mobile Money’ and 23% as ‘not knowing what Mobile Money is’. The model is 46% accurate.

The model correctly classified percentage into ‘M-Pesa’ as approximately: 51% correctly classified into ‘have an M-Pesa account’, 72% correctly classified into ‘does not have an M-Pesa account’. The model is 62% accurate.

The Linear Discriminate function for both M-Pesa and Mobile Money show a strong positive relationship towards gender and race. Using Linear Regression with a Stepwise selection function; age between the high (> 55 years old) and low – medium (25 – 34 years old) categories as well as gender have the greatest influence on *Behavioural Intention*.

This study discovered that age significantly influences user adoption which is consisted with the literature as Yu (2012) and Venkatesh et al. (2003) collaborated this in his study. It was discovered by Venkatesh et al. (2003) that men (and respondents from younger age brackets) have a greater influence on adoption. This is particularly the case on perceived performance, but has differing results depending on the construct. Tobbin (2012), mentioned that age and gender were determinants that affected Perceived Ease of Use.

This study discovered that gender played a key role in user adoption of M-Pesa as seen in the literature. It is worth noting the significance of the effects of gender and age to each of the UTAUT model factors for future research. This will provide further analysis on how to best segment and market M-Pesa in the future.

5.6 Conclusion

This chapter provided an explanation of the results presented in Chapter 4 and offered a comparison of other similar research in the field of Mobile Money. As per Proposition 1, the various factors of the UTAUT model were covered to illustrate its significance to Mobile Money adoption and specifically M-Pesa adoption in South Africa. *Perceived Financial Cost*, *Perceived Self-Efficacy* and *Behavioural Intention* were statistically the strongest constructs; however the other constructs were also illustrated as factors in the adoption of M-Pesa and Mobile Money. The main factors which affected *Behavioural Intention* to adopt M-Pesa in South Africa are *Facilitating Conditions*, *Perceived Credibility*, *Social Influence* and *Performance Expectance*.

As per Proposition 2, both age and gender were revealed to be influences that affect the adoption of M-Pesa and Mobile Money.

Respondents within the age range of high (> 55 years old) and low – medium (25 – 34 years old) categories as well as gender have the greatest influence on *Behavioural Intention*.

The factors that influence the adoption and use of Mobile Money, specifically M-Pesa, in South Africa have been determined and the results have illustrated that M-Pesa could be successful, if the above constructs are perceived to be met by the customer. These include sound environmental conditions that encourage the use of the product such as:

- Numerous distribution outlets in areas with minimal bank ATM's;
- The product is trustworthy as users have to feel that their money is safe and secure from fraud;
- There is a large community of users that vouch for, and use, the product; and
- The performance of the entire technology structure and value chain is easy to use, fast and reliable.

Age and gender can also be used as feasible inputs in marketing strategies to segment the market.

CHAPTER 6. CONCLUSIONS and RECOMMENDATIONS

6.1 Introduction

This chapter provides the conclusion of this research report, including key results and observations, as well as recommendations for the improvement of M-Pesa and Mobile Money in South Africa. It also offers suggestions for future research into this field. The objective of the research was to understand the potential customer's adoption behaviour with the use of M-Pesa in South Africa, as well as assess if the potential customer's adoption behaviour with the use of M-Pesa in South Africa is affected by age and gender.

There is a significant gap in literature and research of Mobile Money in South Africa - specifically M-Pesa, using the UTAUT model. This was a much more comprehensive model than the TAM and other competing models and was ideally suited for understanding Mobile Money adoption. An overview of the literature concerning the factors that influenced the adoption of M-Pesa was covered in Chapter 2, after an evaluation the predominant UTAUT technological model was used to assess adoption behaviour. Chapter 3 discussed the design and methods, as well as the methodology that was applied to complete the quantitative research study. Chapter 4 presented the results in graphical and statistical output suitable for this study. Chapter 5 provided an in-depth analysis of the results presented. This chapter summarises the significant results of each proposition.

6.2 Conclusions of the study

The purpose of this research was to analyse and evaluate the factors that influence the adoption of the Mobile Money M-Pesa in South Africa. The second research problem was to establish if age and gender has an influence on the adoption of the Mobile Money M-Pesa in South Africa.

A number of interesting findings were concluded from the study and have been validated by similar previous studies in other countries.

The results from Proposition 1 illustrated the main factors of the UTAUT model which contributed to Mobile Money adoption and specifically M-Pesa adoption in South Africa. *Perceived Financial Cost*; *Perceived Self-Efficacy* and *Behavioural Intention* were the primary constructs of significance but other constructs were also seen as a factor in the adoption of M-Pesa and Mobile Money. The main factors which affect *Behavioural Intention* to adopt M-Pesa in South Africa were *Facilitating Conditions*, *Perceived Credibility*, *Social Influence* and *Performance Expectance*.

The results from Proposition 2 indicated that both age and gender were factors that influenced the adoption of M-Pesa and Mobile Money. Age between the high (> 55 years old) and low – medium (25 – 34 years old) categories and as well as gender have the greatest influence on *Behavioural Intention*.

Telecommunication companies, and specifically Vodacom, as well as banks are able to improve M-Pesa and Mobile Money as a service by focusing on these factors of adoption, which will go a long way toward better customer understanding. These key factors discussed above can be used to streamline the large focus that Mobile Money receives and to increase its success rate in South Africa to levels similar to that of Kenya. Attributes of M-Pesa as a safe and secure product will entice more customers. *Social influence* was a large contributing factor as it not only encourages other users but also increases the number of people to whom money can be transferred thus increasing its value. The performance of the technology needs to be fast and consumer friendly. Age and gender played an important role in adoption and can be used to assist in consumer understanding.

This research showed that the most effective method to accelerate Mobile Money usage was to deliver a value proposition that establishes value to customers through reliability, security and efficiency.

6.3 Recommendations

According to Ghemawat (2007) businesses have to be equipped to adapt their strategy as business dynamics change continuously. This is a key aspect to consider for businesses to develop perceived opportunities and improve strategic decisions (Ghemawat, 2007). Unique strategies have to be formulated due to shifting of the banking and economic environment. Telecommunications and banking companies have to be dynamic, precise and innovative with their business strategies. Strategies need to be comprised of marketing and key human resource strategies which cover an optimised value chain, in addition to the technology and financial effort within the company. Branding and marketing are key strategies which can be used to entice consumers to utilise Mobile Money. This extends the range of services for customers in the telecommunications industry. Given the competitive nature of the sector, advertising will play a key role in Mobile Money adoption as well as improving consumers' perceptions of the industry. This research can be used by telecommunications operators (e.g. Vodacom's M-Pesa and MTN's Mobile Money), banks (which in addition, have their own Mobile Money products), independent companies (e.g. Wizzit), and government for understanding the factors that influence the environment of M Pesa and Mobile Money.

Recommendations to these stakeholders include having a thorough understanding of how these constructs affect their customers. They need to improve the Mobile Money and M-Pesa service greatly as it has failed numerous times in the past due to a lack of understanding in the local environment. This study reveals that *Perceived Financial Cost*, *Perceived Self-Efficacy* and *Behavioural Intention* are the primary constructs of significance. Therefore, Vodacom and other stakeholders need to improve on the cost of the service as the pricing point is a significant factor, particularly for the price sensitive segment of the population. The service needs to be trustworthy as customers may feel that a mobile telephone is less secure than a bank account. They need to be able to feel safe to use the service to put their hard earned money into and make use of M-Pesa. This is only likely if there are guarantees that no fraud would occur.

Behavioural intention of users is a contributing factor as the marketing, distribution networks, and registration of the service need to be simple and efficient. The main factors which affect *Behavioural Intention* to adopt M-Pesa in South Africa are *Facilitating Conditions*, *Perceived Credibility*, *Social Influence* and *Performance Expectance*. It is worth noting the importance of *Social Influence* on mobile adoption. Marketing campaigns need to be aligned to social opinion as opposed to end to end pervasive coverage. Marketing and advertising need to target specific segments of the market and create a small community of users in various pockets of the economy in order to stimulate M-Pesa awareness as well as the benefits of the service. Companies can educate the customer and increase accessibility and communication. The technology needs to be enhanced to grow with the economic and social environment. The study illustrates that both the banked and unbanked South African population can be targeted to use the service even though the vast majority of participants indicated that they have a formal bank account.

It is recommended that both age and gender be taken as an input towards *Behavioural Intention* to improve adoption.

6.4 Suggestions for further research

There are many constructs that are suitable for analysing m-banking which can be added to the UTAUT model to increase the understanding of user adoption.

There were some demographic variables, such as ‘education level’ or ‘time of day the M-Pesa service is used’ etc., which were collected and not used due to the type of analysis conducted. These additional demographic variables may be utilised to aid in the understanding of M-Pesa adoption.

As mentioned above, the study could be replicated to a greater number of participants in rural areas and at the base of the pyramid.

Age and gender could be evaluated and compared to each of the individual constructs to determine its effect similar to the study by Yu (2012).

A key area of study which seemed to be lacking in the literature is the behaviour of customers once M-Pesa or the Mobile Money product is already adopted and the factors that contribute to its continued usage. Jhina (2012), completed a study on the effect of the impact of m-banking take-up on customer behaviour. A similar study may be completed on the specific company user database as this provides direct information as to why users utilise the service.

Similar research may also be conducted using a qualitative approach as this can gauge users through a broad range of issues.

The micro-environment, competition and regulatory factors in Kenya played a key role in the rapid and successful adoption of M-Pesa. These factors, along with viable methods to measure the variables, can be used to assess the ability to replicate this success in South Africa.

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APPENDIX A

Table 18: M-Pesa questionnaire.

(Please refer to the Qualtrics link of survey:

https://wits.eu.qualtrics.com/SE/?SID=SV_2tpBuodwUlKNTUN)

	Question	Category/ Construct	Response Options	Author (Derived from)
Sub-Problem 1				
1	Where do you stay? (Provide area & province)	User demographics	Mark applicable with cross (X) Area/Province: _____	Ismail and Masinge (2012)
2	What is your Gender?	User demographics	Male/Female	Ismail and Masinge (2012)
3	What is your race?	User demographics	Black White Indian Coloured	Ismail and Masinge (2012)
4	What is your age (years)?	User demographics	18 – 24 25 – 34 35 – 44 45 – 54 > 55	Ismail and Masinge (2012)
5	What is your Work Status?	User demographics	Employed/Working Housewife Student	Ismail and Masinge (2012)

			Self- Employed Unemployed Pensioner/Retired	
6	What is your income level?	User demographics	No income Between: R1 – R999 Between: R 1000 – R2999 Between: R 3000 – R6 999 R 7000 and higher	Ismail and Masinge (2012)
7	What is your education level?	User demographics	No formal schooling/Primary schooling Primary school completed Some high school or Matriculated Technical/apprenticeship College / University/ Post matric	Ismail and Masinge (2012)
8	Do you own/use a cell phone?	User demographics	Yes/No	Ismail and Masinge (2012)
9	Do you have a bank account?	User demographics	Yes/No	Ismail and Masinge (2012)
10	What is the time to get the nearest bank/branch (minutes)?	User demographics	< 20 20 – 44 45 – 60 61 – 89 > 90	Ismail and Masinge (2012)
11	Do you use mobile banking?	User demographics	Yes: happy with the service Yes: but not happy with the service No: not interested No, but I will use if affordable, trustworthy, other reasons Do not know what it is	Ismail and Masinge (2012)
12	If yes on Q11, What do you use mobile banking for? (Mark with X all applicable)	User demographics	Buy airtime Check account balance Transfer money	Ismail and Masinge (2012)

			Pay store accounts (Pay City Council accounts) Pay electricity Cash withdrawal Others Not Applicable	
13	If yes on Q11, Do you have an M-Pesa account?	User demographics	Yes/No	
14	In conducting banking affairs, (PE1) using mobile banking would improve my performance (PE2) using mobile banking would save my time (PE3) I would use mobile banking any place (PE4) I would find mobile banking useful	*Performance Expectance*	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Yu (2012), Luarn and Lin (2005) Venkatesh and Zhang [2010], Foon and Fah [2011]
15	(EE1) Learning to use mobile banking is easy for me (EE2) Becoming skilful at using mobile banking is easy for me (EE3) Interaction with mobile banking is easy for me (EE4) I would find mobile banking is easy to use	*Effort Expectance*	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Yu (2012), Luarn and Lin (2005) Venkatesh and Zhang [2010], Foon and Fah [2011], Sripalawat et al. [2011]

16	(SI1) People who are important to me think that I should use mobile banking (SI2) People who are familiar with me think that I should use mobile banking (SI3) People who influence my behaviour think that I should use mobile banking (SI4) Most people surrounding with me use mobile banking	*Social Influence*	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Yu (2012), Venkatesh et al. (2003), Venkatesh and Zhang [2010], Foon and Fah [2011], Sripalawat et al. [2011]
17	When using mobile banking, (PC1) I believe my information is kept confidential (PC2) I believe my transactions are secured (PC3) I believe my privacy would not be divulged (PC4) I believe the banking environment is safe	*Perceived Credibility*	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Yu (2012), Luarn and Lin (2005), Foon and Fah [2011]
18	(PFC1) the cost of using mobile banking is higher than using other banking channels (PFC2) the wireless link fee is expensive when using mobile banking (PFC3) the mobile device setup to using mobile banking charges me lot of money	*Perceived Financial Cost*	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Yu (2012), Luarn and Lin (2005), Sripalawat et al. [2011]

	(PFC4) Using mobile banking services is cost burden to me			
19	(FC1) My living environment supports me to use mobile banking (FC2) My working environment supports me to use mobile banking (FC3) Using mobile banking is compatible with my life (FC4) Help is available when I get problem in using mobile banking	*Facilitating Conditions*	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Yu (2012), Venkatesh et al. (2003), Venkatesh and Zhang [2010], Sripalawat et al. [2011]
20	I could use mobile banking …. (PSE1) if I had the built-in help guidance for assistance (PSE2) if someone showed me how to do it (PSE3) if I had seen someone else using it (PSE4) if I could call someone for help	*Perceived Self-Efficacy*	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Yu (2012), Venkatesh et al. [2003],Luarn and Lin (2005), Venkatesh and Zhang [2010],
21	When dealing with banking affairs (BI1) I prefer to using mobile banking (BI2) I intend to use mobile banking (BI3) I would use mobile banking	*Behavioural Intention*	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Yu (2012), Venkatesh and Zhang [2010], Luarn and Lin [2005], Sripalawat et
22	CON1 Mobile payment is convenient because the telephone is usually with me CON2 Mobile payment is convenient because I can use it anytime	Convenience	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Kim et al. (2010)

	CON3 Mobile payment is convenient because I can use it in any situation CON4 Mobile payment is convenient because mobile payment service is not complex			
23	I am willing to take risk I am interested in new technology I tend to be first in buying new products I am kind-of cosmopolitan If someone else did it first, it might be all right	Early adopter	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Kim et al. (2010)
24	TEC1: Mobile banking provides ubiquitous services. TEC2: Mobile banking provides real-time services. TEC3: Mobile banking provides secure services.	*Technology characteristics/ Perceived Ease of Use*	Five-point Likert Scale Questionnaire. A scale of 1 to 5. 1-strongly disagree, 2-diagree, 3-neutral, 4-agree and 5- strongly agree	Zhou et al. (2010) (Adapted from Lin and Huang (2008)).

APPENDIX B

Table 19: Consistency Matrix

Research problem stated here					
Sub-problem	**Literature Review**	**Hypotheses or Propositions or Research questions**	**Source of data**	**Type of data**	**Analysis**
The first sub-problem is to analyse and evaluate the factors that influence the adoption of the Mobile Money M-Pesa in South Africa.	Davis (1989) Venkatesh and Davis (2000) Hall and Khan (2003) Venkatesh et al. (2003) Luarn and Lin (2005) Bagozzi (2007) Chan et al. (2007) Yu (2012) Venkatesh et al. (2012)	Proposition 1: The potential customer's adoption behaviour with the use of M-Pesa in South Africa is significantly influenced by: • Performance Expectance • Effort Expectation • Technology Characteristics / Perceived Ease of Use • Social Influence • Perceived Credibility • Perceived Self-Efficacy • Financial Cost • Facilitating Conditions • Behavioural Intention	Questionnaire questions provide in Table 4: M-Pesa Questionnaire. In conducting banking affairs, (PE1) using M-Pesa would improve my performance (PE2) using M-Pesa would save my time (PE3) I would use M-Pesa anyplace (PE4) I would find M-Pesa useful	Primarily Ordinal data with some basic Nominal data	Multivariate, factor analysis, correlation and regression techniques

		Proposition 2: The potential customer's adoption behaviour with the use of M-Pesa in South Africa is affected by the following motivating factors: • Age • Gender	(EE1) Learning to use M-Pesa is easy for me (EE2) Becoming skilful at using M-Pesa is easy for me (EE3) Interaction with M-Pesa is easy for me (EE4) I would find M-Pesa is easy to use (SI1) People who are important to me think that I should use M-Pesa (SI2) People who are familiar with me think that I should use M-Pesa (SI3) People who influence my behaviour think that I should use M-Pesa (SI4) Most people surrounding with me use M-Pesa		

			When using M-Pesa, (PC1) I believe my information is kept confidential (PC2) I believe my transactions are secured (PC3) I believe my privacy would not be divulged (PC4) I believe the banking environment is safe (PFC1) the cost of using M-Pesa is higher than using other banking channels (PFC2) the wireless link fee is expensive when using M-Pesa (PFC3) the mobile device setup to using M-Pesa charges me lot of money		

Research problem stated here					
Sub-problem	**Literature Review**	**Hypotheses or Propositions or Research questions**	**Source of data**	**Type of data**	**Analysis**
			(PFC4) Using M-Pesa services is cost burden to me		

APPENDIX C: Annexure 1

Table 20: Gaussian distribution Fit.

	CON1	CON2	CON3	CON4	PE1	PE2	PE3	PE4	EE1	EE2	EE3	EE4	TEC1	TEC2	TEC3	SI1	SI2	SI3	SI4	PC1	PC2	PC3	PC4	PFC1	PFC2	PFC3	PFC4	FC1	FC2	FC3	FC4	PSE1	PSE2	PSE3	PSE4	BI1	BI2	BI3	Overall
Observed frequencies																																							
5	5	6	4	6	10	7	8	6	7	5	5	7	7	4	5	10	9	10	8	7	6	6	8	30	17	19	28	9	5	4	6	7	6	7	8	8	9	9	**328**
4	2	1	7	7	17	9	16	6	7	8	9	7	9	9	15	25	20	23	25	20	21	23	18	61	55	57	73	7	8	5	15	7	12	13	9	23	13	10	**672**
3	10	9	20	19	83	29	44	32	26	30	29	21	46	37	61	85	84	79	60	42	42	53	60	54	61	74	48	25	34	39	68	68	61	66	76	43	48	43	**1809**
2	45	47	54	50	51	85	73	84	83	83	84	88	79	90	70	41	53	58	69	85	86	75	68	27	37	23	22	91	89	86	63	80	80	77	68	66	71	77	**2558**
1	67	66	44	47	20	51	40	53	58	55	54	58	40	41	30	20	15	11	19	27	26	24	27	9	11	8	10	49	45	47	29	19	22	18	20	41	40	42	**1303**
n=	129	129	129	129	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	**6670**
Distribution parameters																																							
μ=	0.87	0.83	0.41	0.44	-0.31	0.29	0.07	0.33	0.38	0.36	0.34	0.39	0.12	0.21	-0.05	-0.37	-0.35	-0.40	-0.24	-0.04	-0.05	-0.13	-0.13	-0.88	-0.69	-0.78	-0.92	0.27	0.25	0.27	-0.10	-0.14	-0.09	-0.17	-0.20	0.02	0.06	0.12	
σ^2=	1.55	1.60	1.04	1.29	0.66	0.93	0.95	0.89	1.00	0.88	0.88	0.97	0.83	0.70	0.71	0.69	0.58	0.56	0.69	0.75	0.72	0.72	0.77	0.79	0.73	0.62	0.78	0.96	0.77	0.73	0.72	0.57	0.60	0.58	0.60	1.06	0.95	0.95	
Expected frequencies																																							
5	3.0	3.5	3.1	4.6	9.8	4.4	7.6	3.6	4.2	3.3	3.3	3.8	5.2	2.6	5.7	12.2	9.0	9.4	9.1	6.4	5.9	7.4	8.1	37.5	25.6	26.3	39.4	5.0	3.0	2.5	6.8	4.6	4.6	5.4	6.3	10.4	7.9	6.8	
4	5.4	5.8	7.3	8.3	24.6	11.4	16.2	10.3	10.4	9.7	9.8	10.0	13.9	10.1	16.8	27.1	25.7	27.3	22.8	17.2	17.0	19.5	19.7	42.2	38.1	42.7	43.0	12.1	10.3	9.3	18.6	17.4	16.6	18.7	20.1	18.2	16.5	15.0	
3	16.3	17.0	24.2	23.4	63.8	38.2	45.5	37.1	35.1	35.9	36.4	34.8	45.0	42.1	53.5	64.3	68.6	71.0	60.9	52.4	53.2	56.5	55.0	60.3	65.1	69.1	59.8	39.0	40.2	39.3	55.4	60.8	57.8	61.7	62.2	45.6	45.7	43.9	
2	37.5	37.4	49.5	44.7	67.4	73.4	71.2	75.1	71.0	75.3	75.5	71.9	76.1	83.3	77.3	63.4	66.3	63.8	69.8	75.7	76.7	73.7	72.4	35.9	45.2	39.0	34.2	72.5	80.1	82.2	74.9	79.3	79.9	77.1	74.9	66.9	70.8	71.9	
1	66.9	65.2	45.0	48.1	15.3	53.6	40.5	55.0	60.3	56.8	56.0	60.5	40.8	42.9	27.7	14.0	11.4	9.5	18.5	29.4	28.1	23.9	25.7	5.1	7.0	3.9	4.6	52.4	47.3	47.8	25.3	18.9	22.1	18.1	17.6	40.0	40.2	43.4	
χ^2 contributions																																							
5	1.3592	1.7936	0.2938	0.4273	0.0023	1.4799	0.0218	1.5788	1.8511	0.9322	0.8443	2.6439	0.6221	0.7183	0.0873	0.3882	0.0000	0.0375	0.1311	0.0633	0.0007	0.2529	0.0026	1.4897	2.8837	2.0386	3.2750	3.1968	1.2702	0.9776	0.1011	1.2266	0.4097	0.5070	0.4892	0.5436	0.1575	0.7319	
4	2.1029	4.0200	0.0121	0.1930	2.3739	0.5074	0.0018	1.7922	1.1375	0.2839	0.0694	0.9008	1.7227	0.1153	0.1889	0.1615	1.2716	0.6707	0.2211	0.4682	0.9664	0.6379	0.1540	8.3622	7.4764	4.8215	20.8685	2.1748	0.5073	1.9700	0.6893	6.2223	1.2669	1.7486	6.1119	1.2825	0.7294	1.6754	
3	2.4471	3.7728	0.7197	0.8187	5.8022	2.2040	0.0489	0.6908	2.3514	0.9818	1.4964	5.4568	0.0221	0.6143	1.0499	6.6567	3.4590	0.8946	0.0126	2.0675	2.3723	0.2160	0.4508	0.6588	0.2562	0.3463	2.3159	5.0116	0.9662	0.0020	2.8513	0.8529	0.1818	0.2984	3.0406	0.1473	0.1153	0.0172	
2	1.5072	2.4358	0.4149	0.6314	3.9851	1.8347	0.0447	1.0606	2.0347	0.7853	0.9586	3.5952	0.1088	0.5361	0.6870	7.9368	2.6615	0.5260	0.0083	1.1426	1.1197	0.0215	0.2630	2.2164	1.4843	6.5911	4.3800	4.7126	0.5795	0.1800	1.8793	0.0060	0.0001	0.0002	0.6271	0.0118	0.0006	0.3571	
1	0.0003	0.0100	0.0226	0.0241	1.4088	0.1251	0.0069	0.0696	0.0862	0.0594	0.0699	0.1018	0.0155	0.0837	0.1855	2.5859	1.1217	0.2383	0.0127	0.1898	0.1629	0.0002	0.0629	3.0020	2.2602	4.4207	6.3304	0.2169	0.1123	0.0148	0.5408	0.0010	0.0007	0.0004	0.3340	0.0264	0.0006	0.0458	
264.0543	7.4167	12.0321	1.4632	2.0945	13.5723	6.1512	0.1241	5.1921	7.4609	3.0426	3.4986	12.6985	2.4922	2.0677	2.1967	17.7290	8.5138	2.3672	0.3859	3.9314	4.6220	1.1286	0.9334	15.7291	14.3608	18.2181	37.1697	15.3127	3.8355	3.1444	6.0618	8.3088	1.8592	2.5545	10.6029	2.0116	1.0035	2.8274	
"Solver" parameters	τ_1	τ_2	τ_3	τ_4																																			
Thresholds	-1.61	-1.02	-0.22	0.81																																			
Means	0.7515	0.7171	0.3591	0.3824	-0.2648	0.2538	0.0627	0.2828	0.3288	0.3089	0.2988	0.3371	0.1066	0.1846	-0.0417	-0.3196	-0.3065	-0.3443	-0.2111	-0.0367	-0.0418	-0.1161	-0.1091	-0.7657	-0.6008	-0.6757	-0.7950	0.2314	0.2176	0.2373	-0.0905	-0.1194	-0.0810	-0.1457	-0.1710	0.0152	0.0540	0.1068	
Variances	1.1590	1.2022	0.7812	0.9699	0.4957	0.7007	0.7101	0.6659	0.7488	0.6593	0.6567	0.7261	0.6238	0.5227	0.5291	0.5152	0.4351	0.4166	0.5184	0.5623	0.5393	0.5376	0.5742	0.5913	0.5450	0.4624	0.5879	0.7189	0.5748	0.5446	0.5376	0.4266	0.4529	0.4374	0.4525	0.7976	0.7162	0.7096	

Sample size, n =	0	To prevent division by zero:																																		
Hypothesis tests																																					
t-value	7.93	7.43	4.61	4.41	-5.06	4.08	1.00	4.66	5.11	5.12	4.96	5.32	1.82	3.43	-0.77	-5.99	-6.25	-7.18	-3.95	-0.66	-0.77	-2.13	-1.94	-13.40	-10.95	-13.37	-13.95	3.67	3.86	4.33	-1.66	-2.46	-1.62	-2.96	-3.42	0.23	0.86	1.71
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.3183	0.0000	0.0000	0.0000	0.0000	0.0000	0.0710	0.0007	0.4417	0.0000	0.0000	0.0000	0.0001	0.5112	0.4448	0.0346	0.0542	0.0000	0.0000	0.0000	0.0000	0.0003	0.0002	0.0000	0.0984	0.0149	0.1072	0.0035	0.0008	0.8194	0.3921	0.0897
Rescaling of values																																						
"Expected value" within category:																																						
5	-2.0742	-2.0927	-1.9921	-2.0605	-1.9536	-1.9735	-2.0048	-1.9551	-1.9832	-1.9490	-1.9492	-1.9730	-1.9603	-1.9041	-1.9368	-1.9732	-1.9271	-1.9226	-1.9569	-1.9522	-1.9417	-1.9518	-1.9688	-2.1097	-2.0446	-2.0129	-2.1154	-1.9841	-1.9238	-1.9079	-1.9480	-1.8950	-1.9037	-1.9044	-1.9161	-2.0499	-2.0088	-1.9980
4	-1.2730	-1.2751	-1.2663	-1.2746	-1.2703	-1.2647	-1.2717	-1.2612	-1.2653	-1.2598	-1.2600	-1.2636	-1.2646	-1.2522	-1.2629	-1.2744	-1.2668	-1.2670	-1.2696	-1.2655	-1.2638	-1.2669	-1.2695	-1.2978	-1.2880	-1.2888	-1.2989	-1.2666	-1.2561	-1.2523	-1.2658	-1.2557	-1.2569	-1.2585	-1.2615	-1.2776	-1.2724	-1.2702
3	-0.5678	-0.5709	-0.5666	-0.5752	-0.5936	-0.5676	-0.5801	-0.5652	-0.5663	-0.5609	-0.5614	-0.5643	-0.5720	-0.5571	-0.5764	-0.5992	-0.5946	-0.5976	-0.5900	-0.5784	-0.5772	-0.5831	-0.5847	-0.6354	-0.6233	-0.6314	-0.6377	-0.5702	-0.5599	-0.5553	-0.5810	-0.5749	-0.5736	-0.5785	-0.5822	-0.5868	-0.5810	-0.5773
2	0.3281	0.3249	0.3060	0.3060	0.2212	0.2960	0.2762	0.2992	0.3094	0.3021	0.3010	0.3045	0.2787	0.2863	0.2555	0.2164	0.2051	0.1954	0.2315	0.2584	0.2562	0.2462	0.2501	0.1744	0.1851	0.1574	0.1705	0.2937	0.2914	0.2937	0.2496	0.2336	0.2490	0.2308	0.2290	0.2740	0.2755	0.2808
1	1.8225	1.8271	1.4967	1.5962	1.1834	1.4212	1.3719	1.4113	1.4700	1.4457	1.4111	1.4608	1.3377	1.3005	1.2481	1.1840	1.1416	1.1246	1.2062	1.2680	1.2538	1.2364	1.2582	1.1516	1.1533	1.1014	1.1461	1.4241	1.3406	1.3284	1.2420	1.1709	1.1947	1.1723	1.1763	1.4030	1.3727	1.3835
Squared differences from the mean:																																						
5	8.6548	8.5301	5.7920	6.2603	2.7157	5.1372	4.3147	5.2058	5.5830	5.3158	5.2630	5.5800	4.3407	4.4827	3.5669	2.5735	2.4752	2.3259	2.9347	3.6474	3.5853	3.3046	3.3960	1.5020	1.8248	1.5198	1.4940	5.0684	4.7310	4.7603	3.3985	3.0875	3.2768	3.0143	2.9538	4.2741	4.2896	4.5000
4	4.5827	4.4227	2.8254	2.9452	0.9304	2.4265	1.8067	2.5211	2.7059	2.6128	2.5758	2.7319	1.9256	2.1472	1.4756	0.8197	0.8336	0.7561	1.0524	1.4961	1.4775	1.2835	1.3075	0.1711	0.3544	0.2567	0.1452	2.3525	2.2722	2.3294	1.3485	1.2497	1.3535	1.1886	1.1323	1.6774	1.7814	1.9420
3	2.0608	1.9565	0.9629	1.0339	0.0829	0.7407	0.4257	0.7916	0.8948	0.8419	0.8215	0.9092	0.4831	0.5933	0.2791	0.0530	0.0579	0.0400	0.1199	0.2873	0.2797	0.2017	0.2104	0.0619	0.0050	0.0221	0.0785	0.7012	0.6580	0.6876	0.2270	0.1910	0.2305	0.1683	0.1481	0.3652	0.4138	0.4909
2	0.2911	0.2530	0.0113	0.0104	0.2776	0.0000	0.0416	0.0007	0.0068	0.0030	0.0019	0.0072	0.0242	0.0054	0.0922	0.3427	0.3124	0.3515	0.2258	0.0905	0.0927	0.1445	0.1414	1.1204	0.7724	0.8790	1.1846	0.0007	0.0016	0.0004	0.1254	0.1380	0.1132	0.1593	0.1818	0.0658	0.0455	0.0248
1	0.9136	0.9984	1.1709	1.3332	2.2173	1.2728	1.6867	1.1766	1.1889	1.1217	1.1368	1.1483	1.4753	1.1825	1.6801	2.4120	2.2363	2.3168	2.1024	1.7171	1.6954	1.6781	1.9160	4.1441	3.4114	3.5402	4.2599	1.3384	1.1866	1.1119	1.8131	1.7128	1.6594	1.7969	1.8871	1.9196	1.7172	1.5881
Variance with Discretisation Error:																																						
	1.2094	1.2677	0.8904	1.1024	0.5950	0.8119	0.8439	0.7669	0.8577	0.7557	0.7540	0.8300	0.7354	0.6053	0.6284	0.6211	0.5187	0.4980	0.6221	0.6697	0.6412	0.6427	0.6883	0.7104	0.6595	0.5557	0.7047	0.8364	0.6656	0.6271	0.6415	0.5021	0.5941	0.5169	0.5370	0.9536	0.8521	0.8392
Rescaled values																																						
5	-2.46	-2.46	-2.19	-2.27	-2.04	-2.14	-2.13	-2.13	-2.17	-2.13	-2.13	-2.16	-2.09	-2.06	-2.05	-2.06	-2.02	-2.01	-2.05	-2.06	-2.05	-2.05	-2.07	-2.18	-2.11	-2.08	-2.18	-2.14	-2.08	-2.07	-2.05	-2.01	-2.02	-2.01	-2.02	-2.17	-2.13	-2.13
4	-1.55	-1.54	-1.40	-1.42	-1.32	-1.38	-1.35	-1.38	-1.39	-1.39	-1.38	-1.40	-1.35	-1.36	-1.34	-1.32	-1.32	-1.32	-1.32	-1.34	-1.34	-1.33	-1.33	-1.32	-1.32	-1.32	-1.32	-1.37	-1.37	-1.37	-1.33	-1.33	-1.33	-1.33	-1.33	-1.35	-1.35	-1.36
3	-0.75	-0.74	-0.65	-0.66	-0.61	-0.63	-0.62	-0.63	-0.64	-0.63	-0.63	-0.64	-0.62	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.62	-0.62	-0.62	-0.62	-0.63	-0.62	-0.62	-0.61	-0.60	-0.60	-0.60	-0.61	-0.62	-0.62	-0.62
2	0.26	0.26	0.30	0.29	0.25	0.30	0.29	0.30	0.30	0.30	0.30	0.30	0.29	0.29	0.27	0.25	0.24	0.23	0.26	0.28	0.27	0.27	0.27	0.23	0.23	0.21	0.23	0.30	0.29	0.30	0.27	0.26	0.26	0.26	0.25	0.29	0.29	0.29
1	1.95	1.95	1.58	1.69	1.26	1.50	1.45	1.49	1.56	1.50	1.49	1.55	1.41	1.38	1.33	1.26	1.23	1.21	1.28	1.34	1.33	1.31	1.33	1.26	1.24	1.20	1.26	1.51	1.42	1.41	1.32	1.26	1.28	1.26	1.26	1.48	1.45	1.46

APPENDIX C: Annexure 2

Table 21: Rotated Factor Pattern.

	EE	PC	FC	PSE	SI	PFC	PE	BI	TEC
PE1	0.27112	0.09246	0.03194	0.09513	0.22094	0.1518	0.5558	0.08385	0.11315
PE2	0.3785	0.19318	0.20389	0.05672	0.06634	-0.06349	0.72163	0.18794	0.04667
PE3	0.2913	0.20936	0.12172	0.05466	0.16925	0.03627	0.65838	0.13336	0.0411
PE4	0.38238	0.23845	0.2742	0.13316	0.12817	-0.05866	0.64823	0.1652	0.04377
EE1	0.75033	0.21664	0.2637	0.01918	0.09804	-0.06117	0.26957	0.09264	0.04366
EE2	0.82075	0.14259	0.26454	-0.01111	0.12795	-0.06004	0.27749	0.09736	0.08521
EE3	0.80657	0.19604	0.23405	-0.00751	0.10608	-0.03817	0.304	0.17181	0.02533
EE4	0.79323	0.17821	0.26998	0.05039	0.13523	-0.01483	0.25302	0.15812	0.13033
TEC1	0.45728	0.28051	0.31807	0.05186	0.25437	0.06585	0.15447	0.05527	0.53636
TEC2	0.3926	0.28075	0.3456	0.00751	0.25543	0.02872	0.32375	0.06886	0.47867
TEC3	0.22325	0.47959	0.2356	0.01149	0.28177	0.024	0.21523	0.18098	0.39234
SI1	0.10956	0.20234	0.10645	0.21064	0.78429	0.08145	0.10531	0.16322	0.13935
SI2	0.07447	0.25698	0.15171	0.20131	0.7874	0.10738	0.11535	0.10821	0.1083
SI3	0.154	0.20112	0.17835	0.24508	0.77405	0.03949	0.08821	0.13041	0.04415
SI4	0.12867	0.19246	0.1762	0.06643	0.56359	0.10226	0.23106	0.15241	-0.04582
PC1	0.17499	0.79077	0.14891	0.13288	0.25691	-0.05344	0.10612	0.1862	0.00566
PC2	0.13766	0.83505	0.14116	0.12961	0.1751	-0.07771	0.18797	0.17354	-0.00669
PC3	0.18657	0.81326	0.13418	0.09227	0.21016	-0.02026	0.16795	0.12815	0.07505
PC4	0.15935	0.80565	0.14738	0.12685	0.14613	-0.02859	0.10991	0.09134	0.13023
PFC1	-0.00297	0.00011	-0.05596	0.1663	0.02312	0.79639	-0.01576	-0.0193	0.06576
PFC2	0.03529	-0.01603	0.02548	0.09215	0.11679	0.77481	0.02702	-0.03727	-0.06073
PFC3	-0.03172	-0.02515	0.00867	0.10755	0.05569	0.91408	0.03441	0.02298	-0.02494
PFC4	-0.1061	-0.07649	-0.04289	0.06888	0.02714	0.82672	0.00995	-0.04834	0.05529
FC1	0.29591	0.14813	0.77028	0.05581	0.12506	-0.03088	0.07038	0.16578	0.03385
FC2	0.26183	0.13692	0.83032	0.06942	0.13923	-0.0352	0.12284	0.10028	0.09341
FC3	0.31551	0.13485	0.74085	0.06625	0.13157	-0.10781	0.19377	0.26736	0.06895
FC4	0.13306	0.22952	0.53473	0.05491	0.24239	0.07446	0.13635	0.13948	0.07766
PSE1	0.01928	0.07409	0.0788	0.75015	0.16793	0.16557	0.1659	0.11555	0.00634
PSE2	0.00729	0.08171	0.03058	0.86101	0.15608	0.1056	0.0241	0.04314	-0.00487
PSE3	0.01006	0.06046	0.01931	0.86898	0.07215	0.11766	0.02714	0.01104	0.00262
PSE4	0.02523	0.15917	0.06611	0.81544	0.14508	0.09327	0.01474	0.08053	0.03483
BI1	0.26515	0.35144	0.27294	0.14721	0.19233	-0.07025	0.15751	0.68139	0.10851
BI2	0.16627	0.2857	0.296	0.15062	0.27167	-0.0219	0.21155	0.74512	0.04548
BI3	0.19352	0.22539	0.27476	0.10785	0.27809	-0.07475	0.25532	0.70672	-0.01278