A FRAMEWORK FOR DETERMINING THE ADOPTION OF NEW SERVICES IN THE SOUTH AFRICAN MOBILE TELECOMMUNICATIONS MARKET

By

Neil Wesley Smith

Submitted in fulfilment for the requirements for the degree

DOCTOR OF BUSINESS LEADERSHIP

in the

SCHOOL OF BUSINESS LEADERSHIP

at the

UNIVERSITY OF SOUTH AFRICA

Supervisor: Professor P Venter

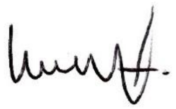
Pretoria February 2019

Declaration

I, Neil Wesley Smith, declare that “A Framework for Determining the Adoption of New Services in the South African Mobile Telecommunications Market”, is my own unaided work in both content and execution. All the resources I used in this study are cited and referred to in the reference list by means of a comprehensive referencing system.

I declare that the content of this thesis has never been used before for any qualification at any tertiary institution.

Neil Wesley Smith Date: 15 February 2019



Signature

Abstract

The aim of this study was to determine the key factors which explain the adoption of mobile data services in South Africa and incorporate them into an explanatory framework that can be used to indicate whether a new mobile data service that is introduced into the South African Mobile Market will be successful. Additionally, it shows that the current usage of mobile data services in South Africa supports the framework.

The research used a design based on a mixed methods methodology. The research was conducted using a literature survey and two research phases. The literature survey was an extensive review of communication technology adoption frameworks and all the possible factors of adoption. This literature survey was also used to develop the discussion document which was used as the guidelines for the Phase 1 interviews. The interviews were with experts in the telecommunications market in South Africa and were used to determine the key drivers of adoption and possible moderating factors of mobile data services. From those interviews a preliminary model was proposed. Phase 2 was a market survey which tested the framework and moderating factors in different metropolitan areas as well as examined the current usage of mobile data services.

The statistical analysis used in determining the framework incorporated Descriptive Statistics, Factor Analysis, using Principal Axis Factoring, and Structural Equation Modelling. The framework, which was based on the Technology Acceptance Model, introduced two new constructs. The first new construct was the Mobile Service Providers Marketing Tactics and the second was Social Pressure and Aspirational Value. The two constructs combined can be used to explain why mobile service providers with low cost strategies are not successful.

Demographic factors such as Age were found to influence the adoption as well as Socio-economic factors such as Income. Personal factors such as Technical Knowledge, Ability and Skills and Attitude towards Technology were also found to influence adoption. Geographical location was found to be the most important moderating factor.

The current mobile data usage supported the framework. The results of data usage highlighted the fact that nearly 50% of the study’s participants spent over 4 hours per day interacting with their mobile devices and that the participants from Gauteng spent more than 2½ times on mobile services than those in the other metropolitan municipalities of Cape Town and eThekwini.

Key words: Mobile Data Services, Technology Adoption, Consumer Behaviour, South Africa, Usage of Mobile services, Moderating Factors.

Opsomming

Die doel van hierdie studie was om die sleutelfaktore te bepaal wat die aanneming van selfoondatadienste in Suid-Afrika verklaar, en hulle te verenig in ŉ raamwerk waarmee aangetoon kan word of ŉ nuwe selfoondatadiens die Suid-Afrikaanse selfoondatamark suksesvol sal betree. Afgesien hiervan dui hierdie studie aan dat die huidige gebruik van selfoondatadienste in Suid-Afrika die geldigheid van die voorgestelde raamwerk bevestig.

ŉ Mengsel van metodes is in die navorsing toegepas. Die navorsing het uit ŉ literatuuroorsig en twee navorsingsfases bestaan. Die literatuuroorsig het ŉ deurtastende oorsig van die raamwerke vir die aanneming van kommunikasietegnologie en alle moontlike faktore daarvoor behels. Uit die literatuuroorsig is die besprekingsdokument saamgestel wat as riglyn gedien het vir die onderhoude in fase 1 van die navorsing. Onderhoude is met kundiges uit die Suid-Afrikaanse telekommunikasiebedryf gevoer om die belangrikste dryfvere vir aanneming en moontlike remfaktore ten opsigte van selfoondatadienste te bepaal. ŉ Voorlopige model is op grond van die onderhoude aangebied. Fase 2 het ŉ markopname behels waarin die raamwerk en remfaktore in verskeie metropolitaanse gebiede getoets en die huidige gebruik van selfoondatadienste ondersoek is.

Die statistiese analise waarop die raamwerk berus, het bestaan uit beskrywende statistiek, faktorontleding met behulp van hoofasfaktorering, en struktuurvergelykingsmodellering. Twee nuwe konstrukte het uit die raamwerk wat op die tegnologieaanvaardingsmodel gegrond was, gespruit. Die eerste was selfoondiensverskaffers se bemarkingstrategieë en die tweede sosiale druk en aspirerende waarde. Saam verklaar die twee konstrukte waarom selfoondiensverskaffers wat laekostestrategieë volg, misluk.

Daar is bevind dat demografiese faktore soos ouderdom, en sosiaal-ekonomiese faktore soos inkomste, aanneming beïnvloed. Volgens die bevindings word aanneming eweneens bepaal deur persoonlike faktore soos tegniese kennis, vermoë en vaardighede asook houding jeens tegnologie. Daar is bevind dat geografiese ligging die belangrikste remfaktor is.

Die huidige selfoondatagebruik bevestig die geldigheid van die raamwerk. Die uitslag van datagebruik benadruk die feit dat byna 50% van die deelnemers aan die studie langer as vier uur per dag met hulle selfone doenig is, en dat deelnemers in Gauteng twee en half keer meer as deelnemers in die metropolitaanse munisipaliteite van Kaapstad en eThekwini aan selfoondienste bestee.

Sleutelwoorde: selfoondatadienste, tegnologieaanneming, verbruikersgedrag, Suid-Afrika, gebruik van selfoondienste, remfaktore

OKUCATSHANGIWE

Inhloso yalolu cwaningo bekuwukuthola izinto ezibalulekile ezichaza ukwamukelwa kwezinsiza zamadatha amaselula eNingizimu Afrika nokuzifaka ohlakeni oluchazayo olungasetshenziswa ukukhombisa ukuthi ngabe insiza entsha yedatha ethulwe emakethe yamaselula eNingizimu Afrika izophumelela. Ngaphezu kwalokho, kukhombisa ukuthi ukusetshenziswa kwamanje kwezinsiza zedatha yamaselula eNingizimu Afrika kuyalusekela uhlaka.

Ucwaningo lusebenzise umklamu osuselwe ezindleleni zokwenza ezixubile. Ucwaningo lwenziwe kusetshenziswa ucwaningo lwezincwadi kanye nezigaba ezimbili zocwaningo. Ucwaningo lwezincwadi belungukubuyekezwa okubanzi kokwamukela kwenzinhlaka zobuchwepheshe kwezokuxhumana kanye nazo zonke izici ezingenzeka ukuthi zamukelwe. Lolu cwaningo lwezincwadi lusetshenzisiwe futhi ukuthuthukisa umqulu wezingxoxo osetshenziswe njengezinkombandlela zokuxoxisana nabantu besigaba 1. Izingxoxo ebezinazo bezingochwepheshe emakethe yezokuxhumana eNingizimu Afrika futhi zasetshenziselwa ukuthola izidingongqangi zokwamukelwa kanye nezici zokulingisanisa kwezinsiza zamadatha amaselula. Kulezo zingxoxo, kuphakanyiswe isifaniselo sokuqala. Isigaba 2 bekungukucwaningo lwezimakethe oluhlola uhlaka kanye nezici zokulinganisa ezindaweni ezahlukahlukene zedolobha kanye nokuhlola ukusetshenziswa kwamanje kwezinsiza zedatha yamaselula.

Ukuhlaziywa kwezibalo okusetshenzisiwe ekunqumeni uhlaka lufake izibalo ezichazayo, ukuhlaziya izakhi, kusetshenziswa izisekelo eziyinhloko zokuphamba, kanye nesifaniselo sokulinganisa esihlelekile. Uhlaka, olwalususelwa kusifaniselo sokwamukela ubuchwepheshe, lwethule izakhiwo ezimbili ezintsha. Isakhiwo esisha sokuqala kwakungamacebo wokukhangisa wabahlinzeki bezinsiza zamaselula futhi owesibili kwakuyingcindezi yomphakathi nenani lesifiso. Lezi zakhiwo zombili ezihlanganisiwe zingasetshenziswa ukuchaza ukuthi kungani abahlinzeki bezinsizakalo zamaselula abanamasu ezindleko eziphansi bengaphumeleli.

Izici ezithinta abantu ezinjengobudala zitholakele ukuthonya ukwamukelwa kanye nezici zezomnotho nezenhlalo ezifana nomholo. Izici ezithinta umuntu ngqo ezifana nolwazi lwezobuchwepheshe, ukwazi ukwenza kanye namakhono, nesimo sengqondo maqondana nezobuchwepheshe zatholakala zithonya ukwamukelwa. Indawo yendawo yatholakala njengesici sokulinganisa esibaluleke kakhulu.

Ukusetshenziswa kwedatha yeselula yamanje kusekele uhlaka. Imiphumela yokusetshenziswa kwedatha igcizelele iqiniso lokuthi bacishe babe ngama-50% ababambe iqhaza kulolu cwaningo bachithe isikhathi esingaphezu kwamahora amane ngosuku bexhumana nemishini yabo yamaselula nokuthi ababambiqhaza abavela eGauteng bachithe izikhathi ezingaphezu kwezingu-2½ kuzinsiza zamaselula kunalabo bakwamanye amadolobha amakhulu aseKapa naseThekwini.

Amagama asemqoka: izinsiza zedatha yeselula, ukutholwa kobuchwepheshe, ukuziphatha kwabatheng, iNingizimu Afrika, ukusetshenziswa kwezinsizakalo zeselula, izinci zokulinganisa

Acknowledgements

I would like to express my sincere gratitude and thanks to all the people who gave of their time and assistance to help me in this endeavour and without whom it would never have been completed. In particular, the following people who each made a unique contribution.

To my supervisor, Professor Peet Venter for your guidance, support and motivation and for bearing with me when I did things my own way.

To Dion Van Zyl, for your statistical analysis, I would never have been able to glean the nuggets of new knowledge without it.

To the ladies and gentlemen who gave of their precious time and knowledge in the interviews. There was wisdom in your words.

To Peter Scott Wilson and the field research team for all the surveys, you did a great job.

To the NRF for making funds available to carry out the market research.

To my children, Eric and Monica, for your support and help over these past few years.

Finally, but most importantly, to my wife Anne Marie without whose support and proof reading skills it would never have been completed. For your forbearance, support, motivation, comfort, and for putting up with me when I was stressed and hiding away in my study, Thank you.

Table of Contents

List of Figures

List of Tables

CHAPTER ONE

INTRODUCTION

The focus of this thesis is concerned with identifying the particular factors that influence the adoption of mobile data services in the South African Mobile Telecommunications Market and from these factors will derive a framework that explains the adoption of mobile data services in this market.

1.1 OVERVIEW

Mobile telecommunications services were initially created with the intention of making voice services mobile, but with the creation and rapid adoption of the World Wide Web, or internet as it is better known, the requirement and use of data services in a mobile environment has increased rapidly. In 2007 there were 268 million active users of mobile broadband (data) globally and by 2017 it was estimated that this had grown to 4.22 billion, a compound annual growth rate of just under 130% per annum (International Telecommunications Union, 2017). The amount of actual mobile data transferred has been growing exponentially from 0.9 petabytes per month in 2005 to 11500 at the end of 2017, a compound annual growth rate of just under 120% per annum (International Telecommunications Union, 2015: Cisco, 2017), and in this respect South Africa is no exception. According to the Cisco Virtual Networking Index (VNI) (Cisco, 2017), the mobile data market in South Africa, grew by 73% in 2016 and is predicted to grow 10 fold between 2016 and 2021 from 28 to 269 Petabytes per month. In fact, mobile data has grown so much that for Vodacom South Africa, during the period of April to September 2017, mobile data revenues exceeded those of voice for the first time (Vodacom, 2107). So the adoption and use of mobile data services is the biggest driver in mobile telecommunications.

The mobile telecommunications market is a complex rapidly evolving market that involves the use of a mobile handset or device, mobile network, mobile users and the adoption and use of the system (Pedersen, 2005). With the mobile data market the type of handset or device does influence the adoption of these services but in a predictable manner, in that if the device is data enabled then the service can be used and if the device is not enabled it cannot be used. It is the same with the mobile network itself, for a subscriber to use mobile data services the access point of the network to which they are connecting must be data enabled. Therefore, although the network and mobile handsets do influence adoption of mobile services, for this research these effects are largely ignored. Hence, the research focusses on the mobile user and the factors which influence their adoption of mobile data services.

Literature is not consistent on the factors that influence the adoption of mobile services. With regard to behavioural models, demographic factors such as Age (Khare*,* Khare & Singh, 2012), Gender (Riquelme and Rios, 2010), Income levels (Margaret and Ngoma, 2013) and Educational levels (Rahman, 2015) have been shown to influence the adoption of mobile services. However, with similar models but under different conditions, these same four demographic factors are shown to have no influence on the adoption of mobile services, (Sobhanifard, Kharazan & Alikhani, 2017; Khedhaouria, Beldi & Belbaly, 2013; Lee and Han, 2015; Laukkanen and Cruz, 2012). In certain circumstances behavioural factors such as Culture (Avgerou, 2010), Social Interaction (Venkatesh, Morris, Davis & Davis, 2003), Perceived Ease of Use and Perceived Usefulness (Davis, 1986) have also been found to affect the adoption of mobile services.

There is another body of knowledge that bases the adoption of telecommunications services on physical factors. These factors include Economic/Financial, Regulatory/Policy, Political, Affordability and Technology (Bernt and Weiss, 1993; Mbarika, 2000; Udo, Bagchi & Kirs, 2008).

In all, literature lists over 50 different possible factors which affect, possibly influence or account for the adoption of telecommunications services. Therefore, one purpose of this research is to identify which of those factors are the most important in the adoption of mobile data services in South Africa.

The research will be carried out in two separate phases. The first phase will be interviews with experts in the mobile telecommunications market who are involved with analysing and forecasting the South African Mobile Telecommunications market. Phase 2 will be to use the factors which the experts in Phase 1 have determined to be the most important and test them with users of mobile data services in South Africa. The two mobile data services with which these factors will be tested are the alternative data based voice services, Voice over Internet Protocol (VoIP) services and WiFi ‘off load’ data services.

This chapter is divided into eight further sections. Section 1.2 will give the background to the study and the topic being explored. Section 1.3 will cover the problem statement and purpose of the research, while section 1.4 will concern the aim, research questions and objectives of the study followed by a rationale for the research from a personal perspective in section 1.5. Section 1.6 will give a summary of the research design and methodology to be used. Section 1.7 will indicate the scope, assumptions made and limitations of the study. Section 1.8 will give potential contributions of this study and the final section will give a diagrammatic overview of the study.

1.2 BACKGROUND

This section will start by examining the development of mobile communications and the evolution from a voice based service into a data service and the current magnitude of the market. It will then give a brief overview of the types of models that have been developed for explaining the adoption of ICT services, and it will conclude by highlighting ICT and the individual.

1.2.1 The Development of Mobile Telecommunications

In April 1973, the first cellular telephone call was made between Martin Cooper, of Motorola in the United States, and Bell Laboratories (International Telecommunications Union, 2006). In 1979, Nippon Telegraph and Telephone (NTT) launched its 1G mobile network in the metropolitan area of Tokyo and within five years, the NTT network had been expanded to cover the whole population of Japan, and became the first nationwide 1G network (International Telecommunications Union, 2006). In 1991, the first Global System for Mobile Communications (originally Groupe Spécial Mobile, or GSM) telephone call was made (International Telecommunications Union, 2006). This GSM technology is what is classed as the 2nd Generation Mobile Network (2G). It too was originally designed as a digital, circuit-switched network optimized for full duplex voice telephony system (Ericsson Telecom and Telia, 1998), but it could also be used for low speed data transmission (Ericsson Telecom and Telia, 1998). With the introduction of Short Message Services (SMS) and the availability of the internet, there came a requirement for data services on the network and the (General Packet Radio Services) GPRS and EDGE (Enhanced Data rates for GSM Evolution, or EGPRS) data systems were created for these functions.

However, the circuit switched portion of the network limited its data speeds and capacity and hence a 3rd Generation (3G) system, Universal Mobile Telecommunications System (UMTS), was launched in 2003 to transport data at ever increasing speeds. However, the need for high speed data networks that could deliver live video conferencing and media streaming (downloading of television and films for live viewing) meant that even faster data speeds at a greatly increased bandwidth were required. In 2010, the first 4th Generation (4G) network known as Long Term Evolution (LTE), was commercially launched (Temple, 2017). The 4G networks are basically data networks which carry voice as a data application. These networks are completely digital and have packet switching at the core.

The growth of mobile communications has far exceeded expectations, and according to the estimates in the 2017 version of '*Measuring the Information Society*' (International Telecommunications Union, 2017), by the end of 2016 there were more mobile cellular telephone subscribers than there were inhabitants in the world. In fact the International Telecommunications Union (ITU) estimates that at that time there were 103.5 mobile telephone subscriptions for every 100 inhabitants globally (International Telecommunications Union, 2017).

So what started as a system for mobile voice calls with slow data services has developed into a fast data system that carries voice as a data application, therefore, emphasising the predominance of data over voice in modern society.

1.2.2 Development of Mobile Telecommunications in South Africa

Vodacom launched the first mobile network using 2G GSM technologies in South Africa in 1994 closely followed by MTN a month later. Originally both networks only had post-paid contracts similar to those used by the fixed line service provider Telkom. The take up of the service was much more rapid than forecast and by the end that year the number of subscribers had risen to 340,000. The number of subscribers rose rapidly, nearly doubling on a yearly basis, so by the end of 1996 there were 935 000 subscribers and by the end of 1997 it was nearly 2 million (Horwitz, 2014). It has continued to grow at these phenomenal rates so that by the end of the 3rd Quarter 2017, ICASA estimated that South Africa had a total of 87.1 million mobile subscriptions (ICASA, 2018).

The biggest growth stimulator for the mobile telecommunications market was the 1996 development of pre-paid subscriptions. This development opened the market to the vast majority of South Africans who could not obtain the credit clearance required to have a post-paid subscription (MyBroadband, 2014; Vodacom, 2018a). In late 2001 the third mobile network provider, Cell C, launched in South Africa and the fourth, 8ta or Telkom Mobile, launched in 2010. Mobile broadband data services were launched in 2004 with the advent the of 3G technology (BMI Research, 2004), while in 2012 Vodacom, MTN and Telkom Mobile commenced with the rollout of high speed 4G data networks. However, these 4G rollouts have been confined to metropolitan areas due to ICASA not releasing the spectrum in the lower 800MHz and upper 2.3GHz ranges (Mcleod, 2017).

The mobile telecommunications market is entering a new stage of development, in that total subscriber numbers of mobile users has only grown with a Compound Annual Growth Rate (CAGR) of 0.1% over the last three years (September 2015 to September 2018) (ICASA, 2018), thus indicating that the total market has become saturated. However, what is seen in the market is a shift from voice subscriptions to data subscriptions, with data subscriptions growing at a CAGR of 14.9% over the same three year period (ICASA, 2018).

1.2.3 Frameworks for Predicting the Adoption of ICT

The frameworks which have been developed to explain or predict the adoption of ICT fall into 4 distinct classes. These will now be briefly discussed.

1.2.3.1 Class 1: Country Level Frameworks.

These frameworks were developed to explain the adoption of ICT in various countries and so were country level models. These studies found that there were specific country level factors which would explain the differences in ICT adoption between similar countries (Udo, *et al*., 2008). These frameworks were generally created in the developed world so applicability to the less developed world could not be confirmed. In 2000, Mbarika modified the Bernt and Weiss framework and adopted it to explain obstacles to growth in the Low Developed Countries (United Nations, 1999).

These models were a collection of different factors which would be combined into several key constructs, which could be used to determine the growth in ICT in a country when compared to another. The constructs in which the various factors were collected were aspects such as Demographics, Geography, Economic and Technological.

Examples of these models are the Bernt & Weiss Framework (1993); Mbarika, Meso & Musa (2004); and Udo, *et al*. (2008).

The majority of these models were developed prior to the rollout of prepaid mobile communications which revolutionised the telecommunications market (Hodge, 2005).

1.2.3.2 Class 2: Innovation Diffusion Theory (IDT) Framework

The Innovation Diffusion Theory (Rogers and Shoemaker, 1971; Rogers, 1995) has been in use since the 1960's to study a variety of innovations from organizational innovation to agricultural tools (Tornatzky and Klein, 1982). Rogers (1995) initially identified five general attributes of innovations that had been consistently shown to influence adoption, namely Relative Advantage; Compatibility; Complexity; Observability and Trialability.

In 1982, Tornatzky and Klein identified a further 5 characteristics, namely cost, communicability, divisibility, profitability and social approval. Moore and Benbasat (1991) adopted the characteristics of innovations, as postulated by Rogers, and defined a set of constructs that could be used to study the technology acceptance of an individual. This framework is referred to as the Perceived Characteristics of Innovating (PCI) Framework (Moore and Benbasat, 1991).

Some of the characteristics can be seen to be related to the country level frameworks, such as cost, while other characteristics such as complexity, which Moore and Benbasat changed to Ease of Use, can be related to the behavioural models. In essence, the IDT framework is a bridge between the country level models and individual behavioural models.

1.2.3.3 Class 3: Behavioural Frameworks

As with the Innovation Diffusion Theory framework this next class of frameworks, which attempt to explain the adoption of ICT services by the individual, have their theoretical basis in the field of sociology and in particular the area of explaining human behaviour.

This change was driven by International Business Machines (IBM), which in 1981, rolled out the IBM Personal Computer (PC), model 5150, and turned the information technology market completely around. The information technology market changed from a market where machines were primarily for business and research and which cost around US$9 million each, to a device which retailing at under US$1000 could be owned and operated by the average person.

1.2.3.3.1 General Behavioural Models

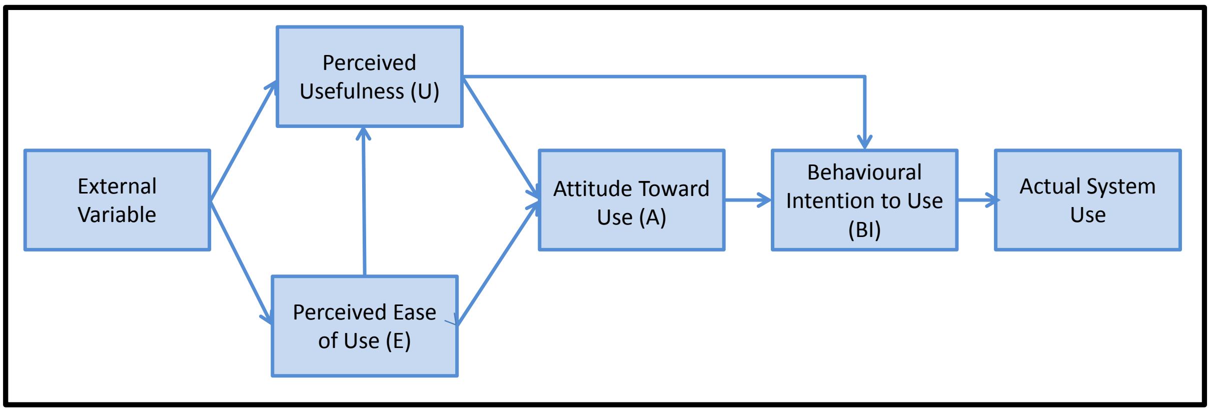
Researchers then turned to behavioural models as a way to explain an individual's acceptance and use of this new technology. Davis, Bagozzi & Warshaw (1989) applied the Theory of Reasoned Action (TRA), (Fishbein and Ajzen, 1975) to the individual acceptance of technology and found that the results were consistent with its use for other behaviours. In 1991, Ajzen extended the TRA with a third construct, Perceived Behavioural Control to postulate the Theory of Planned Behaviour (TPB). In 1995, Taylor and Todd, created the Decomposed Theory of Planned Behaviour (DTPB) which is very similar to the TPB but just 'decomposes' the attitude, the subjective norm and the perceived behavioural control constructs into their underlying belief structures within the technology acceptance context. Thompson, Higgins & Howell (1991), adapted Triandis' (1977) theory of human behaviour to predict PC utilisation to create the Model of Personal Computer Utilisation (MPCU).

1.2.3.3.2 The Technology Acceptance Model (TAM)

In 1986, Davis used the Theory of Reasoned Action (Fishbein and Ajzen, 1975) and created the Technology Acceptance Model (TAM) as a special case for modelling technology adoption in organisations (Davis, 1986 and 1989).

The Technology Acceptance Model (TAM) (Davis, 1986 and 1989) and its subsequent modifications are some of the most significant models used for explaining the acceptance of technology. According to Google Scholar, the original article had been cited nearly 44500 times by July 2019 (Google Scholar, 2019). Figure: 1-1 shows the original TAM model, often called TAM 0.

Figure: 1-1: Original TAM Model (TAM 0)



(Source: Davis, 1986 and 1989)

Originally, the TAM was used to explain the acceptance of computers in the workplace, but as with ICT it has moved into all walks of life and society. Currently, it is most often used in explaining the adoption of new technologies in the consumer environment. The TAM and its subsequent developments are considered very important as they have been found to be very good in explaining the success or failure of many new technologies (Rondan-Cataluña, Arenas-Gaitán & Ramírez-Correa, 2015).

There has been a steady progression in the development of the TAM with the addition of new factors and antecedents to the existing factors as well as the modifications required for it to be used to explain the acceptance of technology by individuals in the consumer markets.

1.2.3.3.3 Universal Theory of Acceptance and Use of Technology Model (UTAUT)

Venkatesh, *et al*. (2003) examined all the different TAM and Behavioural Models in relation to Information Technology and distilled the key elements into a single unified model, the Universal Theory of Acceptance and Use of Technology Model (UTAUT). It was tested using the original data and found to outperform all of the original models.

UTAUT 2: Like the TAM and TRA models, the UTAUT model was designed from the perspective of the adoption of technologies in a business organisation. Therefore, in order for UTAUT 2 to be applicable to consumer technologies Venkatesh, Thong & Xu (2012) extended the model with three new determinants of Behavioural Intention.

1.2.3.4 Class 4: Techno-economic Statistical Forecasting Models

These models are used by various Telecommunications research houses to forecast the adoption of service at a country or a regional level. They typically use statistical techniques such as time series, causal-economic modelling techniques and autoregressive moving average model (ARMA). For their data sources they use national telecommunications ministries or regulators, the network operators' annual reports and other officially released service provider data, industry organisations, national news agencies as well as international organisations such as the International Monetary Fund (IMF), the World Bank and the International Telecommunications Union (ITU) (BMI Research, 2017).

For new product adoption the trend has gone towards the new-product diffusion models of which the best known is the Bass Model (1969) (Mahajan, Muller & Bass, 1990). However, the basic Bass Model has many apparent limitations, the most important of which is the calibration of the parameters when limited data are available, which is generally the case with new products. Many different studies have been conducted to overcome this limitation and they include using genetic algorithms (Fildes and Kumar, 2002), the use of Meta parameters (parameters estimated from earlier diffusions) for similar products (Jeanjean, 2014), or in other geographical areas (Easingwood, 1989) and Stochastic Frontier Analysis (Smith, 2008).

The four classes of frameworks highlighted show the diversity and richness of the current research into the field. Frameworks in Class 1 (Country level frameworks), Class 4 (Techno-economic Statistical Forecasting Models) and to an extent Class 2 (Innovation Diffusion Theory frameworks) can be seen as models that predict the adoption of services, while the Class 3 or behavioural models are causal explanatory in that they explain the adoption of services (Shmueli, 2010). These frameworks were chosen for analysis in that they give the widest possible base of different factors that could possibly affect the adoption of mobile data services. The function of Phase 1, Chapter 4, of the research is to wean this large base of factors and concentrate on those that are in the opinion of the experts in the South African Telecommunication market the most appropriate for the adoption of mobile data services in South Africa.

1.2.4 ICT and the Individual

The various models in section 1.2.3 have highlighted numerous factors that have been shown to influence the adoption of ICT's by individuals. However, a deeper analysis shows that many of the factors are in most of the models in one form or another. These factors can be divided into four main groups and these are highlighted below.

1.2.4.1 Demographic Factors

Demographic factors are used in all the frameworks described in section 1.2.3 either as a main determinant or as a moderating factor in behavioural models. The main demographic factors of individuals that are generally accepted as the important indicators for the adoption of mobile information and communication technology are age, gender, educational level and livelihood activities (Khan, 2017; Oluwatayo, 2014).

However, literature indicates that although they are important in some situations, while in other circumstances they have no effect. Therefore, they must be tested in each context.

1.2.4.2 Socio-economic Factors

Socio-economic factors such as income, product price and affordability have been shown to be a factor in the adoption of mobile services in all four classes of frameworks (Udo, *et al*., 2008; Moore and Benbasat, 1991; Davis, *et al*., 1989; Venkatesh, *et al*., 2003; Mahajan, *et al*., 1990). In this research the Living Standards Measures (LSM), a measurement of an individual's social class or living standard that does not take into account ethnicity nor uses income as a variable, will be tested. As this is a very specific South African measure and not adopted in other parts of the world, there are no references to its effect on the adoption of mobile services.

1.2.4.3 Personal Factors

The third group of factors which have an influence on the adoption of mobile services are personal factors. The factors that are included in this group are attitude towards technology and technical knowledge or competence. These factors emerged from the Behavioural and Innovation Diffusion Theory frameworks.

1.2.4.4 ICT and Culture/ Ethnicity

The University of Minnesota, Centre for Advanced Research on Language Acquisition (CARLA) defines culture as "*the shared patterns of behaviours and interactions, cognitive constructs, and affective understanding that are learned through a process of socialization. These shared patterns identify the members of a culture group while also distinguishing those of another group*" (CARLA, 2013: 1). Hofstede (1991) developed a model which defines a culture in 5 dimensions, Power Distance (PDI); Individualism/Collectivism (IDV); Masculinity/Femininity (MAS); Uncertainty Avoidance (UAI) and Long- vs. Short-Term Orientation (LTO). This 5 Dimension model is frequently used to analyse conflicts between the values and behaviours required by ICT and those embedded into the national culture of developing countries (Leidner and Kayworth, 2006). Numerous researchers have analysed the effect of Hofstede's dimensions on the adoption of mobile services and as with other factors such as demographic factors, differing results have been obtained. For example, Lee, Choi, Kim & Hong (2007) found that the higher the Uncertainty Avoidance (UAI) in a country, the more it led to users perceiving less usefulness, less enjoyment, less ease of use, and less monetary value in the mobile Internet, while Bagchi, Hart & Peterson (2004) and Geissler (2006) found that UAI was the dimension of culture which had the least correlation with technology adoption.

Owing to the legacy of apartheid and separate development, South Africa has very distinct differences in terms of ethnicity and development and hence cultural differences between different ethnic groups could be a factor that affects the adoption of mobile services in South Africa.

1.3 PURPOSE OF THIS RESEARCH AND PROBLEM STATEMENT

1.3.1 Purpose of the Study

Results of forecasts on fixed and mobile services for the South African Telecommunications market are generally disappointing in that forecasts of 2 years ahead showed variations of +/- 20% or more when compared to actual figures. As with any forecast this error would get progressively bigger the further forward the projection is made. This is especially evident with newly released products where there is only limited data available as a basis. The mobile telecommunications industry is a capital intensive industry (Vodacom and MTN both show capital spends in the range of 16-25% of service revenues for the past two business years, Vodacom, 2017; MTN, 2017) and it has relatively long lead times. Therefore, it is important to understand the drivers for the adoption of mobile data services and thus forecast uptake of a new service correctly in order to prevent the congestion on the network that results from insufficient capacity caused by inadequate capacity or building too much capacity and wasting the limited capital available. A better understanding of these drivers will allow networks to plan better and have sufficient network capacity when required. This study is an attempt to better understand the drivers of adoption of mobile data services in South Africa, so networks can improve network planning.

1.3.2 Problem Statement

There is a lack of understanding of the drivers and an appropriate framework to explain the adoption of mobile data services in South Africa. This manifests itself in the lack of network capacity, congestion on the networks, and ultimately the subscriber experiencing poor service quality. An example of this poor quality is highlighted by the results of the Static Quality of Service tests conducted by the Regulator ICASA in the 3rd Quarter 2017/18 on 3G data quality. Of the 18 Key Performance Indicators tested the best Network Operator achieved satisfactory results in 8 of the 18 indicators and the worst only in 1 of the 18 (ICASA, 2017).

Although there are numerous different frameworks to determine the adoption of a mobile data service in a market, the majority were developed in first world countries and thus their applicability and relevance to a country such as South Africa is not confirmed (Udo, *et al*., 2008).

The South African Government is also prioritising the use of electronic based services as a way of boosting the economy and making South Africa more globally competitive (South Africa, 2013a: 2). In contrast to this the general household survey of 2012 showed that around 35% of households in South Africa indicated that they had no need for the internet (South Africa, Statistics South Africa, 2013). Therefore, the factors of adoption as well as the moderating factors in the South African context need to be fully understood and articulated in order for this Government objective to be achieved.

Anomalies are also evident in the market in that although the ICT spend in South Africa, as a percentage of Household Final Consumption Expenditure (HCFE) (South Africa, Statistics South Africa, 2017a), is almost double that of the European Union, the United Kingdom and New Zealand (New Zealand, Statistics New Zealand, 2016; United Kingdom, Office of National Statistics UK, 2016; Eurostat, 2018) usage is well below those countries. Additionally, in South Africa the networks with the cheapest services have the lowest market share (ICASA, 2018a).

1.4 AIMS, RESEARCH QUESTIONS AND OBJECTIVES OF THE RESEARCH

1.4.1 Aims of the Research

The aim of this study was to determine the key factors which explain the adoption of mobile data services in South Africa, incorporate them into an explanatory framework and see if the current usage of mobile data services supports the framework.

1.4.2 Research questions

In order to develop and test a South African market explanatory framework for the adoption of mobile data services the following research questions had to be answered:

1. What are the drivers of adoption of mobile data services in the South African Telecommunications market and can they be integrated into an explanatory framework?
2. Are there any moderating and/or mediating factors that are important to the adoption of mobile data services within the South African context?
3. Does the current usage of mobile data services in South Africa support the framework and any specific South African related findings?

1.4.3 Objectives of the Research

The research had five objectives that allow the research questions to be answered.

1. Determine the factors that drive the adoption of mobile data services in the South African telecommunications market, based on the input of experts in the market and published literature.
2. Use the data obtained to develop a theoretical framework for the adoption of Mobile Data Services in South Africa.
3. Identify all the possible moderating and mediating factors which have a significant effect on the adoption of mobile data services in South Africa.
4. Test the framework for mobile data services, using a market questionnaire, and by adjusting the framework as appropriate.
5. Use data regarding the usage of mobile data services to support the framework and moderating factors and to highlight any significant features in the South African mobile data market.

1.5 PERSONAL RATIONALE FOR THE RESEARCH

The author has worked in the South African Telecommunications Industry for over 30 years and seen it change from the days of analogue electro-mechanical switches, into the digital age in the circuit-switched fixed line market, and through all four generations of the mobile market into where we currently stand at the cusp of a totally digital world. This digital world will be where fixed line communications, mobile communications and Information Technology will be integrated into one large converged market. One of the things that has stood out over time is how little is actually known about why telecommunications, particularly mobile, are adopted differently in different countries and contexts. For example, by June 2016 the M-Pesa mobile money service on the Kenyan Mobile Network Safaricom had over 11 million users while the same service on the Vodacom South Africa network was to be closed at the end June 2016 due to it only having attracted 76,000 users (Van Zyl, 2016). Our inability to really understand this problem is manifesting in the inaccuracy of forecasts especially when we use proxy data from another country as a basis (Udo, *et al*., 2008). Each country is unique, and what goes for Brazil and Malaysia (research houses' favourite proxies for South Africa) has time and time again been found to be inaccurate in South Africa. This is further complicated, with the fact that there are conflicting results in literature with regard to whether factors such as Age, Gender, Income and Education actually influence adoption of mobile services (explained in more detail in section 2.4). This thesis set out to determine what are the actual factors of adoption of mobile data services in South Africa and in so doing try and highlight what makes South Africa different and understand why in a country where people spend more on average on mobile services as a percentage of Household Final Consumption Expenditure (HCFE) than most countries globally (South Africa, Statistics South Africa, 2017a; New Zealand, Statistics New Zealand, 2016; United Kingdom, Office of National Statistics UK, 2016; Eurostat, 2018), yet where the cheapest service providers have the lowest market shares (ICASA, 2018a).

1.6 OVERALL RESEARCH DESIGN, STRATEGY OF INQUIRY AND METHODOLOGY

This study was designed to be executed in two distinct phases. Phase 1 entailed conducting a series of semi-structured interviews with experts in the mobile telecommunications industry in South Africa with the objective of obtaining their insights into the drivers and constraints of mobile data services in South Africa. The information obtained was integrated with that obtained in the literature review to propose a preliminary framework. Phase 2 entailed using the information gained in Phase 1 to develop a survey instrument to test and optimise the preliminary framework with mobile data subscribers and to test whether the current usage of mobile data supports this framework.

One of the complications of such a research design was the methodology in that the researcher was required to describe three different research methodologies. There was the overall research methodology, which covers the whole research, a separate methodology for Phase 1, which was a qualitative study and again a separate methodology for Phase 2 which was a quantitative study. In order to keep the three methodologies separate, the overall research methodology is discussed in the next section, while the methodology for Phase 1 is discussed in Chapter 3 and the methodology for Phase 2 in Chapter 5.

1.6.1 Introduction

This section begins by discussing the research paradigm. It then proceeds to discuss the overall strategy of inquiry and the factors which are common to all phases of the research. It concludes by assessing and demonstrating the quality and rigour of the proposed research design and the ethical considerations.

1.6.2 Research Paradigm

According to Schwandt (2001: 183-4) a paradigm can be defined as a "*shared world view that represents the beliefs and values in a discipline and that guides how problems are solved*". A research paradigm is therefore used to set the context of a researcher's study. There are many different types of paradigms that can be used to guide research and all the assumptions that are made regarding the particular study (Ponterotto, 2005).

Although it was not the author's intention to become immersed in the debate surrounding the conceptualisation (Cresswell and Tashakkori, 2007) and topologies of mixed methods research (Guest, 2012), it was necessary to define this particular research paradigm.

According to Creswell and Tashakkori (2007) there are four different, but not mutually exclusive, perspectives that academics take when discussing and writing about mixed methods. The four perspectives are the discussed in the following sections.

1.6.2.1 The Method Perspective

The method perspective is a perspective which focuses on the process and outcomes of using both qualitative and quantitative methods and types of data, but does not focus much on the worldview or paradigms.

1.6.2.2 The Methodological Perspective

The methodological perspective is a perspective that holds that one cannot separate methods from the larger process of research of which it is a part. It holds that discussions of mixed methods should focus on the entire process of research, from the philosophical assumptions, through the questions, data collection, data analysis, and on to the interpretation of findings. This perspective was initially called the paradigm-method (Reichardt and Rallis, 1994).

1.6.2.3 The Paradigm Perspective

This is a perspective which holds that mixed methods is less about methods or the process of research and more about the philosophical assumptions.

1.6.2.4 The Practice Perspective

The practice perspective is a perspective where scholars view mixed methods research as a means or a set of procedures to use as they conduct their research designs; it is a ‘bottoms up’ approach (Tashakkori, 2006). The Practice Paradigm allows the individual researcher to have the freedom of choice on the methods, techniques and procedures of research that best suits the research and its intended outcomes, (Cresswell, 2009).

The prevailing paradigm for this research will be the Methodological Perspective. This paradigm was chosen as it focuses attention on the research problem and uses pluralistic approaches to derive knowledge about the problem (Tashakkori and Teddlie, 1998).

For this thesis the author has adopted the methodological route and hence uses the expanded definition of mixed methods research from Johnson, Onwuegbuzie & Turner (2007: 129) to define the research paradigm. *“Mixed methods research is the research paradigm that (a) partners with the philosophy of pragmatism in one of its forms (left, right, middle); (b) follows the logic of mixed methods research (including the logic of the fundamental principle and any other useful logics imported from qualitative or quantitative research that are helpful for producing defensible and usable research findings); (c) relies on qualitative and quantitative viewpoints, data collection, analysis, and inference techniques combined according to the logic of mixed methods research to address one’s research question(s); and (d) is cognizant, appreciative, and inclusive of local and broader socio-political realities, resources, and needs”.*

1.6.3 Ontology and Epistemology Assumptions

Ontology refers to what sort of things exist in the social world and assumptions about the form and nature of that social reality (Slevitch, 2011). There are basically three distinct ontological positions namely Realism, Idealism and Materialism (Snape and Spencer, 2003). Realism claims that there is an external reality independent of what people may think or understand it to be, while Idealism claims that reality can only be understood via the human mind and socially constructed meanings. Materialism also claims that there is a real world but it is only the material or physical world that is considered to be real and that other phenomena, such as, beliefs, values or experiences arise from this material world but do not shape it (Snape and Spencer, 2003).

Epistemology is concerned with the nature of knowledge and ways of knowing and learning about social reality (Bryman and Bell, 2011).The two main perspectives for knowing are Positivism and Interpretivism. Positivism holds the view that there is no external reality independent of human consciousness (Robson, 2002), while Interpretivism, sometimes referred to as Constructivism, (Guba and Lincoln, 1994) maintains the basic principle that reality is socially constructed (Robson, 2002).

This research is derived from a Realist and Interpretivist perspective.

1.6.4 Overall Research Design

The following section describes the overall design of the complete research, defines and classifies it and gives reasons for the choices.

1.6.4.1 Choice of Research design

The design of the research project included one qualitative method, in this case the factors of adoption and one quantitative method, the survey instrument. Therefore, it meets the classic definition of mixed methods research as stated by Greene, Caracelli & Graham (1989: 256), *"[Mixed Methods] includes at least one quantitative method (designed to collect numbers) and one qualitative method (designed to collect words)*".

1.6.4.2 Reasons for the choice of Mixed Methods Research

The choice of the mixed methods research methodology was derived from the following perspectives.

One of the key questions that this thesis strives to answer is **"**What are the drivers of adoption of mobile data services in the South African Telecommunications market?**"** It is the author's contention that the adoption of mobile data services in South Africa is unique and cannot be modelled using an existing techno-economic framework. The author also contends that the diversity and the past history of South Africa, a country that was divided along ethnic lines, may mean that the drivers of adoption may be differ along these past divisions

Phase 1 of the research was to determine those specific drivers out of the 50 plus possible drivers identified in the literature survey. To conduct a survey with 50 plus factors is not practical, so the list was winnowed to a more manageable number. It was concluded that the most efficient and effective way to reduce the number of possible into a manageable number was by conducting a series of interviews with various key market players and knowledge carriers in the South African mobile telecommunications market and draw on their knowledge. The experts were drawn from the research houses that cover the South African mobile data market and from the market experts in the South African mobile service providers. This proposed methodology is qualitative research.

Phase 2 of the research was to take the winnowed list of possible drivers and test them in the market by way of a survey. The survey not only tested the drivers, but it also identified and tested the factors that could moderate or influence the rate of adoption. The use of statistical methods in accomplishing this goal was indicative of quantitative research. Therefore, the complete research was utilising both quantitative and qualitative methodologies and hence the adoption of a mixed method design.

An additional motivation for the use of a mixed methods research is the strength that is gained by the triangulation of the two research types. According to Torrance (2012) the core principle for the use of mixed methods is triangulation in that no single method is likely to give as comprehensive a result as a methodology which uses two different methods and can investigate the problem from different points of view.

Triangulation refers to the use of more than one approach to the investigation of a research question in order to enhance confidence in the ensuing findings.

Denzin (1978) distinguished four forms of triangulation:

- **Data triangulation**, which entails gathering data through several sampling strategies,
- **Investigator triangulation**, which refers to the use of more than one researcher in the field to gather and interpret data.

- **Theoretical triangulation**, which refers to the use of more than one theoretical position in interpreting data.
- **Methodological triangulation**, which refers to the use of more than one method for gathering data. This is expanded further to 'within-method triangulation**'** which involves the use of varieties of the same method to investigate a research issue and 'between-method triangulation' which involves contrasting research methods.

In this research the author utilises both 'Data Triangulation' and 'Between-method Triangulation'. 'Data Triangulation' was used in that the data was gathered using different sampling strategies and 'between-method triangulation' was used in the utilisation of both qualitative and quantitative methodologies in the research.

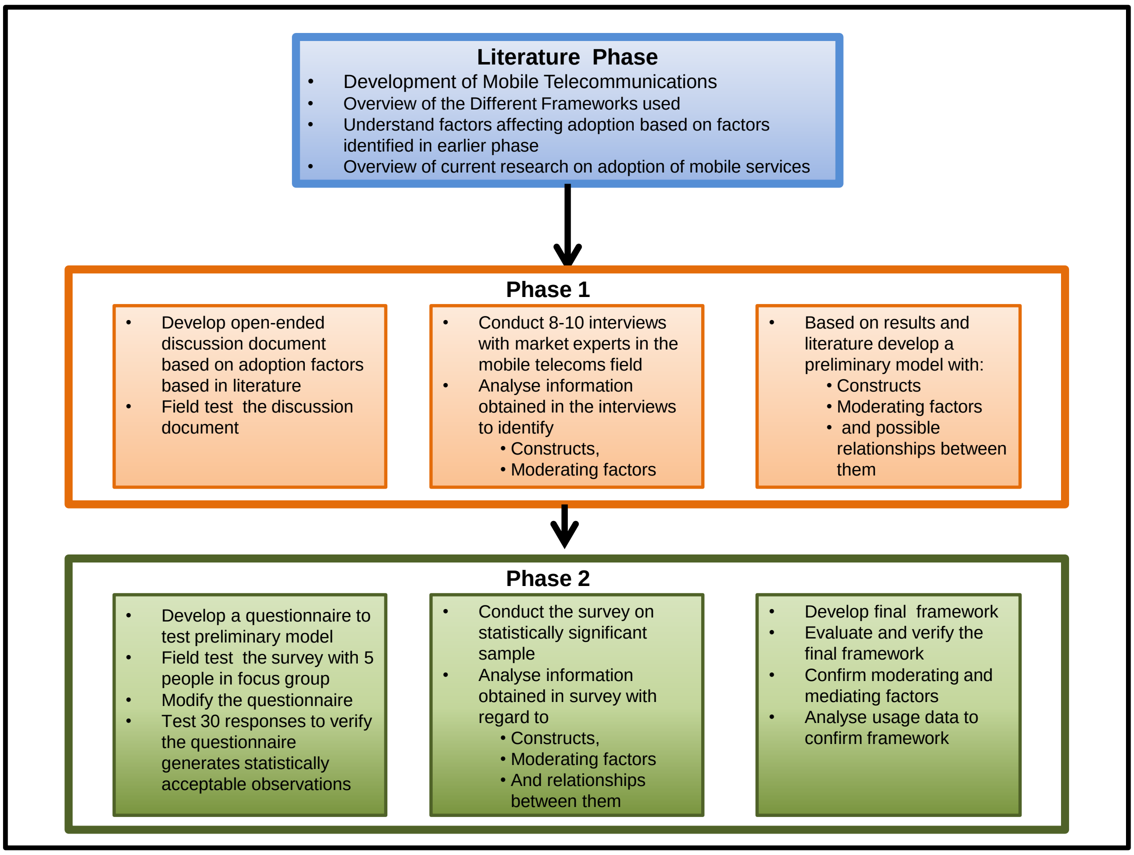
1.6.5 Overall research design

The research design involved three distinct elements, with the first element being the literature survey. The literature survey, apart from serving as an introduction and overview of the topic, provided a comprehensive picture of all the research that has previously been conducted to determine the factors that have been found to influence the adoption of mobile telecommunications services and the frameworks developed to explain the adoption of communications. It also examines the most recently published research on the adoption of mobile services. The second element was Phase 1 which used qualitative research to determine the key drivers of adoption and inhibitors in the South African mobile telecommunications market and to develop a preliminary framework. Phase 2 then used the framework developed in Phase 1 and tested it against a sample of South African Mobile telecommunications mobile data users and from that validates and modifies the preliminary framework. The usage data collected in this phase is also used to validate the framework. Figure: 1-2 gives a visual representation of this process.

1.6.5.1 Description of the Overall Strategy of Inquiry

In the design of a mixed methods research project, three key aspects must be determined, namely 'Timing', 'Weighting' and 'Mixing' (Creswell, 2009). These three components for the overall strategy are described below.

Figure: 1-2: Visual Representation of complete research design



Timing:

The sampling and data collection for the two phases can be conducted in either a ‘concurrent’ or a ‘sequential’ manner. In concurrent sampling the qualitative and quantitative sample data are collected simultaneously in order to validate one form of data with the other form, either to transform the data for comparison, or to address different types of questions (Creswell and Plano Clark, 2007: 118). In concurrent sampling often the same subjects are simultaneously supplying both qualitative and quantitative data (Driscoll, Appiah-Yeboah, Salib & Rupert, 2007: 20). While in sequential data collection the data is collected in an iterative or sequential process and in which the data collected in one phase contributes to the data to be collected in the subsequent phase (Driscoll, *et al*., 2007).

The experimental design used in this research was the sequential method in that the data collected in Phase 1 lead directly into the preliminary framework and design of the questionnaire used in Phase 2.

Weighting:

As indicated earlier the data collection was in a sequential manner. The results of Phase 1 and to a limited extent the literature survey were used to develop the preliminary framework. The data collected in Phase 2, the quantitative research was used to confirm or modify the framework. Therefore, the quantitative research has the greater weighting.

Mixing:

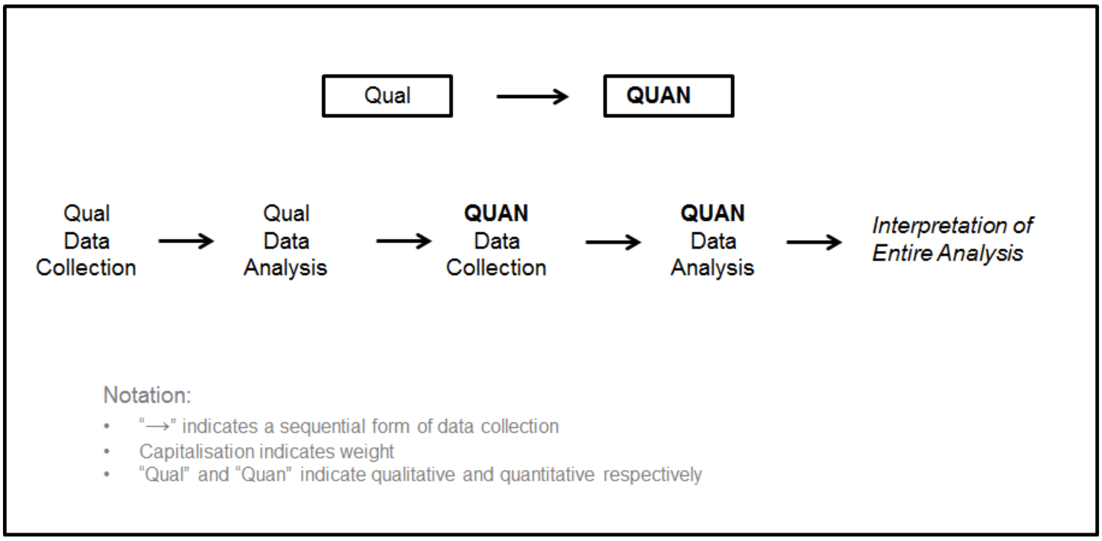
When discussing mixing one must be cognizant of the fact that there are actually two questions being asked: 'When' does the mixing occur?: And 'How' does the mixing occur? The 'how' the data can be mixed occurs in one of two ways. It can either be in a 'connected' or an 'embedded' manner. In mixed methods research 'connected' means the mixing of the quantitative and qualitative research occurs between the data collection of one phase and the data analysis of another, while 'embedding' is when a secondary form of data is added to the primary database from a different source (Creswell, 2009).

In this research design the data collected in Phase 1 was used to develop the preliminary framework and the questionnaire employed in evaluating the framework. Hence, the 'when' of mixing occurs between the two phases and it is carried out in a 'connected' manner.

Therefore the overall strategy of inquiry for the broader research is a mixed methods methodology using 'sequential timing' with the 'quantitative research having the greater weighting' and the 'mixing' occurring in a 'connected' manner between the two phases.

Creswell (2009) recommends that there is a visual model of the design strategy to assist in a better understanding of the research design. He recommends using the mixed methods notation developed by Creswell, Plano Clark, Gutmann & Hanson (2003). Figure: 1-3 describes the overall research design in the mixed methods notation.

Figure: 1-3: Mixed Methods Notation of Overall Research Design



(Source: Adapted from Creswell, et al., 2003)

1.6.5.2 A classification of the proposed study's overall research design

The following are the appropriate descriptors that best describe the broader research design of the proposed study:

Cross-sectional:

Cross-sectional research involves the study of a particular phenomenon at a point in time. In this study, although data are collected at two different points of time, the data collected is different and hence it is cross-sectional as it represents a snap shot of one particular point in time (Creswell, 2009). Additionally, this research design was ideally suited to the descriptive and the predictive functions associated with correlation research, as it assessed the interrelationship between the variables in the study (Shaughnessy and Zechmeister, 1997).

Non-experimental:

Non-experimental research provides a numerical (quantitative) description of attitudes, opinions or trends of a population by studying a sample of the population. The key differentiator between 'experimental' and 'non-experimental' research designs is whether the predictor variable is being manipulated or not. In this research design the data were collected through questionnaires and structured interviews but at no stage was the predictor variable manipulated, meaning it was a 'non-experimental design' (Creswell, 2009; Babbie, 2008).

Primary Data:

Primary data refers to data that is collected specifically for a research project being undertaken (Saunders, Lewis & Thornhill, 2009). In this study, although the researcher used secondary data, in the form of the literature study as a basis for the structured interviews, the data collected in the interviews and by way of the survey to address the research questions was primary data.

Empirical Research:

The study was classified as an empirical study as the researcher collected and analysed primary data.

Evaluative Research:

Babbie and Mouton (2001: 335) describe evaluative research "*as the conceptualisation, design, implementation and impact/outcomes of a particular social intervention aimed at solving a recognised organizational or social need or problem*". The development of a framework to determine the adoption of a new mobile telecommunications service would be classified as evaluative research.

Quantitative Data (Numerical Data):

Quantitative data refers to numerical data that can be statistically analysed to determine the results of the research project. The data collection technique that was used for Phase 2 of this study was questionnaires which generated numerical data, (Saunders, *et al*., 2009). This data was then used to perform Inferential and Predictive statistical analysis and draw conclusions thereof.

1.6.5.3 Sampling

To answer the research question and hypotheses stated, the researcher selected a non-experimental strategy of inquiry. This required the researcher to select a non-experimental data collection method.

1.6.5.4 Units of Analysis

The units of analysis of a study refer to the entities about which the researcher wishes to draw conclusions. The units of analysis can refer to individuals, families, organisations and any other groupings or entities (Terre Blanche, Durrheim &

Painter, 2006). The unit of analysis of this study was the individuals who use a mobile data telecommunications service.

1.6.5.5 Target population

The target population in this study was the individuals who use a mobile data telecommunication service in urban South Africa in the metropolitan areas of Tshwane (Pretoria), Johannesburg, Cape Town and eThekwini (Durban).

The research was limited to mobile data telecommunications users who are using 3G and 4G mobile data services. The reasons for this are two-fold. Firstly as explained in section 2.2.3.1 only services based on 3G and 4G mobile services can be classed as mobile data services (Telkom, 2017). Secondly, mobile 3G and 4G data subscriptions are estimated to be around 45 million out of the estimated 93.5 million mobile subscriptions at the end of September 2017 (BMI Research, 2017). This equates to approximately 48% of total mobile subscriptions.

As highlighted in section 1.2.2 the inability of the mobile network operators to roll out the high speed 4G networks outside of the metropolitan areas meant that it was not practical to sample outside of metropolitan areas. It was determined that the four metropolitan municipalities, Tshwane, Johannesburg, Cape Town and eThekwini had a total population in 2016 of 15.9 million residents which constitutes 71.8% of the total population who reside in the eight metropolitan municipalities in South Africa and almost 50% of the total urban population of South Africa. (South Africa, Statistics South Africa, 2012; South Africa, Statistics South Africa, 2017; Municipalities of South Africa, 2018).

1.6.6 Research Methodology

As detailed above the over-arching methodology was Sequential mixed methods, while the methodologies used in the literature review, Phase 1 and Phase 2 are elaborated on in the following sections.

1.6.6.1 The Literature review

The literature review was conducted with the following four aims in mind. The first aim was to highlight the development of the mobile telecommunications industry from what was once a technology developed for voice transmission to a technology designed to carry large amounts of data at high bandwidths and with voice transmission now a data application[1]. It will also give an overview of the current status of the market in South Africa, key factors affecting the market and the South African market in relation to the rest of the world.

The second aim was to get an overview of all the different frameworks that have been used to try and forecast or explain the adoption of ICT services in general and mobile services in particular and examine how they have developed over time. Another benefit from this section of the literature review was to highlight all the possible factors which have been recognised as affecting the adoption of ICT services.

The third aim was to understand the way and to what extent factors identified in the second part of the review affect the adoption of mobile and other ICT services. It also tried to identify which factors would possibly affect the adoption in South Africa.

The final aim was to carry out a high level scan of the recent research being carried out regarding the adoption of mobile services and to scan for any trends or indications which indicate where the research is heading.

1.6.6.2 Phase 1: Qualitative approach

The interviews of Phase 1 were semi-structured interviews with 6 open ended questions that just introduced the topics to be discussed. The interviews were originally coded using a 'Deductive' or 'Theoretical' approach (Hayes, 1997; Crabtree & Miller, 1999). This is a 'top down' approach which uses an a priori template of codes into which the data is fitted. When this was found to be inadequate, a second iteration of coding was carried out using an 'Inductive' or 'bottom up' approach (Boyatzis, 1998). In this iteration codes and themes were allowed to emerge out of the data (Braun and Clarke, 2006). The analysis was carried out using thematic analysis (Braun and Clarke, 2006; Fereday and Muir-Cochrane, 2006), with concept maps which are "*graphical tools for organizing and representing knowledge*" (Novak and Cañas, 2008: 1) to further enhance understanding.

[1] In this research the terms 'applications' and 'services' are interchangeable. The terminology 'application' started to be term used after 2007 and the widespread adoption of the smartphone. However, for mobile data an 'application' is a computer 'program' which is runs across 'the internet' and provides a specific data 'service'.

1.6.6.3 Phase 2: Quantitative Research

This phase consisted of a quantitative survey of 400 participants using a questionnaire which was based on the theoretical model proposed after Phase 1. The results of the survey were analysed with descriptive and inferential statistics while the validity of the theoretical framework was tested with Statistical Equation Modelling (SEM).

Table: 1-1: Overview of 2 Phases of Overall Research Design

Phase	Action	Type of Research	Methodology	Instrument	Input	Output
1	Determination of Key Market Drivers and Adoption of Theoretical Model	Qualitative	• 8-10 Semi-structured interviews with key market players	• Face to face interviews with specific individuals or groups of individuals • Use of a mixture of predetermined and emerging codes • Atlas.ti software	Literature	• List of key drivers as well as moderating factors • Development of model to test in Phase 2
2	• Testing of Theoretical model to test strengths and interactions • Development of the Final Predictive Model	Quantitative	• Survey of customers based on the Theoretical Model to determine key drivers and weightings • Inferential and predictive statistical analysis	• Face to Face survey on a random sample of mobile data users • SPSS Statistical software	• Literature • List of key drivers and Theoretical Model determined in Phase 1	• List of key drivers and weightings per segment • Segmented Predictive model for Telecom products

1.6.7 Assessing and demonstrating the quality and rigour of the proposed research design

'Reliability' is defined as the "*extent to which the data collection technique or techniques will yield consistent findings, similar observations would be made or conclusions reached by other researchers or there is transparency in how sense was made from the raw data*" (Saunders, *et al*., 2009: 600), while 'Validity' is defined as "*the extent to which the data collection method accurately measures what it was intended to measure"* (Saunders, *et al.*, 2009: 603). Nyika (No date) indicates that reliability and validity must be incorporated into each of the phases of research separately. Zohrabi (2013) agrees but also indicates that while the different phases are dealt with separately and are the main source of reliability and validity in the whole research, reliability and validity must also be examined at a complete research level. In this section reliability, validity and rigour of the complete research project will be examined, while they will also be discussed in the research methodologies of the individual phases.

1.6.7.1 Reliability

Torrance (2012) indicates that the core justification for choosing mixed methods research is that it gives the concept of triangulation and the reliability this imparts to the research. Denzin (1970 and 1978) indicates that there were four essential aspects of triangulation. They are 1) 'triangulation of data'—different data sources, accessed over different times; 2) 'triangulation of investigators'—the use of more than one investigator; 3) 'triangulation of method'—the use of different methods, observation, interview, survey, and so on, and 4) 'triangulation of theory'—the use of different theoretical perspectives on the data in order to generate different interpretive accounts.

This overall research design used all four of the aspects. 'Triangulation of Data' was achieved by using data from both interviews and surveys and the two phases were carried out nearly nine months apart. 'Triangulation of Investigators' was achieved by the researcher conducting the interviews in person while the surveys were carried out by a separate team of field workers, while 'Triangulation of Method' was achieved by using both interviews and survey instruments. 'Triangulation of Theory' was used in the interview phase where different theories, thematic analysis and concept mapping were used to determine the key drivers of adoption.

1.6.7.2 Validity

Onwuegbuzie and Johnson (2006) developed a parallel nomenclature for validity in mixed methods research naming it 'Legitimation'. They proposed nine different types of legitimation, namely: Sample Integration; Inside-Outside; Weakness Minimisation; Sequential; Conversion; Paradigmatic Mixing; Commensurability; Multiple Validities; and Political legitimation (Onwuegbuzie and Johnson, 2006).

'Sample Integration', which is "*the extent to which the relationship between quantitative and qualitative sampling designs yields quality meta-inferences*" (Onwuegbuzie and Johnson, 2006: 57) was upheld in that although the participants in the interviews were a specially selected group they were still a sub-section of the greater population which was mobile data telecommunications users.

'Weakness Minimisation' which is defined as "*the extent to which the weakness from one approach is compensated by the strengths from the other approach*" (Onwuegbuzie and Johnson, 2006: 57), was mitigated in that the weakness of the qualitative research which was in the choice of the framework constructs was compensated for in the survey which gave a strong response to those constructs as factors of adoption and moderating factors.

The design of the research was sequential so the legitimation referred to as ‘Sequential’ and defined as “*the extent to which one has minimised the potential wherein the meta-inferences could be affected by reversing the sequence of the qualitative and quantitative phases*” (Onwuegbuzie and Johnson, 2006: 57) must be taken into account. The strong positive response to the pilot phase of 30 questionnaires indicated that the choice of constructs was correct. A strong negative reaction after the pilot phase would have indicated that the framework was incorrect and changes in it were required. In this way the sequential legitimisation was adhered to.

By the choice of the extended methodological perspective as defined in section 1.6.2 the ‘Paradigmatic mixing legitimisation’ defined as “*the extent to which the researcher’s epistemological, ontological, axiological, methodological and rhetorical beliefs that underlie the quantitative and qualitative approaches are successfully (a) combined or (b) blended into a usable package*”, (Onwuegbuzie and Johnson, 2006: 57) was adhered to.

1.6.7.3 Rigour

The rigour was tested for this study by using the correct sampling strategy when selecting the samples. By using a purposive sampling method in Phase 1, the qualitative research, the best sample was selected because some of the most knowledgeable persons in the field were interviewed. In Phase 2, the quantitative research, the sample was a convenience sample chosen from the population of mobile data users that reside in four metropolitan municipalities in South Africa. This gave a population of 15.9 million people from which to choose the sample. The sample was also selected to be as diverse as possible in terms of the demographic factors of location, age, gender and ethnicity which were to be evaluated as possible moderating factors in the analysis. Additionally, the sample was large enough to give statistically significant results with a margin of error (confidence level) less than 5% within this limited set of parameters. The other way the rigour in this study was demonstrated was the correct application of both qualitative and quantitative analysis.

1.6.8 Researcher bias

According to Leedy and Ormrod (2010: 208), "*bias can be defined as any influence, condition, or set of conditions that singly or together distort data*". The researcher employed self-awareness and a monitoring approach towards the data as the analysis of the data, especially the qualitative data, could have been prone to manipulation by various influences. It was important to eliminate any bias within a research study, as without acknowledging it could appear in the critical areas of research, it may have given rise to questions on the quality of the research study and as a result may have put the study in dispute.

In Phase 1 the researcher attempted to remove all forms of bias by deliberately not becoming actively involved in the discussions and steering the interview towards drivers and segmentations that the researcher felt were valid. The researcher may also have added bias to the study by the choice of codes in the qualitative analysis. However, the method of using both pre-determined and emergent codes as well as two analysis techniques (thematic analysis and concept mapping) and cross checking results with some of the participants were methods employed to mitigate any bias that may have been present.

1.6.9 Research ethics

According to Saunders, *et al*. (2009: 600), "*research ethics is the appropriateness of the researcher's behaviour in relation to the rights of those who become the subject of a research project, or who are affected by it.*"

In order to ensure that this research adhered to all the ethical considerations required by the University of South Africa, School of Business Leadership the following actions were undertaken by the researcher.

1.6.9.1 School of Business Leadership Approval

The research was carried out under the auspices of the University of South Africa, School of Business Leadership who appointed a supervisor to oversee all stages of the research and to be final approval.

Additionally, the research was presented at three key stages to a colloquium comprising of a selected panel of senior staff members of the Business School and approval was obtained. Approval was obtained at completion of the following stages of the research; 1) the Proposal stage (approved in March 2013); 2) the Literature Survey and Methodology stage (approved July 2014) and; 3) the Results stage (approved January 2018).

1.6.9.2 School of Business Leadership Ethics Committee

Before the research was put to the field it obtained ethical clearance from the School of Business Leadership Ethics Committee. Clearance for Phase 1 was obtained in May 2016 and for Phase 2 in July 2017. See Appendix 1 for copies of Ethic clearances.

1.6.10 Protection from harm and risk

The researcher took all precautionary measures to ensure that the participants or their organisations were not exposed to any undue physical or business risk by ensuring no unedited data was released and that participants were shown the results prior to release.

1.6.11 Informed consent (voluntary participation)

Participation was strictly voluntary and if at any stage the participant had feelings of discomfort or the need to retract, they had the full right to not participate any further. All participants in Phase 1 signed their consent on the request letter (see Appendix 2 for the letter). Additionally, two weeks prior to the interviews a discussion document was sent to the participants with an outline of what would be discussed (see Appendix 3 for the discussion outline).

All participants in Phase 2 were asked if they were willing to participate in the survey and were asked to sign that they were willing to participate. A copy of the questionnaire can be found in Appendix 4.

1.6.12 Right to privacy

Any research study should respect the participant partaking in the process. This respect covers the individual's right to privacy. All participation was strictly confidential and participants had the right to withdraw at any time.

1.6.13 Data Security

All data collected is the property of the University of South Africa, School of Business Leadership and the researcher. The researcher also undertook the responsibility to keep a record of all the data collected for a minimum period of 5 years. The data was kept in a digital format in a locked cabinet.

All persons who participated in the collection, transcribing and analysis of the data signed a Non-Disclosure agreement, either individually or via the company which employed them to carry out the research.

1.6.14 Conclusion of Overall Research Design and Methodology

As highlighted previously the key research parameters and methodologies that influence the research as a whole have been described in the previous sections but they can be summarised as follows:

The overall strategy of inquiry for the research was a mixed methods methodology using ‘sequential timing’ with the ‘quantitative research having the greater weighting’ and the ‘mixing’ occurring in a ‘connected’ manner between the two phases.

However, as the methodology and requirements for qualitative and quantitative research are very different these topics will be discussed separately. The methodology and requirements for Phase 1, which was qualitative research, are discussed in Chapter 3. The methodology and requirements for Phase 2, which was quantitative research, are discussed in Chapter 5.

1.7 SCOPE, ASSUMPTIONS AND LIMITATIONS OF THIS RESEARCH

The next section will outline the scope of this research, the assumptions which were made and the limitations of this research and its design.

1.7.1 Scope of the Research

The aim of this research was to develop a framework that determines the adoption of mobile data services in metropolitan South Africa. It examined the factors given in literature and those identified as important by the telecommunications experts in Phase 1 of the research. It also examined the factors that moderate or mediate the adoption of data services but did not attempt to determine why they acted in that manner.

The research focused on the individual and their interaction with mobile data services as opposed to group behaviour.

This research was concerned with current users of mobile data services. In doing this approximately 50% of mobile subscribers were excluded. At the end of March 2017, Vodacom had 37 131 million subscribers of which 19.5 million, or 52.5%, were active data users. The 19.5 million data users spend ZAR20.696 billion on data, meaning each data user spends on average ZAR88 per month on data against a total average monthly spend of all subscribers of ZA110 (Vodacom, 2017). This relatively high spend in data in comparison to total mobile telecommunications spend means the 50% of subscribers which are excluded are most likely to be the poorer segments of the economy namely those residing in Living Standards Measures (LSM) Groups 1 to 5. Also, with the geographical coverage of high speed data being only around 80%, the segment of the population covered which does not have coverage, is in the rural low population density areas. Therefore, by choosing to sample mobile data users in the metropolitan areas the research will cover the sample of the population which has higher incomes and a higher spend on mobile telecommunications.

1.7.2 Assumptions

The key assumptions in this research are that using attitudes and usage decisions on two data services, namely data based voice services and WiFi Hotspots, will give data that is representative of mobile data services usage as a whole. Additionally, although sampling was only conducted in four metropolitan municipalities it would be applicable to all urban areas of South Africa.

1.7.3 Limitations

As explained above this research will not cover the poorer rural segments of the population. The General Household Survey of Statistics South Africa (2012) indicates that this rural segment is likely to be poorest, least educated and with the most basic of lifestyles which do not include the use of mobile data services. Additionally, the lack of mobile data coverage in these areas limits its applicability to those areas.

The research was cross-sectional and conducted on the users of mobile data services who reside in the metropolitan areas of South and thus may not be valid outside of this region.

This study only covers mobile data services delivered by Mobile Network Service Providers and those suppliers which offer services across this medium in a seamless fashion. Hence, it includes suppliers such as mobile Value Added Service Providers (VAS) and mobile Internet Service Providers (ISP's), but it excludes all fixed telecommunications services, broadcast and media services.

1.8 POTENTIAL CONTRIBUTIONS FROM THIS RESEARCH

This research will add to the current body of research into the Technology Adoption Frameworks and determine the factors which drive the adoption of mobile data services in a South African urban context. It will also highlight the key factors which moderate and mediate the adoption of mobile data services in South Africa.

On a practical side it can be a guide to mobile service providers to help them design and promote mobile data products, so that the products can become more attractive to subscribers and increase usage and ultimately increase revenues.

There is a big push from the South African Government to increase the data services with the Broadband Policy (South Africa, 2013a) and this framework may assist in the design and implementation of this policy by making available products and services which would be more desirable to new users. It will also assist policy makers in the allocation of limited resources such as spectrum so that they can have the greatest impact.

1.9 OUTLINE OF THE RESEARCH

The literature regarding the mobile telecommunications market, the frameworks used to explain or predict adoption of mobile services and a scan of the current state of research into the adoption of mobile services are given in Chapter 2. Chapter 2 leads into both Chapter 3 and Chapter 5. Phase 1 is covered in Chapters 3 and 4 and is the qualitative analysis that leads into the development of the theoretical framework. Chapter 4 leads into Chapter 5 and Chapter 7.

Phase 2, which is the quantitative analysis phase, is covered in Chapters 5 and 6. The conclusions, discussions and recommendations of both phases as well as the combined result are given in Chapter 7.

The following gives an overview of each chapter in more detail:

Chapter 1: Provides an overview of the thesis and the overall methodology for the research.

Chapter 2: Is the literature review that underlies the research, and it has four separate aims. These are:

1. To highlight the development of the mobile telecommunications industry as a whole and give an overview of the current status of the market in South Africa, the key factors affecting the market and the South Africa market in relation to the rest of the world.
2. To obtain an overview of all the different frameworks that have been used to try and forecast or explain the adoption of ICT services in general and mobile services in particular and examine how they have developed over time.
3. To understand the way and to what extent factors identified affect the adoption of mobile and other ICT services.
4. To carry out a high level scan of the research being carried out from 1st March 2017 to the 28th February 2018 on the adoption of mobile services.

Chapter 3: Is the first part of Phase 1 and covers the methodology and execution thereof in the qualitative analysis. It covers the interviews with the experts and the analysis of the data obtained from them.

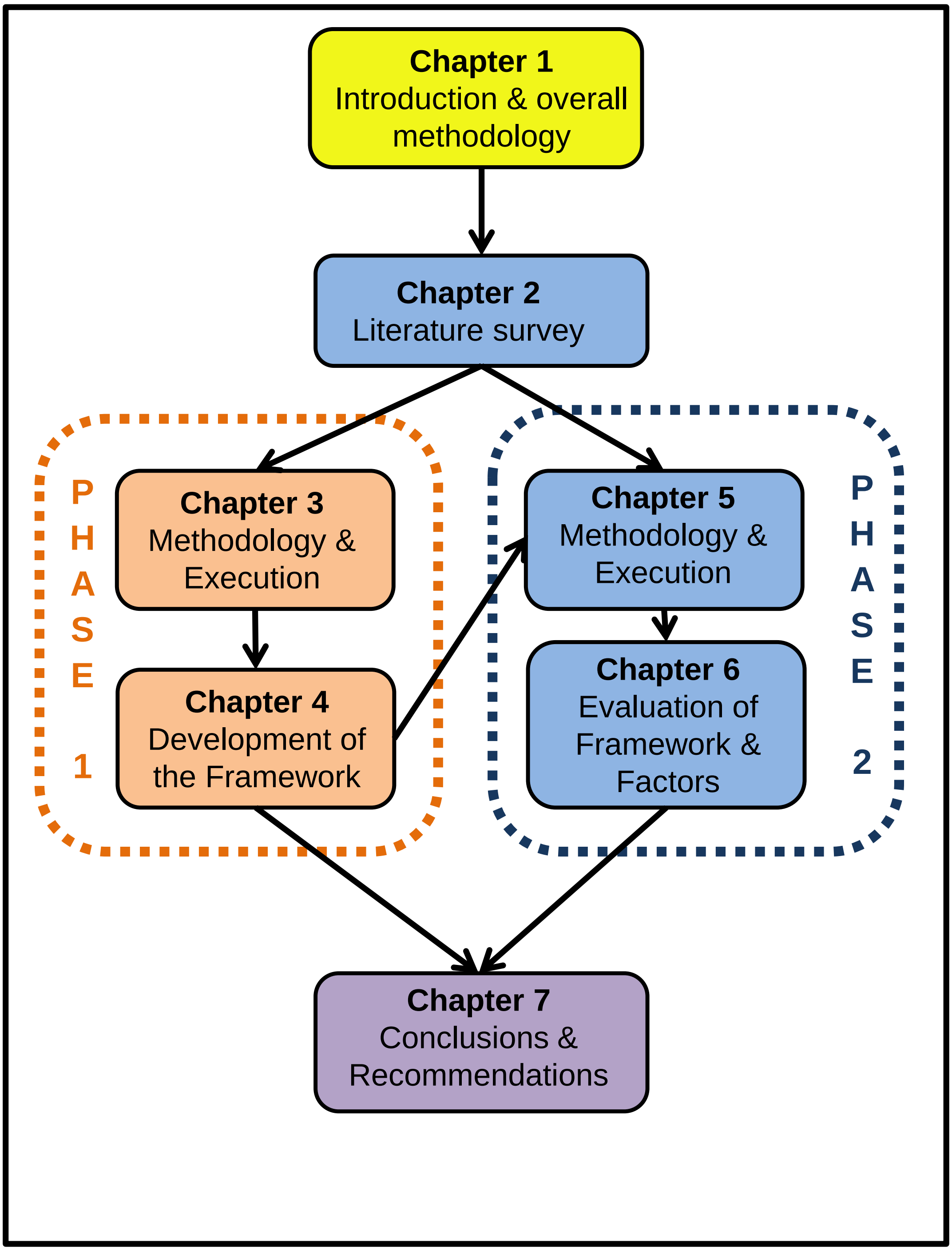
Chapter 4: Is the second part of Phase 1 and it evaluates the themes developed and uses them to develop a theoretical framework for evaluating in the next phase.

Chapter 5: Is the first part of Phase 2. It covers the methodology used in this phase and it describes the development of the questionnaire and the execution of Phase 2.

Chapter 6: Is the second part of Phase 2. In this chapter the analyses are conducted, the framework is evaluated and the moderating and mediating factors are identified. It then conducts a further analysis into the usage of mobile data services in the four metropolitan areas.

Chapter 7: Discusses the results obtained and draws up the conclusions. It also takes some of the results obtained and uses them to hypothesise explanations for some of the puzzling aspects of mobile adoption in South Africa. It concludes with contributions of this research to the universal body of knowledge, reflections on the results, as well as a discussion of the future research that can build on these findings.

Figure: 1-4: An overview of the research design



CHAPTER TWO

LITERATURE REVIEW

The focus of this chapter is examine the development of mobile communications globally and in South Africa, to examine the prior research that has taken place with regard to the adoption of mobile services and the frameworks used to explain the adoption of mobile services. It concludes with a scan of the recent research which has been conducted regarding these topics.

2.1 INTRODUCTION TO THE LITERATURE REVIEW

To develop a framework regarding the adoption of services in a market, entails examining the many factors which can have an effect on the adoption of a particular mobile service. This chapter consists of four sections.

The literature review was conducted with the following four aims in mind. The first aim was to define the mobile telecommunications industry, highlight the development of the industry and elaborate on its evolution from a technology developed exclusively for voice transmission to a technology designed to carry large amounts of data at high bandwidths and with voice transmission now a data application. It also gives an overview of the current status of the mobile telecommunications market in South Africa, key factors affecting the market and the South African market in relation to the rest of the world.

The second aim was to develop an overview of all the different frameworks that have been used to try and forecast or explain the adoption of ICT services in general and mobile services in particular. It also highlights the development of the frameworks as their focus changes from explaining the adoption of a business orientated technology to that of the individual based technology. An additional benefit of this section is that it highlights all the possible factors which have been recognised in affecting the adoption of ICT services.

The third aim is to understand the way and to what extent factors identified in the second part of the review affect the adoption of mobile and other ICT services. It also identifies which factors would possibly affect the adoption in South Africa.

The fourth and final aim was to carry out a high level scan of the research regarding to the adoption of mobile services, which was published between March 2017 and February 2018, and to scan for any trends or clues which indicate where the research is heading.

2.2 THE TELECOMMUNICATIONS SECTOR

This section will commence by defining what is meant by a telecommunications sector and the different sub-sectors that constitute the sector. It will then define what is meant by the mobile telecommunications sub-sector and provide an overview of the development of this sub-sector.

2.2.1 What is the telecommunications sector

The Organisation for Economic Co-operation and Development (OECD) defines the Information and Communications Technology (ICT) industry as "*The production (goods and services) of a candidate industry [that] must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display*" (Organisation for Economic Co-Operation and Development, 2007). It then lists 5 separate sectors in the services market, namely; Software Publishing; Telecommunications; Computer programming, Consultancy and related activities; Data processing, Hosting and related activities and Web portals; Repair of computers and communication equipment (Organisation for Economic Co-Operation and Development, 2007a). The OECD further breaks the Telecommunications sector down into 4 sub-sectors with the four ISIC codes, namely:

Code 6110 Wired Telecommunications Activities

Code 6120 Wireless Telecommunication Activities

Code 6130 Satellite Telecommunication Activities

Code 6190 Other Telecommunication Activities (Organisation for Economic Co-Operation and Development, 2007)

Newton's Telecom Dictionary (Newton, 1997: 640), defines 'telecommunications' as "*the art and science of 'communicating' over a distance by telephone, telegraph and radio*." So the telecommunications sector is the subsector of the ICT industry involved with the actual transmitting and receiving of electronic information. The three basic transmission methods are wired (copper, fibre optic and powerline), wireless (mobile, microwave, WiFi) and satellite. The types of products transmitted are, voice, data, internet, image, video, fax and music to name just a few (Gartner, 2014). This research will concentrate on the wireless communication sub-sector, specifically data services offered on a mobile communications network.

2.2.2 What are Cellular Mobile Telecommunications?

A cellular network is a radio network consisting of numerous individual cells distributed over a large area with a fixed radio receiver/ transceiver in each cell and together these cells provide radio coverage over a large area. The network uses small portable devices such as mobile phones, and is able to maintain communication even if the equipment is moving through and across different cells during transmission (Shepard, 2005; Ghetie, 2009).

According to Shepard (2005) there are four key design principles that make the cellular mobile networks different from other wireless networks and permit these networks to handle the large amount of subscribers that currently reside on them. These principles are;

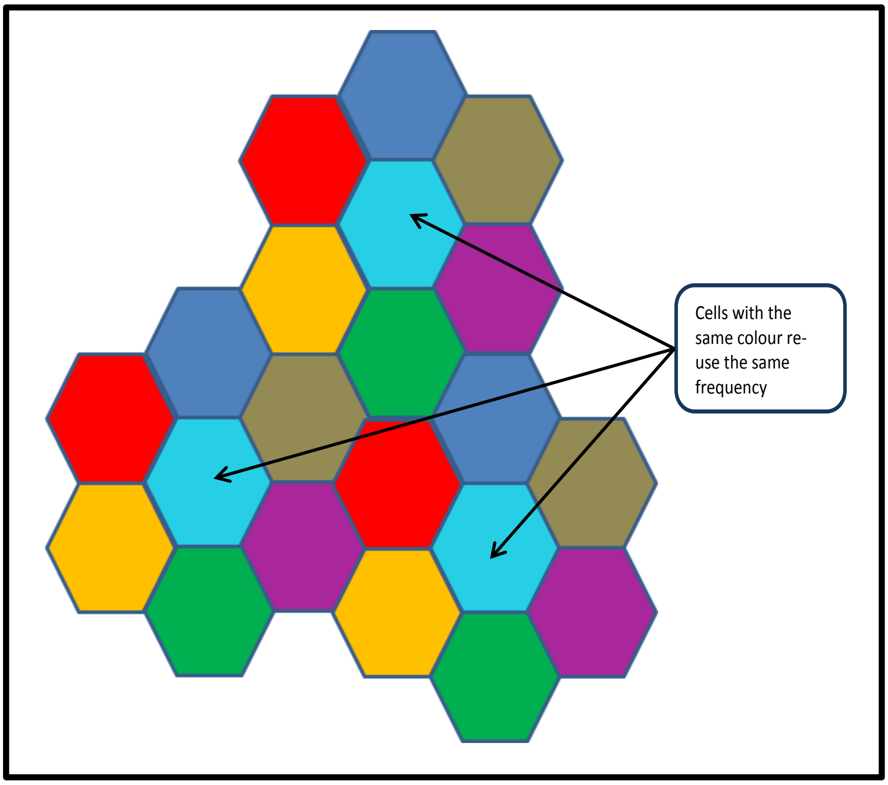
Cellular structure:

The network is designed in a honeycomb of hexagonal cells with a low power radio transmitter and receiver within each cell allowing the network to handle many more simultaneous calls than a single monolithic transmitter (Shepard, 2005). Figure: 2-1 shows an illustration of the concept of the honeycomb structure.

Frequency re-use:

This is a very important concept as there are only a limited number of frequencies available for use in radio networks so the more often a frequency can be re-used, the greater the number of simultaneous conversations on that same frequency can be handled by the network. The problem with using the same frequency for simultaneous calls is that the calls will interfere with each other if they are too close so by keeping the power down and having at least one other cell between cells using the same frequency, frequencies can be reused.

Figure: 2-1: Cellular Network showing the honeycomb shape and re-usability of frequencies



(Source: Ghosh, 2017)

Cell-splitting and Cell-sectoring:

When a cell becomes congested on a regular basis, that is all available frequencies are utilised, there are two options available to increase the capacity of the cell, cell-splitting and cell sectoring (Ghosh, 2017). Cell-splitting is when a second or more transmitters, operating on a different frequency to the original, are placed in the cell and the cell is split into two or more cells increasing the capacity the cell. In cell-sectoring, the cell is either split into three or six equal sectors and each of these sectors has its own transmitters and frequencies, thereby increasing the number of calls that can be handled in relation to the additional number of sectors that are added (Shepard, 2005; Ghosh, 2017).

Hand-offs between cells:

This is the unique part of the network that makes it mobile. In all wireless networks the user logs on to the transmitter in a particular cell, and in fixed wireless networks the user must log off and log onto the new transmitter if they change cells, while in mobile networks the user is seamlessly handed over to the transmitter in the new cell if they move cells without the user being aware of the change (Ericsson Telecom and Telia, 1998; Shepard, 2005; Clark, 2012; Ghosh, 2017).

There are two other principles, which although are not unique to mobile networks, that make mobile networks as effective as they are in handling the large amounts of traffic. The first is that mobile networks employ a full duplex telephony system (duplex telephony means that different frequencies are used for the out-going and incoming signals) which allows the handset to receive and transmit signals simultaneously. This is what differentiates mobile telephony from radio phones (Ericsson Telecom and Telia, 1998; Shepard, 2005; Clark, 2012).

The second principle is a concept called trunking. When it is applied it means that each cell can have transmitters that operate on multiple frequencies, so many calls can be handled simultaneously by a single transmitter with each call on a different frequency and in its own channel or ‘trunk’ (Ericsson Telecom and Telia, 1998; Shepard, 2005; Clark, 2012).

These six key principles are what have led to the exponential growth in mobile communications in that they allow networks to grow seamlessly as the number of users increases while at the same time maintaining the desired Quality of Service (QoS).

2.2.3 Development of Mobile Networks

This section will look at the development of mobile networks from three angles. The first is to look at the development from a technical point of view and how these dedicated voice networks that had a small data capability, which was added on as almost an after-thought, migrated into high speed data networks that provide voice services as an application among many data services. The second will examine five developments that had a significant impact in creating this global communications market. The third will examine the development of the global mobile communications market while the development of the South African Market will be examined in section 2.2.4.

2.2.3.1 Technical Development of Mobile Networks

This first section examines the technical developments which took place to develop the mobile telecommunications market from its humble beginnings from a voice network to a high-speed data network.

2.2.3.1.1 1G: First Generation Mobile Networks

The first cellular telephone call was made between Martin Cooper, of Motorola in the United States, and Bell Laboratories in 1973 (International Telecommunications Union, 2006), and a new industry was born. The first commercial networks were radios for cars which weighed around 45Kg (Ericsson Telecom and Telia, 1998; Clark, 2012). However, in 1979, Nippon Telegraph and Telephone (NTT) launched the first mobile network in the metropolitan area of Tokyo and within five years, the NTT network had been expanded to cover the whole population of Japan (International Telecommunications Union, 2018).

In 1983 AT&T released the Advanced Mobile Phone System (AMPS)[2] system in Chicago, again a duplex analogue voice system (Tipper, no date).

2.2.3.1.2 2G: Second Generation Mobile Networks

By the middle of the 1980's there were at least 7 different cellular radio standards in existence each competing globally (Tipper, no date; Temple, 2018). In 1987 a pan-European mobile telecommunications standard that came to be known as the Global System for Mobile Communications, originally Groupe Spécial Mobile (GSM), was proposed. This standard had three revolutionary ideas, namely: the adoption of one standard internationally; the use of digital technology using of silicone chips; and the greater spectrum efficiency and its re-usability (Temple, 2018). These three ideas combined resulted in networks that were standard across numerous countries, used the same handsets, networks that could be economically expanded to take millions of subscribers without a corresponding decrease in the Quality of Service. This brought into existence the cost effective communication networks that were affordable and available to the average man in the street (Ericsson Telecom and Telia, 1998; Shepard, 2005; Clark, 2012; Ghosh, 2017; Temple, 2018).

---

[2] The AMPS system used Frequency-Division Multiple Access technology (FDMA) to separate users. FDMA is a technology that separates subscribers by allocating them different frequencies. However this technology was slow and did not use its spectrum efficiently so networks were very quickly congested and QoS became an issue (Ericsson Telecom and Telia, 1998)

The first GSM call was made in Finland on July 1, 1991 by the former Finnish Prime Minister Harri Holkeri who called Kaarina Suonio (mayor of the city of Tampere) using a network built by Telenokia and Siemens and operated by Radiolinja, a subsidiary of Elisa, the Finnish Telecommunications company (Ericsson Telecom and Telia, 1998; Temple, 2018).

The GSM system was built using a Time-division multiple access system (TDM)[3] and had a Digital Access system (handsets and base stations) while the core or switching system was a circuit switched system[4]. This meant that the network could be used for low speed data transmission, with the first Short Message (SMS) a data service, being sent in 1992 (Temple, 2018). However, the growth in personal PC's and the beginnings of the roll out of the World Wide Web brought about a requirement for data on the network and the GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution, or EGPRS) data systems were created (Ericsson Telecom and Telia, 1998; Temple, 2018).

2.2.3.1.3 3G: Third Generation Mobile Networks

The need for a European wide high speed network based on fibre optical networks with a mobile data component was envisioned by European scientists and in 1987 the RACE (Research and Development in Advanced Communications Technologies in Europe) program was set up. This resulted in the development of the 3rd Generation mobile system called the Universal Mobile Telecommunications System (UMTS) (Ericsson Telecom and Telia, 1998; Temple, 2018; International Telecommunications Union, 2018). The vision for this UMTS network is captured in Figure: 2-2. It is interesting to note at this stage that the World Wide Web had not been invented but the developers of the system not only foresaw the need for a high rate data channel to connect to computers and data centres, but they also foresaw that by 2003, 50% of phone calls would be between people and not places (Temple, 2018).

---

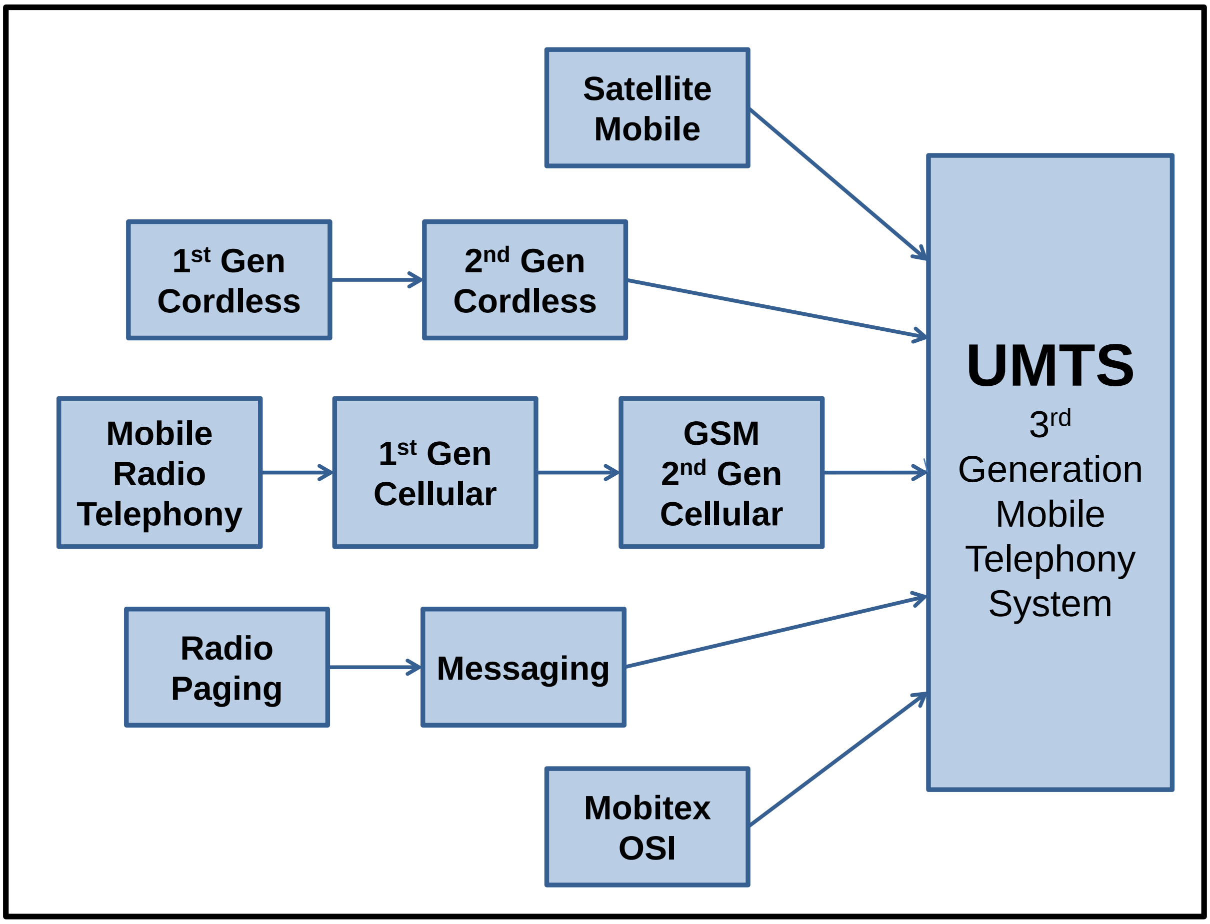
[3] This system utilises two frequency bands for a call, one for the uplink to the base station and the second for the downlink to the handset. The subscribers are then separated by the network allocating them different time slots (Ericsson Telecom and Telia, 1998).

[4] A circuit switched system is a system which was also used in fixed networks and involves connecting the two nodes, in this case two access systems, (sender and receiver), with a solid circuit type connection. Circuit switching will allow the passage of data but it is very slow and limited by the speed which the circuit can support, usually 56 kbps (Ericsson Telecom and Telia, 1998).

The network was similar in concept to the 2G networks in that it had a digital access, and a circuit switching at the core. However, the technology on the access side was changed to Wide-band Code Division Multiple Access (WDCMA)[5] (Shepard, 2008; Temple 2018).

In 2000, the technical specifications were finally accepted and came under the control of the ITU and were called IMT-2000 (International Telecommunications Union, 2018).

Figure: 2-2: UMTS Roadmap and Vision



(Source: Adapted from Temple 2018)

New technologies were rapidly developed for the data packet switching part of the network and soon High Speed Packet Access (HSPA) technologies were delivering

---

[5] WCDMA is a technology that is different from technologies such as TDMA in that it does not channelize the available bandwidth but rather allows all users to access the available spectrum simultaneously, a technique called "*spread spectrum transmission*" (Shepard, 2008; Temple 2018).

network data speeds of 7,2 Mbps, then 14,4 Mbps, 21,8 Mbps and onwards. By 2006 3G networks were delivering data rates which were comparable to those available on fixed services (Temple 2018; Clark 2012; Javed and Siddiqui, 2017), and were able to offer multimedia applications such as video and photography, as well as Value Added Services like mobile television, GPS (Global Positioning System), video calls and video conferencing (Agrawal, Patel, Mor, Dubey & Keller, 2015; Javed and Siddiqui, 2017).

Then, in 2007, Apple launched the iPhone smart phone and data requirements of networks rose exponentially and suddenly the 3G networks were inadequate (Arthur, 2012; Eadicicco, 2017; Temple, 2018).

2.2.3.1.4 4G: Fourth Generation Networks

In 2004 the International Telecommunications Union (ITU) defined the International Mobile Telecommunications-Advanced (IMT-Advanced) standard as the global standard for 4G wireless communications (Agrawal, *et al*., 2015; Javed and Siddiqui, 2017). As a result of the problems experienced with the change from 2G to 3G networks the 4th Generation was seen as an evolution of the 3G networks and was called Long Term Evolution (LTE) (Temple, 2018). The key technical change of the 4th Generation systems was to replace the circuit switched core with an Internet Protocol (IP) Packet core and the system became a totally IP based system and voice services became a data application[6] (Agrawal, *et al*., 2015; Javed and Siddiqui, 2017). The access side of the network also evolved to using a new technology called Orthogonal Frequency-Division Multiplexing (OFDM)[7] (Agrawal, *et al*., 2015; Javed and Siddiqui, 2017).

The 4G network was designed to provide very high speed connections such as 100 Mbps for outdoor environments and 1Gbps for indoor environments. Key features included high voice quality, and easily accessed internet, streaming media, video calling etc. (Agrawal, *et al*., 2015; Javed and Siddiqui, 2017). By the end of 2009

---

[6] The basic architecture of LTE contains a separate IP (Internet Protocol) connectivity layer for all the IP based services and Evolved Packet System (EPS) which handles the overall communication procedure. (Agrawal, *et al.*, 2015)

[7] OFDM allows for much greater spectral efficiency, especially when it is used in conjunction with a Multiple-Input Multiple-Output (MIMO) antenna. (Agrawal, *et al.*, 2015)

data traffic was larger than voice traffic and by the 2nd Quarter 2018 data traffic was approximately 80 times larger than voice traffic (Ericsson, 2012; Ericsson, 2018).

Table: 2-1 gives an overview of the different generations of mobile communications.

Table: 2-1: Overview of Cellular Mobile Generations

Technology & Feature	1st Generation 1G	2nd Generation 2G	3rd Generation 3G	4th Generation 4G
Start/ Deployment	1979-1990	1990-2000	2000-2010	2010-2020
Services	Analogue Cellular	Digital Voice, SMS, MMS, packet data	Integrated voice, Mobile internet Multimedia, Mobile TV GPS, Video calling	High voice quality. High speed internet, Streaming media, Video calling, WiFi integration
Standards	AMPS	GSM	IMT-2000	IMT-Advanced
Data Rates	2-56 kbps	64 kbps-2 Mbps	2 -42 Mb/s	1 Gbps
Access/ Multiplexing	FDMA	TDMA	WCDMA	OFDM
Access Frequencies	450 MHZ, 800-900 MHz	450 MHz, 900 MHz, 1800 MHz	900 MHz, 1800 MHz, 2,1 GHZ	As in 3G plus, 800 MHz, 2,6 GHz
Switching	Circuit	Circuit, Packet	Packet, Circuit	Packet
Core Network	PSTN	PSTN	Packet N/W	Internet

(Source: Ericsson Telecom and Telia, 1998; Shepard, 2005; Clark, 2012; Agrawal, et al., 2015; Javed and Siddiqui, 2017; Temple, 2018; Spectrummonitoring.com, 2019)

2.2.3.2 Five Key Market Developments

This section examines five of the key developments which were instrumental in the formation of the massive global market which exists today. These are: the development of the internet; the development of pre-paid billing; the smart phone revolution; the development of internet applications and finally the rollout of social media.

2.2.3.2.1 Development of the Internet

The internet is the engine that is driving the data explosion world-wide. It started as a way of connecting computers and data centres and giving people access to the information available on the different computers (Leiner, Cerf, Clark, Kahn, Kleinrock, Lynch, Postel, Roberts & Wolf, 2009; Abbate, 1999).

The development of the modern Internet can be traced back to the early 1960's. In 1962 J.C.R. Licklider published a series of papers discussing the concept of a 'Galactic Network' which envisioned a globally interconnected set of computers through which everyone could quickly access data and programs from any site. In 1965 Roberts, at MIT Massachusetts, and Merrill in California successfully connected two computers using a low speed circuit switched telephone line. This experiment showed Roberts that the concept of computer networking was workable but circuit switching was too slow (Leiner, *et al*, 2009; Abbate, 1999). Roberts moved to DAPRA in 1966 to develop the computer networking concept, ARPANET. By 1969 ARPANET was operational with additional computer systems being regularly added. In 1972 the first e-mail, which was to become the largest network application for the next decade, was sent across the network and with that e-mail the person-to-person traffic which was to drive the Internet came into being (Leiner, *et al.*, 1997; Abbate, 1999). Also, in 1972 Bob Kahn articulated the communications-oriented set of operating system principles on which all open-architecture networks, such as the internet, depend. These are:

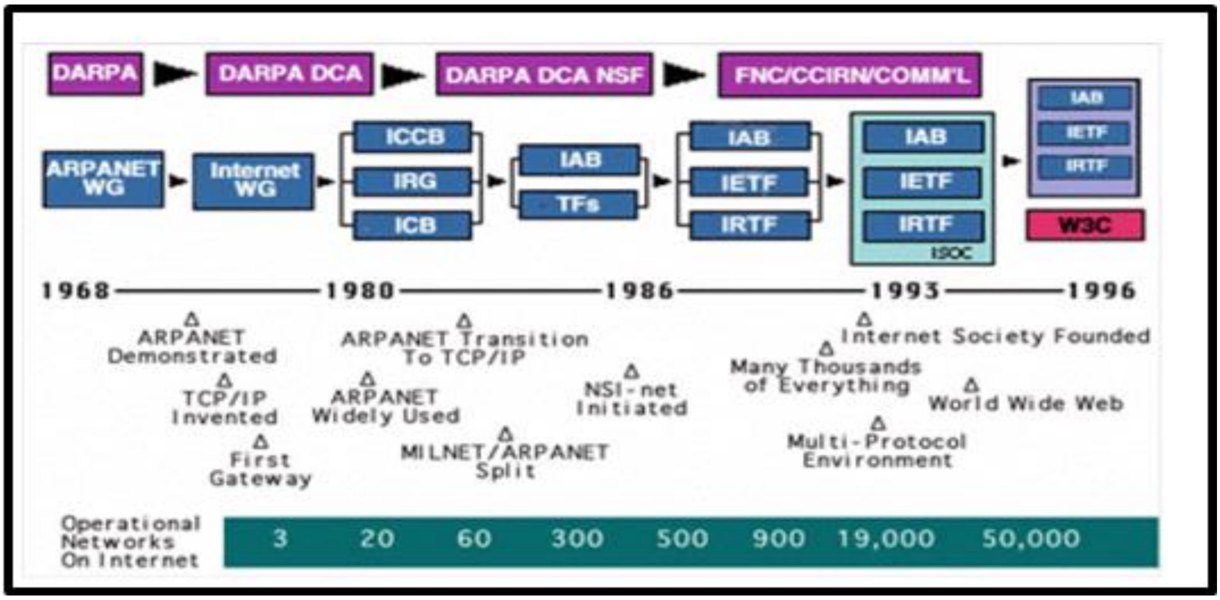
1. Each distinct network would have to stand on its own.
2. Communications would be on a best effort basis. If a packet didn't make it to the final destination, it would shortly be retransmitted from the source.
3. Gateways and routers would be used to connect the networks. There would be no information retained by the gateways about the individual flows of packets passing through them.
4. There would be no global control at the operations level (Leiner, *et al.*, 1997; Abbate, 1999)

In 1973, the Transmission Control Protocol/Internet Protocol (TCP/IP), which is the protocol on which the Internet operates, was developed. By the mid 1980's the development of the Ethernet standards, which supported the formation of Local Area Networks (LAN's) and Wide Area Networks (WAN's) for personal computers were finalised and accepted by the industry (Leiner, *et al.*, 1997; Abbate, 1999).

In 1989, the final block of the Internet was put in place by Tim Berners-Lee and Robert Cailliau, at the European Organization for Nuclear Research (or CERN). They proposed the distributed hypertext system that became known as the World

Wide Web. The necessary software was developed in 1990, and crucially, CERN made the software available to everybody (International Telecommunications Union, 2018). Figure: 2-3 shows a brief timeline of the development of the Internet and the World Wide Web.

Figure: 2-3: Development of the Internet



(Source: Leiner, et al., 1997: 16)

2.2.3.2.2 Development of Pre-paid Billing

Prior to 1996 all billing was carried out in a post-paid manner. In post-paid billing once a call was made a record of the call, a Call Data Record (CDR), was created. This CDR would go to a billing engine where the cost of the call was calculated and this cost was added to the subscriber's invoice which was sent out for payment monthly (Ericsson Telecom and Telia, 1998; Shepard, 2005; Tutorialspoint, no date). This meant the CDR could be processed anytime between when the call was made and the invoice printed and alleviated the need for the CDR to be processed in real time. However, as payment was always made in arrears for the calls made, the system required any person who wished to a subscriber had to be financially vetted and be credit worthy. This severely limited the people who could subscribe to a telecommunication service (Shepard, 2005; GSM Association, 2014).

In 1996, Vodacom South Africa, invented a method of billing a call in real time. In this system as soon as a call was connected to the receiving party the system started calculating the cost of the call in real time and subtracting it from a balance of money which the call initiator had lodged with the mobile service provider (MyBroadband, 2014; Shepard, 2005; GSM Association, 2018; Tutorialspoint, no date). This innovation completely opened the market to everybody, by eliminating the key barrier to entry, that of having to have a credit history and obtaining a credit clearance. Now all a person needed to be a subscriber was have access to a mobile phone, buy a SIM card (Subscriber Identity Module)[8] for the subscriber to make a call and be billed. This SIM card would allow the subscriber to place an amount of money with the service provider and make calls until the money was exhausted and it would be reconnected once the subscriber restored the credit balance (Prokaza, 2018; Tutorialspoint, no date).

2.2.3.2.3 Introduction of Smart Phones

As mentioned in section 2.2.3.2.2 in order to be active on a mobile network all a subscriber needed was a mobile device that held the SIM card and could receive and send voice or data signals. This device was a mobile handset.

According to Ketola (2002) handsets can be divided into three types based on their capabilities. Although this classification was envisaged in 2002 before the advent of modern smartphones, tablets and other modern devices, by expanding the categories slightly they are still valid. These types are the following:

1. Basic and feature phones, these are phones that are basically designed as voice centric devices with very little additional data transmission functionality. The later models of these phones often had many additional features such as cameras, music and interactive games to mention just a few.
2. Smartphones, these are phones which are designed to supply more than just voice but also act as handheld data transmission and manipulation devices.
3. Wireless Internet Devices, these are devices which are data centric devices which are designed to be mobile computing devices.

One very important point to realise is that as networks develop and add more features, the handsets must develop along with them in order for subscribers to take advantage of the new features the network offers, this is what Wisely (2007) calls the

[8] A SIM card is a small chip card which is inserted into the subscriber's device and it has as all the necessary network information for the subscriber to make a call or initiate a data service. Network Operators equate a SIM card to a subscription.

‘generation game’. From the advent of 2G until 2007 the majority of handsets on the market were ‘feature phones’. These were phones which were built around voice as the major feature and had additional functionality such as games, colour displays, WiFi, cameras and ever increasing data functionalities added (Temple, 2018).

However, in 2007, it all changed when Apple launched the iPhone. Although this was not the world’s first smartphone it was the one that caught the world’s attention. On Tuesday 9 January 2007 Steve Jobs took to the stage in San Francisco and introduced the iPhone by saying Apple was introducing three new technology innovations, a widescreen iPod (a device to store and play music) with touch controls, a new mobile phone and a revolutionary internet communications device, and that all three were in one device, the Apple iPhone. The mobile Internet had truly been born, and functions such as pull-to-zoom allowed users to expand web pages and make them bigger and more legible on the small screen so the large screen on a PC was no longer required. Apple had designed the phone to have an operating system like a PC and hence it was an internet-connected handheld computer that ran one program at a time and happened to make phone calls as well (Arthur, 2012).

2.2.3.2.4 Introduction of Internet Applications

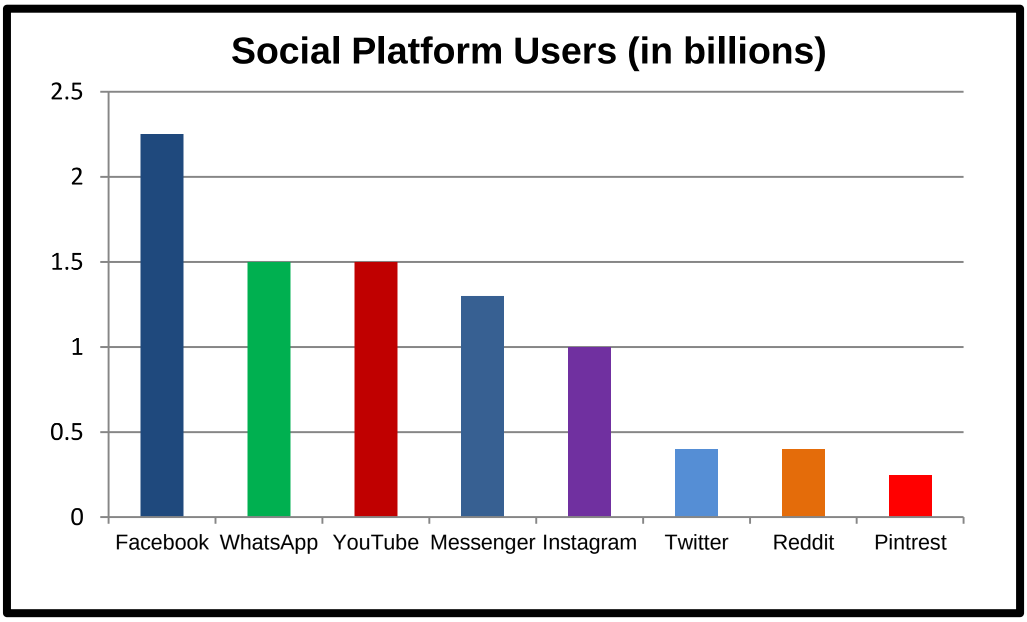
A problem Apple had was how they could expand the functionality of the iPhone with different applications developed by outside developers while keeping the operating system code secret and maintaining the security of the phone (Arthur, 2012). To do this they developed the phone with a full internet engine which allowed developers to develop the applications on the web and users would access them via their internet browser (Arthur, 2012). By doing this they changed the internet from just a source of information to the underlying platform on which the millions of applications and programs which were subsequently developed reside (Arthur, 2012).

2.2.3.2.5 Introduction of Social Media

Towards the end of the 1990’s and early 2000’s the internet started going through a change. It was going from websites where people passively viewed content on a website to one on which people could easily interact and collaborate with each other. It allowed ordinary people to easily create and share content with other users. This new internet was called Web 2.0 (Blank and Reisdorf, 2012; Konopka, 2007). It revolutionised how normal people interacted with media in that it has changed the mass society model (Rosenberg & White, 1957) that has dominated Western societies for the past 150 years into the model of personal production and distribution that has penetrated every fibre of culture today. The internet now influences human interaction on an individual and community level (Blank and Reisdorf, 2012; Van Dijck, 2013).

Web 2.0 is built on two principles: 'network effects', the idea that some things are more valuable when more people participate in them; and 'platforms' where users create simple, reliable environments where they can do what they want (Blank and Reisdorf, 2012).

Figure: 2-4: Largest Social Media platforms (June 2018)



(Source: Hutchinson, 2018)

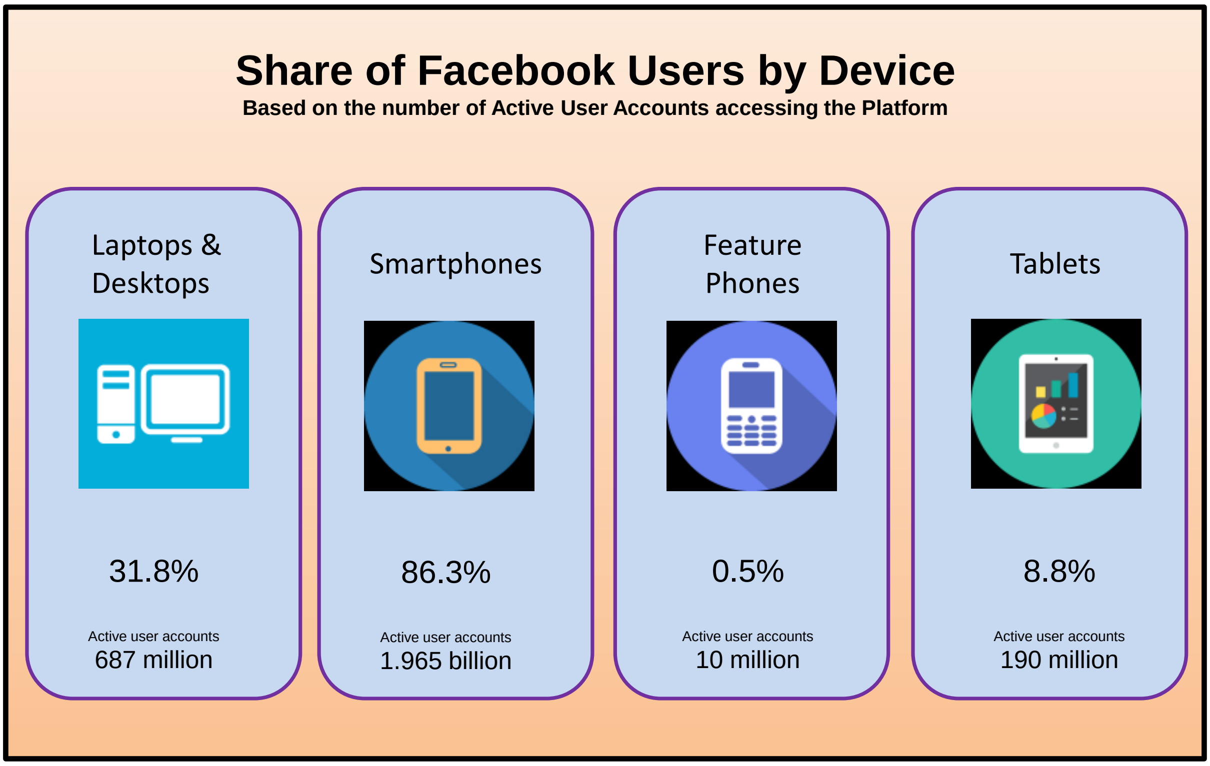
This new connectivity is called Social media and is roughly defined as "*a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content*" (Kaplan and Haenlein, 2010: 60).

From the late 1990's, initially starting with search engines such as Google, these social media platforms have slowly emerged, until they have become the giants they are today (Van Dijck, 2013). Figure: 2-4 below shows the number of users globally, as of June 2018, on the largest of the social media platforms. The largest is

Facebook which has 2.23 billion Monthly Active Users[9] and of this 66% of these or 1.74 billion users are on Facebook every day (Facebook, 2018a).

Figure: 2-5 shows the significance of the mobile smartphone and tablets to social media in that, as of January 2018, 95.1% of active Facebook account users use those devices to interact with their Facebook account (Facebook, 2018). Note the total is over 100% as some people use multiple methods.

Figure: 2-5: Global Device usage to connect with Facebook



(Source: Facebook, 2018)

2.2.3.3 Development of Global Mobile Market

The global mobile telecommunications market, which is the technology with the largest reach globally, will be examined in the following sections.

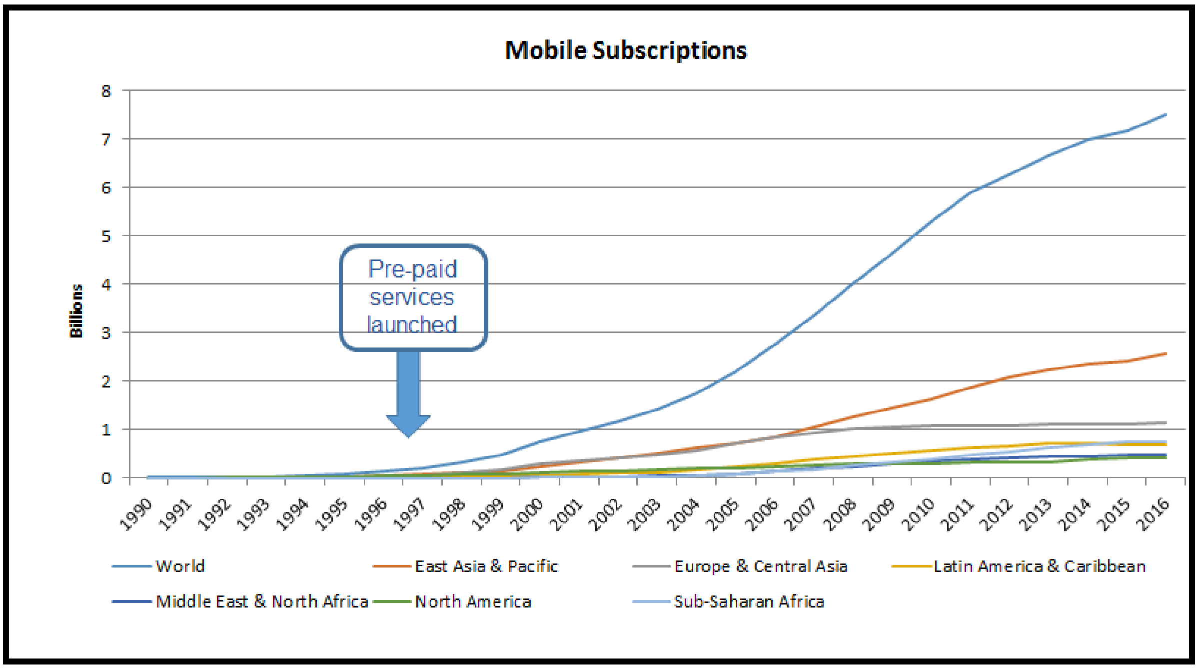
2.2.3.3.1 Subscription numbers

Figure: 2-6 shows the development of the global mobile market, in terms of the numbers of subscriptions or SIM cards, from zero in 1990 to 7.34 billion at end of 2016 (Worldbank, 2018). If this number of subscribers is compared to the world

[9] A Monthly active user is a user who uses the Facebook at least once per month.

population it means that by early 2017 there were slightly more than 100 subscriptions for every 100 people in the world (Worldbank, 2018). However, the GSM Association (GSMA) has indicated that many subscribers have more than one SIM card, especially in Sub-Saharan Africa where they estimate each subscriber has on average 1.7 SIM cards. GSMA states that the subscribers have multiple SIM cards from different mobile service providers, often through dual-SIM handsets, to make use of the best network coverage, call quality in certain locations and promotional pricings (GSM Association, 2018a). The GSMA estimated that there were 5 billion individual subscribers in 2017 which is a total penetration rate of 66% of the world's population and it will rise to 71% or 5.9 billion by 2025 (GSM Association, 2018a). This makes mobile technology the technology with the greatest reach globally (GSM Association, 2018a).

Figure: 2-6: Development of Mobile Subscriptions Regionally and Globally



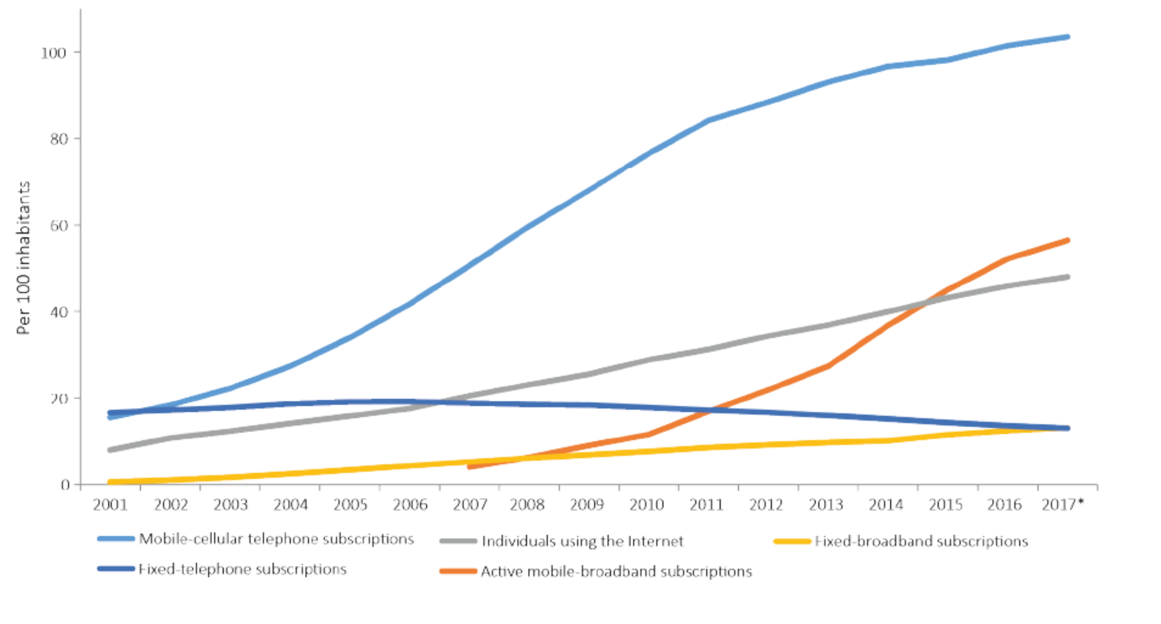
(Source: Worldbank, 2018)

One key point to notice is that the exponential growth in subscribers started around 1999 and 2000 when pre-paid subscriptions became available to the average man in the street and mobile telephony became available to all (Dewar, 2013). In all regions of the world the percentage of pre-paid subscriptions is well above 50% with Sub-Saharan Africa being the highest with pre-paid subscriptions being above 75% (International telecommunications Union, 2018).

2.2.3.3.2 Data and Mobile Internet Users

The numbers of mobile broadband users has exceeded those of fixed-line broadband users as early as 2008 within 2 years of the release of mobile broadband (International Telecommunications Union, 2018). Figure: 2-7 shows that at present the number of active mobile broadband subscribers (orange line) is nearly three times that of fixed line broadband subscriptions (yellow line) (International Telecommunications Union, 2018).

Figure: 2-7: Subscriber numbers from 2001



Notes: * ITU estimate.

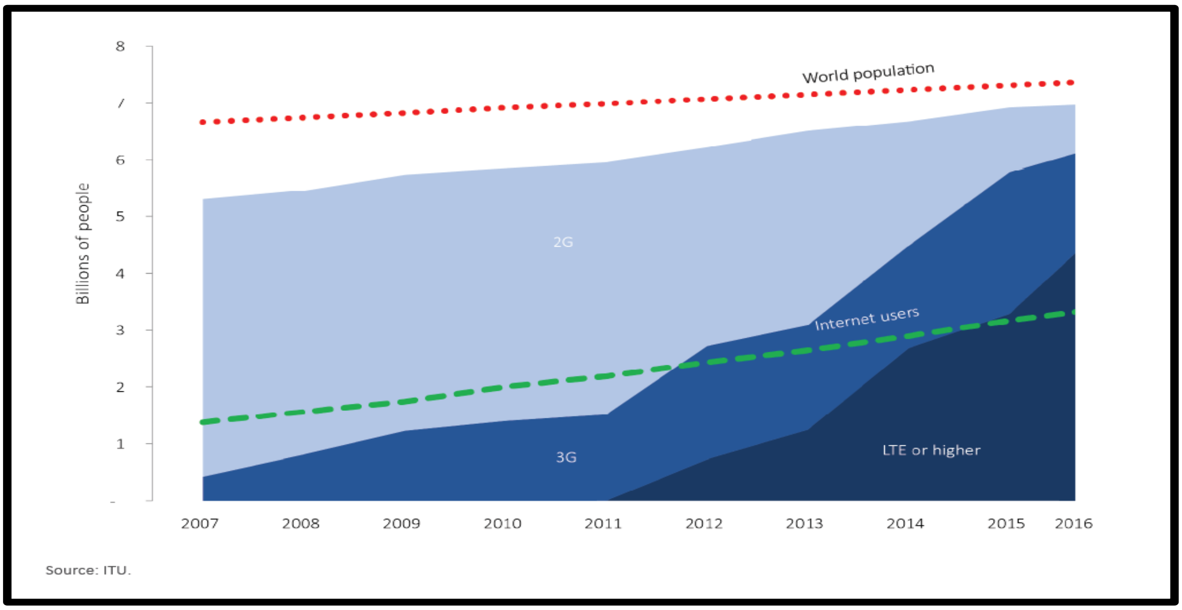
(Source: International Telecommunications Union, 2018: 3)

The GSMA indicates that the number of mobile internet users will become the basic measuring metric instead of the current ‘subscribers’ in the mobile market. They estimate that between 2017 and 2025 1.75 billion new mobile internet subscribers will be added globally giving a global total of 5 billion, meaning a penetration rate of 61% (GSM Association 2018).

2.2.3.3.3 Technology

Both the ITU and the GSMA show the move from 2G technology into the 3G and 4G technologies and the decline in 2G in line with the growth in the number of internet users (International Telecommunications Union, 2018; GSM Association, 2018a), see Figure: 2-8.

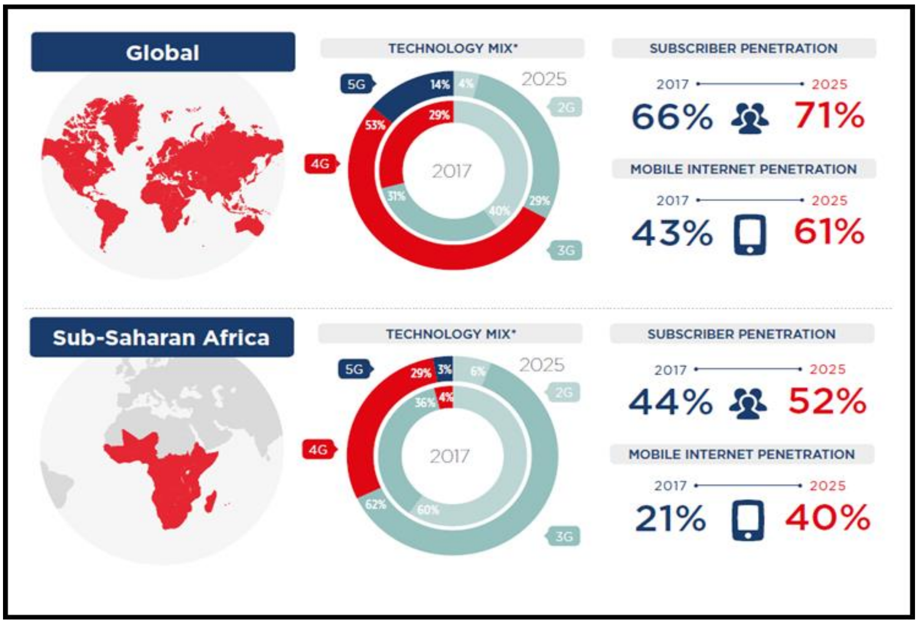
Figure: 2-8: Progression of the Usage in Various Mobile Technologies



(Source: International Telecommunications Union, 2018: 6)

The GSMA shows the trend will continue and estimates that at present 29% of subscribers are using 4G technology and by 2025 the percentage of 4G and the new 5G technology users will have risen to 67% of the total mobile internet users (GSM Association, 2018).

Figure: 2-9: Global and Sub-Saharan African Mobile Market Forecasts for 2025



(Source: GSM Association, 2018a: 8-9)

In Sub-Saharan Africa it is estimated for 2017 that only 4% of subscribers use 4G technology with 60% still using 2G technology and 36% using 3G. However, by 2025 it is estimated that the numbers using 2G will have declined to 6% and the users of 3G will have risen to 62% with only 32% using 4G and 5G technologies (International Telecommunications Union, 2018; GSM Association, 2018a), see Figure: 2-9.

2.2.4 The South African Telecommunications Market

To be able to look at market feasibility frameworks in the South African telecommunications market, the market must first be set into the context of the rest of the South African economy, and the drivers and constraints need to be highlighted.

2.2.4.1 Telecommunications overview

"*Information and Communication Technology (ICT) is at the forefront of the modern economy and has affected all facets of peoples' lives. It has transformed communication completely, with people, businesses and countries connected in a fast, seamless and continuous way. People are connected like never before and systems such as the internet, e-mail, instant messaging and mobile banking on mobile devices have meant that wherever a person is they can transact or communicate with another person or entity instantly though they may be hundreds of kilometres apart*" (South Africa, Statistics South Africa, 2017a: 5). In this regard the South African economy is no different to most other economies, with ICT being in almost every facet from telecommunications to increasing productivity in manufacturing with robots, and more efficient computer hardware and software (South Africa, Statistics South Africa 2017a; Tisdell, 1981; Leff, 1984; Antonelli, 1991; Cronin, Colleran, Herbert, & Lewitzky, 1993; Greenstein and Spiller, 1995; Lee, Levendis & Gutierrez, 2009; Horwitz and Currie, 2007). In fact economic development is increasingly being tied to the breadth and depth of digital gaps within and between nations. Countries with low digital gaps are more developed [The Developed World] than countries with high digital gaps [Developing World] (Mutula, 2007).

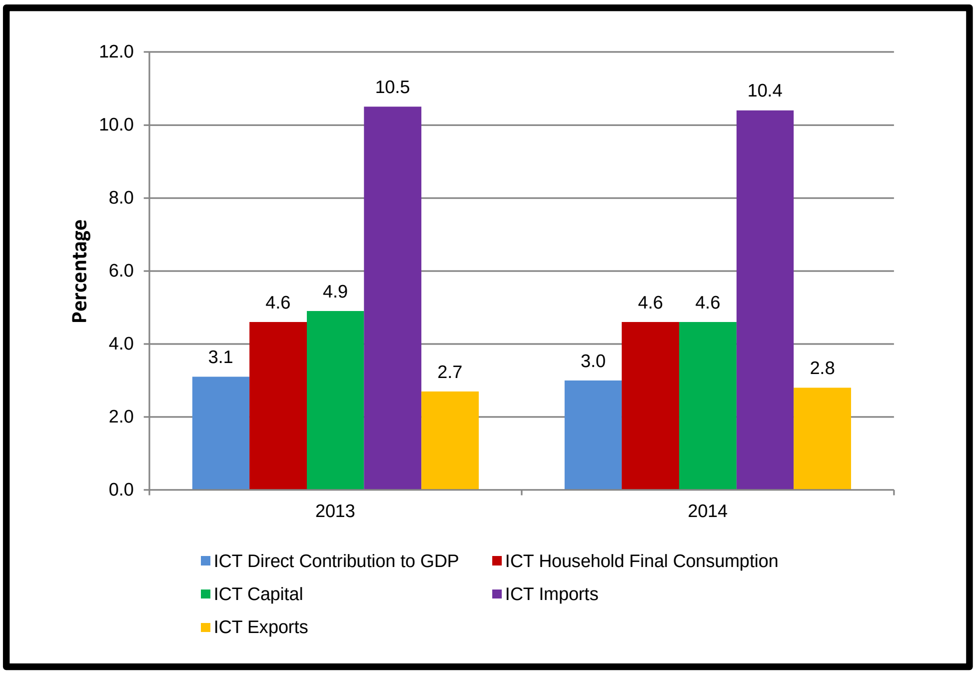
To underline the importance of Telecommunications to South Africa's development on the 31st July 2011 the Minister of Communications, Roy Padayachie, the Department of Communications and ICT industry leaders, signed an ICT Industry

Competitiveness and Job Creation Compact, that commits to 100% broadband penetration by 2020 and the creation of one million additional jobs throughout the ICT industry (MyBroadband, 2012).

2.2.4.2 Size of Total ICT Market

The first question that needs answered is how big is the South African ICT market and what is its effect on the economy. The latest statistics available are from 2014. In that year Statistics South Africa (South Africa, Statistics South Africa, 2017a) estimated that the direct contribution of the Information and Communication Technology (ICT) sector to the gross domestic product (GDP) of South Africa is 3,0% of total GDP. Figure: 2-10 highlights the sector's contribution to the South African GDP.

Figure: 2-10: ICT spend as a percentage of GDP and HFCE



(Source: Statistics South Africa, 2017a)

In 2014, the Household Final Consumption Expenditure (HCFE) on ICT products was ZAR105.714 billion, making it on average 4.6% of a total household's expenditure. The expenditure on telecommunications services was the major expenditure item (ZAR67.412 billion or 63.8% of total ICT HFCE). In addition there was a spend on telecommunications equipment of 17.4%, and on media and content of 11.5% (South Africa, Statistics South Africa, 2017a). This means that on average the 53.7 million South Africans spent about ZAR104 each on ICT communication services per month in 2014 (South Africa, Statistics South Africa, 2017a). By comparison people in New Zealand spend 2.7% of HCFE on communications, in the United Kingdom it was 3.5% and the average in the European Union was 2.5% (New Zealand, Statistics New Zealand, 2016: United Kingdom, Office of National Statistics UK, 2016; Eurostat, 2018). The latest figures from the Independent Communications Authority of South Africa (ICASA) indicates that the spend on Fixed Telecommunication services (voice and data) for the 12 month period ending 30th September 2017 was ZAR33.84 billion, while for the same period the spend on mobile services was ZAR90.7 billion, indicating that approximately 73% of the total telecommunications services (voice and data) spend was on mobile services (ICASA, 2018).

2.2.4.3 Relative sizes of Mobile Telecommunications and Fixed Line Markets

Since being launched in 1993 the mobile service providers have surpassed the fixed line service providers in both subscriptions and revenues, and have become the dominant force in the South African telecommunications market (South Africa, Statistics South Africa, 2017; BMI Research, 2017; ICASA, 2018). ICASA stated at the end of the 3rd Quarter 2017, that South Africa had 87.1 million mobile subscriptions, giving a mobile penetration rate of 154 %[10]. At the same time there were 61.8 million mobile data subscriptions or 71% of the total base (ICASA, 2018). ICASA was unable to separate the '*broadband*' or users of the high speed 3G and 4G networks against those using narrowband 2G out of this total. However, at this time the GSM Association (GSMA) estimates the number of 3G and 4G subscriptions to be 51.8 million (GSM Association Intelligence, 2018).

At the end of the 3rd Quarter 2017 the fixed line market was stated to be about 3.6 million subscribers (ICASA, 2018), a steady decline from 4.8 million subscribers in 2001 (Telkom, 2002), this despite the fact that the predominately POTS lines in 2001 were replaced by ADSL broadband lines (Telkom, 2017). The ADSL lines were in

[10] Mobile networks count the number of active Subscriber Identification Modules (SIM) cards as a subscriber. (A SIM card is the small chip card that goes into a mobile device and holds the subscriber information so they can be identified by the network). In order to keep each mobile device separate on the network every mobile device must have its own separate SIM card and corresponding number. Therefore, if a person has more than one mobile device, say a smartphone, a tablet and a PC router they would be classified as three separate subscribers. Hence, 'penetration' figures are actual devices not individual people. In the more developed economies penetration figures are often well over 200%.

turn being steadily replaced with optical fibre lines (Telkom 2002, and 2017; ICASA, 2018). As of 30th September 2017 of the 3.6 million subscribers slightly over 3 million or 84% were fixed line broadband subscriptions (ICASA, 2018).

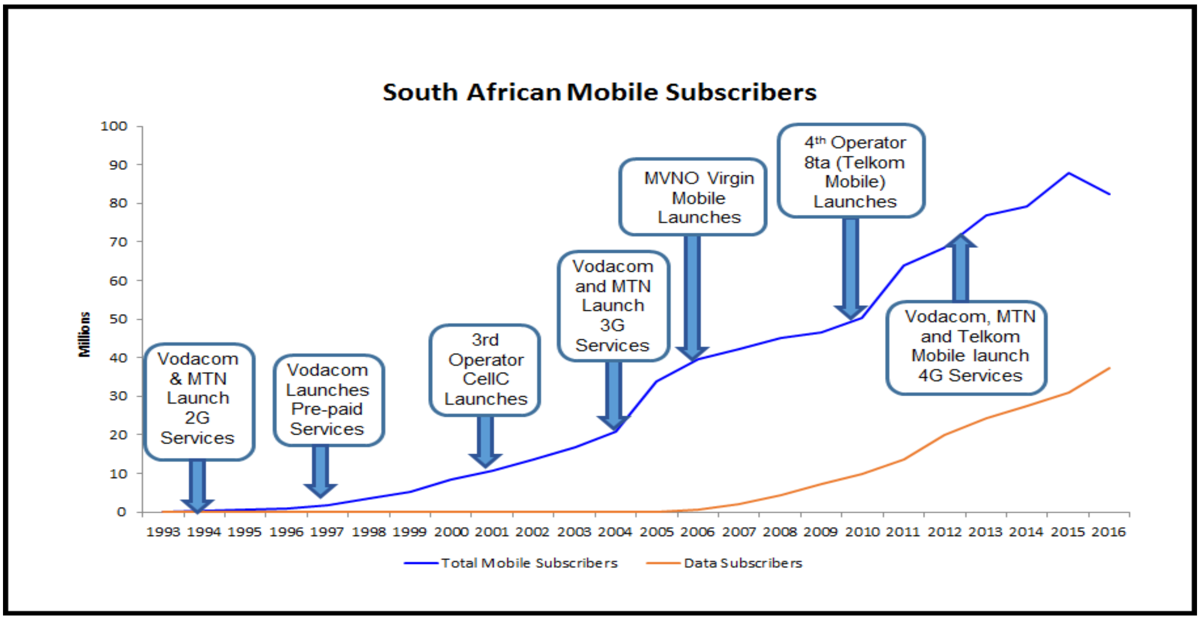
2.2.4.4 Development of the South African Mobile Market

In September 1993 the South African Government announced the awarding of two tenders to provide cellular communications in South Africa (Horwitz, 2014). The successful bidders were Vodacom, a consortium of Telkom (50%), Vodafone UK (35%) and Rembrandt (15%), and Mobile Telephone Networks (MTN), a consortium of M-Net (30%), Cable & Wireless (30%), Naftel (30%) and Transtel (10%). Both bidders proposed the use of the GSM technology (Horwitz, 2014). The initial forecasts for the size of the market were varied with Coopers & Lybrand estimating 160,000 to 220,000 subscribers by the year 2002; M-Net Communications Technologies CE Ian Wilkinson calculated a potential base of 300,000 to 500,000 subscribers and Vodacom MD Allan Knott-Craig projecting a potential cellular market size of one million subscribers over the next five years (Horwitz, 2014).

Vodacom launched their network in 1994 closely followed by MTN a month later with post-paid contracts similar to those used by the fixed line service provider Telkom. By the end of 1994 the number of subscribers had already exceeded Coopers & Lybrand's estimates as there were 340 000 subscribers (Horwitz, 2014). The number of subscribers rose rapidly, nearly doubling on a yearly basis so by the end of 1996 there were 935 000 subscribers and by the end of 1997 it had nearly doubled the highest estimation of Allan Knott-Craig's of 1 million subscribers (Horwitz, 2014). One of the key conditions of the mobile licences acquired by Vodacom and MTN was that they had targets to meet in terms of around 95% population coverage and around 80% territory coverage in 5 years (Horwitz, 2014). These targets were a key to the subsequent growth of the networks as large parts of the population already had coverage before the development of pre-paid services (BMI Research, 2004; Horwitz, 2014).

Figure: 2-11 is a time line for the development of the South African Mobile telecommunications market in terms of subscription growth and with the key events highlighted.

Figure: 2-11: Development of the South African Mobile Telecommunications Market



(Sources: BMI Research, 2004; Horowitz 2014; BMI Research, 2017; ICASA, 2018; Worldbank, 2018; International Telecommunications Union, 2018)

As discussed earlier in section 2.2.3.2.2 a key point in the development of the mobile market was the introduction of pre-paid subscriptions in 1996 (MyBroadband, 2014: Shepard, 2005; GSM Association, 2018; Vodacom, 2018a). This development opened the market to the vast majority of South Africans who could not obtain the credit clearance required to have a post-paid subscription. It is from this point forward that the number of subscribers starts it very rapid growth. A key complimentary factor to this growth was its close proximity to the abolition of apartheid and the freedom which this technology gave subscribers (MyBroadband, 2014; Vodacom, 2018a).

In 1995 Vodacom started its international expansion by building a network in Lesotho and followed this with networks in Tanzania, the Democratic Republic of the Congo and Mozambique (Vodacom, 2018a). MTN followed suit in 1997 and has subsequently become the largest African based mobile network company with operations in 21 countries in Africa and the Middle East (MTN, 2017 and 2018).

In late 2001 the third Mobile Service provider Cell C launched (BMI Research, 2004). One interesting point to notice is that the launch did not create a spike in the number of new subscriptions even though they launched with a low cost strategy (see Figure: 2-11). By the end of 1st Quarter 2004 it was estimated that Cell C had achieved a market share of around 11%, a market share that has not increased significantly since then (BMI Research, 2004 and 2017).

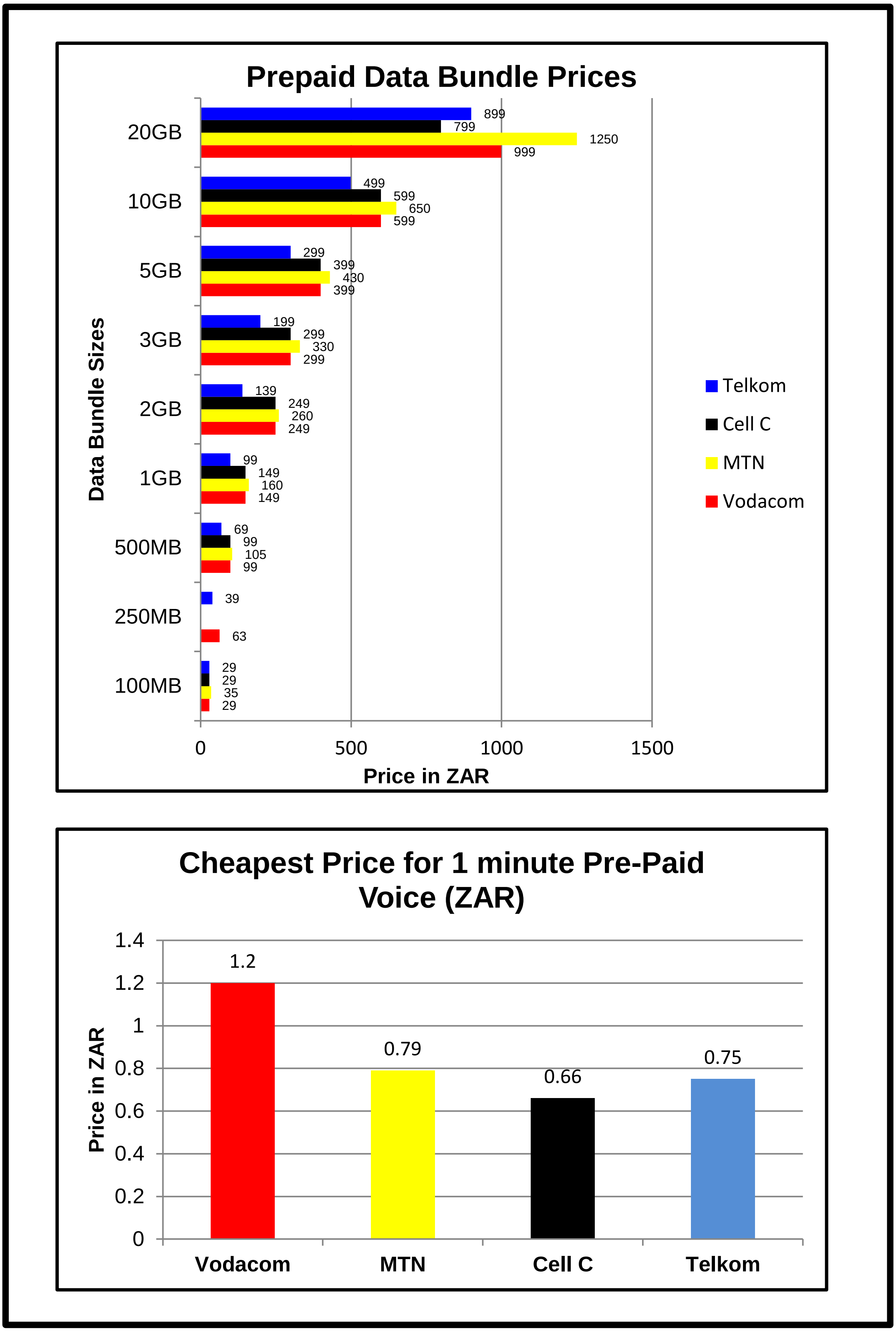
In mid 2004 both Vodacom and MTN were given test licences to start trialling 3G services (BMI Research, 2004). It is worth noting that ICASA, the Regulator kept the prices down to ZAR5 million and ZAR100,000 per megahertz of spectrum (Horwitz, 2014) having learned from the fiasco which had happened in Great Britain and Europe where in March 2000, the bidding started in the United Kingdom for the spectrum required to use the 3G licences. When it finished 150 rounds later, the total bids were close to £70 billion. The European auctions which followed were also at similar elevated levels (Shepard 2005, Temple 2018). The result of this overspend was that there was no money left to roll out the infrastructure required for the new networks and this plunged the whole European mobile industry into recession (Temple, 2018).

Vodacom and MTN launched their 3G networks in close proximity in late 2004 and early 2005 (Shapshak, 2005). The new 3G networks caused a spike in subscriber number growth, see Figure: 2-11. It also started the growth in the mobile data market (BMI Research, 2009). Prior to this point there was a small mobile data market using 2G data technologies such as EDGE and GPRS (Ericsson Telecom and Telia, 1998; Temple, 2018).

In 2006 the first Mobile Virtual Network Operator (MVNO), Virgin Mobile launched operations on the Cell C network (Virgin Mobile, 2018). A MVNO is a mobile service provider which does not own its own mobile network other than customer care and billing equipment, but uses an existing mobile service provider to supply the network infrastructure (Shepard, 2005).

In 2010 Telkom, having previously sold its 50% shareholding in Vodacom, launched its own Mobile Network, 8ta, which has subsequently been rebranded as Telkom Mobile (Telkom, 2017). Telkom launched into the mobile market space in order that it could offer a complete range of converged products to the market. However, like Cell C, Telkom came into the market with a low cost strategy, particularly for mobile data, see Figure: 2-12, but as with Cell C it has not been successful in capturing a significant market share (see section 2.2.4.6.4) (Telkom, 2017; ICASA, 2018).

Figure: 2-12: Comparison of Mobile Network Voice and Data Tariffs - July to December 2017 - as assessed by ICASA



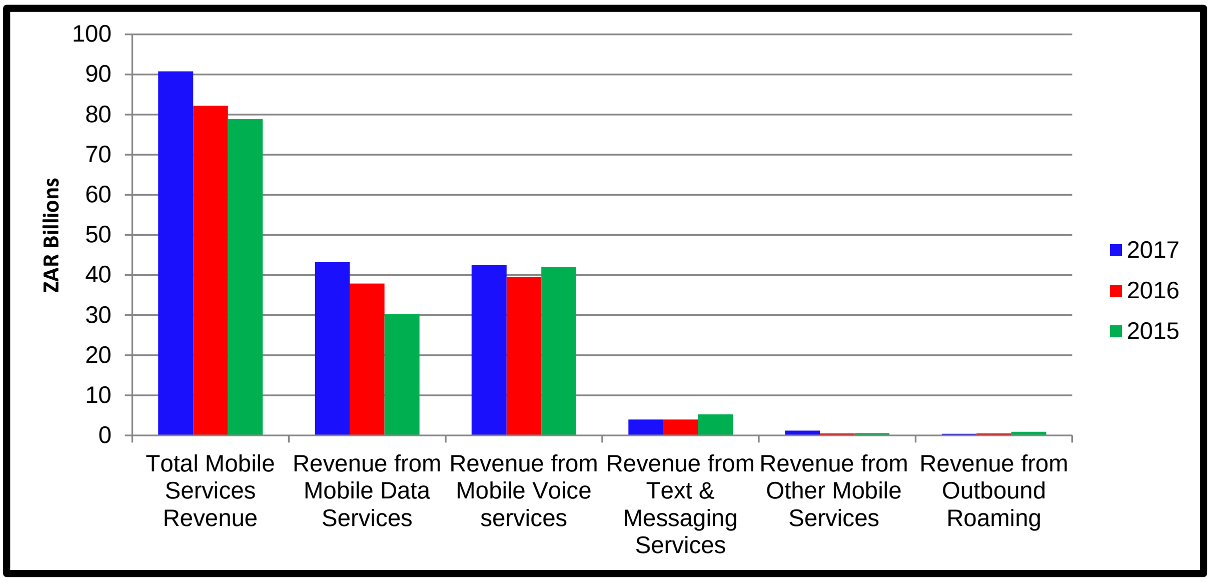
(Source: ICASA, 2018a)

In 2012 Vodacom, MTN and Telkom Mobile commenced with the rollout of high speed 4G data networks (Muller, 2012; MyBroadband, 2012a). However, these rollouts have been confined to metropolitan areas as ICASA has still not released the required spectrum in the lower 800MHz and upper 2.3GHz ranges (Mcleod, 2017).

2.2.4.5 Future Development of the South African Mobile Telecommunications Market

The mobile telecommunications market is entering a new stage of development, in that total subscription numbers of mobile users has only grown with a Compound Annual Growth Rate (CAGR) of 0.1% over the last three years for the period ending 30th September 2017, indicating that the total market has become saturated (ICASA, 2018). However, what is seen in the market is a shift from voice subscriptions to data subscriptions, with data subscriptions growing at a CAGR of 14.9% over the same three year period. For the 12 month period concluding the 30th September 2017, for the first time mobile service provider revenues for data services exceeded those of voice services (ICASA, 2018), see Figure: 2-13.

Figure: 2-13: Mobile Services Revenue for 12 months ending 30th September 2017



(Source: ICASA, 2018)

Prices of mobile services have been relatively stable over the last two years, with no increase being shown in voice tariffs between the ICASA Tariff Reports April 2015 to February 2016 to that of July to December 2017. The only decline in data tariffs was that Cell C decreased its tariffs to better mirror those of Vodacom. Figure: 2-12 shows the prices from July to December 2017 (ICASA, 2016a; ICASA, 2018; ICASA, 2018a).

The amount of data being used is expected to increase dramatically with predictions showing that mobile data is expected to grow at a CAGR of 50% per annum between 2016 and 2021, or by 8 times from 26.8 Petabytes per month to 205.8 Petabytes per month (Cisco, 2017). This is despite mobile data traffic in South Africa having increased by a CAGR of 61% between 2015 and 2017 (ICASA, 2018). Additionally, the number of Smartphones that use the high speed 3G and 4G services is increasing rapidly, with a 72.9 % growth from 24 million to 42 million between September 2016 and 2017 (ICASA, 2018). This rapid transition of subscriptions from mobile voice-centric service users to mobile data-centric users combined with the imminent arrival of the Internet of Things[11], is going to put a tremendous strain on the Mobile Service Providers networks in terms of capacity and Quality of Service (GSM Association, 2015; Erel, Arslan, Ozcevik & Canberk, 2015). It is causing major increases in operating costs as well as requiring significant amounts of capital as the service providers strive to maintain the required quality of service while providing the required bandwidth speeds (Erel, *et al*., 2015). This, combined with ICASA not releasing the required spectrum, see section 2.2.4.4, is putting significant pressure on the mobile service providers to search for new products and services to build new sources of revenue. In fact the Mobile Telecommunications Service Providers increased their Capital spend by a CAGR of 41.9% over the three year period ending September 2017 (ICASA, 2018).

2.2.4.6 Mobile Network Service Providers

There are four mobile network service providers in South Africa, as well as several Mobile Virtual Network Operators (MVNOs) (see section 2.2.4.4 for a description on MVNO's) (ICASA, 2018). The three of the MVNO's in South Africa are, Virgin Mobile, Red Bull and Rain (BMI Research, 2017). However, as the MVNO's only report revenues, and all other statistics are indistinguishable from the host network, they are generally included in the host networks' network statistics (BMI Research, 2017).

[11] The Internet of Things (IoT) is a future concept of global connectivity which will "*enable things to be connected anytime, anyplace, with anything and anyone ideally using any path/network and any service*" (Vermesan, Friess, Guillemin, Sundmaeker, Eisenhauer, Moessner, Le Gall, & Cousin, 2013).

The four mobile service providers are discussed in more detail in the following section.

2.2.4.6.1 Vodacom

Vodacom was the first mobile service provider to launch in South Africa and is the largest, with 40 million subscriptions and a 42.1% market share as of September 2017 (Vodacom, 2017a). Vodacom is part of the Vodafone PLC group and has management responsibility for the Vodafone networks in Kenya (Safaricom), Vodacom Tanzania, Vodacom Mozambique, Vodacom DRC, and Vodacom Lesotho. Vodacom operates 2G, 3G and 4G networks in South Africa (Vodacom, 2017).

Vodacom South Africa had 19.9 million data subscriptions at the end of September 2017 each using an average of 776MB of data per month. As a result of this, for the six months ending September 2017, data revenues were ZAR11.4 billion or 42.6% of all service revenues and for the first time exceeded voice revenues (Vodacom 2017a). Vodacom is dominant in the post-paid contract market with its Average Revenue per User (ARPU) more than double that of its nearest competitor, and as a result of this it has the highest blended ARPU[12], see Figure: 2-14 (BMI Research, 2017).

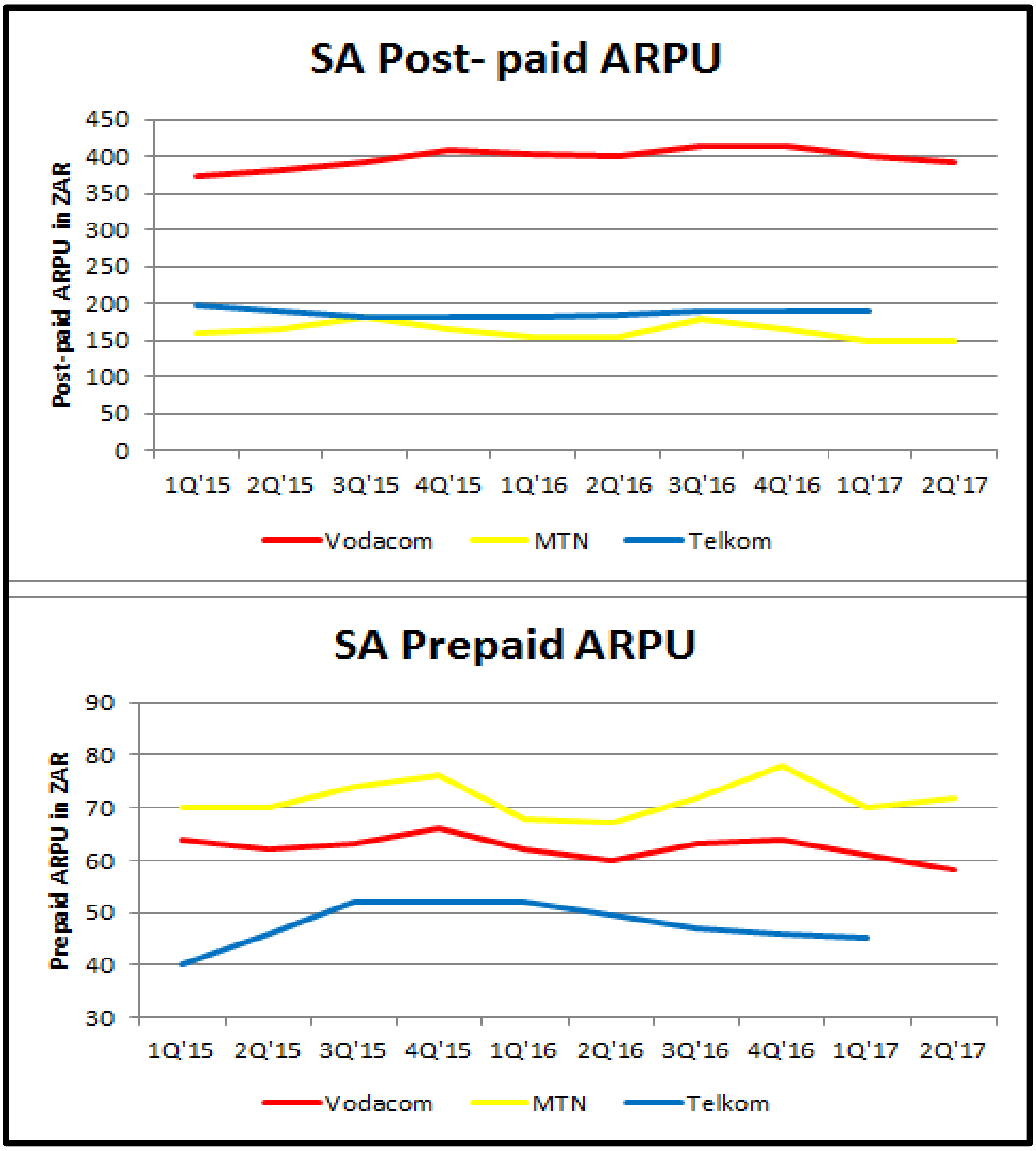
2.2.4.6.2 Mobile Telephone Networks (MTN)

MTN is the second largest of South Africa’s mobile network service providers as well as the second to launch, a month after Vodacom (Horwitz, 2014). MTN has interests in 23 mobile network service providers in Africa, the Middle East and Mediterranean regions (MTN, 2017).

MTN had 31.2 million subscriptions as of the end of June 2017 and a market share of 33.4% (MTN, 2017). MTN had approximately 17.3 million data subscriptions in South Africa with its data revenues (data and digital) of being ZAR7.916 billion for the half year ending in June 2017, and accounting for 47% of the total service revenues of ZAR16.75 billion (MTN, 2017).

[12] Blended ARPU is the weighted average monthly spend on mobile services of both post-paid and prepaid ARPUs (subscribers)

Figure: 2-14: SA Mobile Service providers Post-paid and Blended ARPUs



(Source: BMI Research, 2017)

2.2.4.6.3 Cell C

As Cell C is a private company, it has not been required to publish figures with regard to its operations. However, after its buy-out by Blue Label Telecoms in the 3rd Quarter 2016 (Van Zyl, 2015), the new holding issued a circular to all its shareholders that its actual subscription numbers were nearly 10 million lower than those that management had been telling the market and were at 12.6 million, meaning a market share of 15.3% (Wills, 2016). It also reported that of that 12.6 million around one million were wholesale / MVNO customers (Wills, 2016).

It is interesting to note that when Cell C launched, the total mobile market was only around 7 million subscriptions (Telkom, 2002). Hence it has only attracted around 12.6 million subscriptions in that time while MTN and Vodacom attracted around 67.4 million between them (BMI Research, 2017; Vodacom, 2017; MTN, 2017).

As with all the service providers Cell C operates 2G, 3G and 4G networks, although Cell C still roams on the MTN network in rural areas where it has not built network infrastructure yet (Vallie, 2018).

2.2.4.6.4 Telkom Mobile

Telkom Mobile is the smallest of the four network service providers, and last to launch in late 2010. As of 31st March 2017, it had 4 million subscriptions giving it a market share of 4.5%. It is part of the Telkom group which is the dominant Wireline service provider and operates the largest Optic fibre network in South Africa (BMI Research, 2012; Telkom, 2017).

Telkom Mobile is predominantly a mobile data network with, as of 31st March 2017, 2.6 million of the 4 million mobile subscriptions were mobile broadband data subscriptions (Telkom, 2017). It reports that of its ZAR3.5 billion service revenues for Business Year 2017, ZAR2.35 billion or 67% of its revenues were from data services (Telkom, 2017).

Telkom Mobile’s growth has also not been spectacular in relation to the two dominant players. When it launched the total mobile market was around 50 million total subscribers and of the 37.1 million that has been added since then, Telkom Mobile has only acquired 4 million of them (BMI Research, 2012; BMI Research, 2017; Telkom, 2017).

2.2.4.7 Drivers and Constraints in the South African Telecommunications Market

This section examines the South African Mobile Telecommunications market, and highlights the factors which are playing a major role in the future development of this market.

2.2.4.8 South African Economy and Income Disparity

In 2016 the South African economy was the second largest economy in Sub-Saharan Africa with a Gross Domestic Product (GDP) of US$294.8 billion, but down from 2011 when it peaked at US$416.4 billion and only Nigeria with a GDP of US$405.1 billion was larger (World Bank, 2017). An overview of the South African economy is given in Table: 2-2

Table: 2-2: Key South African Economic and Population Data

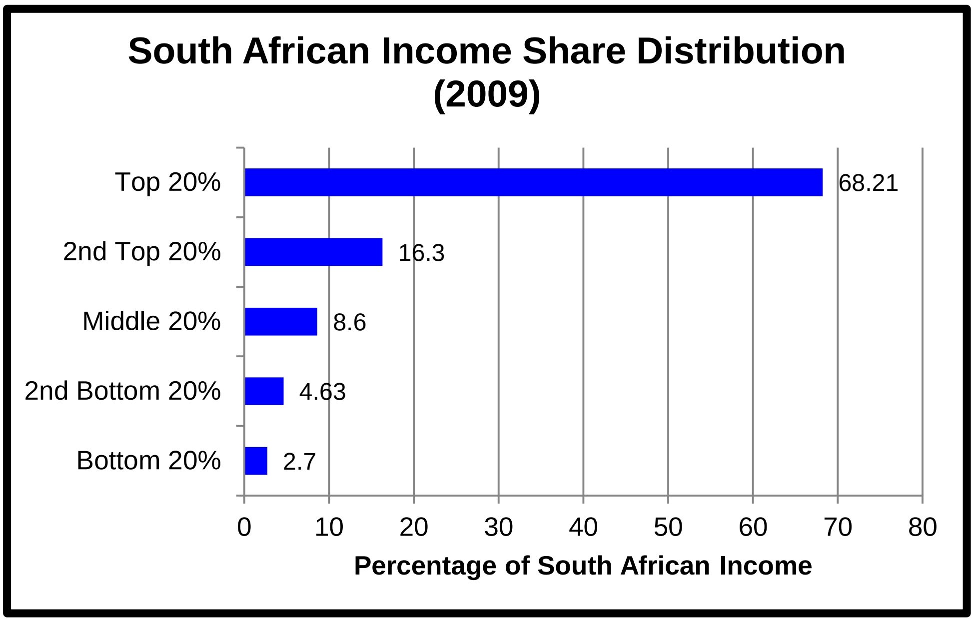
Indicator	Value	Period	Source
Gross Domestic Product (GDP) GDP Composition: Agriculture Industry Services	US$ 294.8 billion 2.0% 29.0% 69.0%	2016	World Bank, 2017
Gross National Income (Atlas method) (GNI)	US$ 306.6 billion	2016	World Bank, 2017
GNI per Capita (Atlas method)	US$ 5480	2016	World Bank, 2017
Population - Total	56.5 million	Mid 2017	Statistics South Africa, 2017
Population – below 15 years of age	29.6%	Mid 2017	Statistics South Africa, 2017
Population - Urbanised	62%	2012	CIA Factbook, 2017
Functionally Literacy Complete Grade 7 & above) – Above 20 years old	85.2%	2016	Statistics South Africa 2017b
Unemployment	26.7%	2017	Statistics South Africa, 2018
GINI Index	63.4	2011	World Bank, 2017 and 2014a

In 2011, the latest figures available for South Africa indicated that South Africa had a GINI Index of 63.4 which is the highest in the world (Worldbank, 2014a and 2017).

The GINI index is defined as *"[an index that] measures the extent to which the distribution of income or consumption expenditure among individuals or households with an economy deviates from a perfectly equal distribution*". A GINI Index of 0 represents perfect equality, while an index of 100 implies perfect inequality (World Bank, 2014a).

Figure: 2-15 shows the actual income distributions. It indicates that 68.21% of the total income earned in South Africa goes to the top 20% of earners while the bottom 60% of earners only earn 15.5% of the income (Worldbank, 2014).

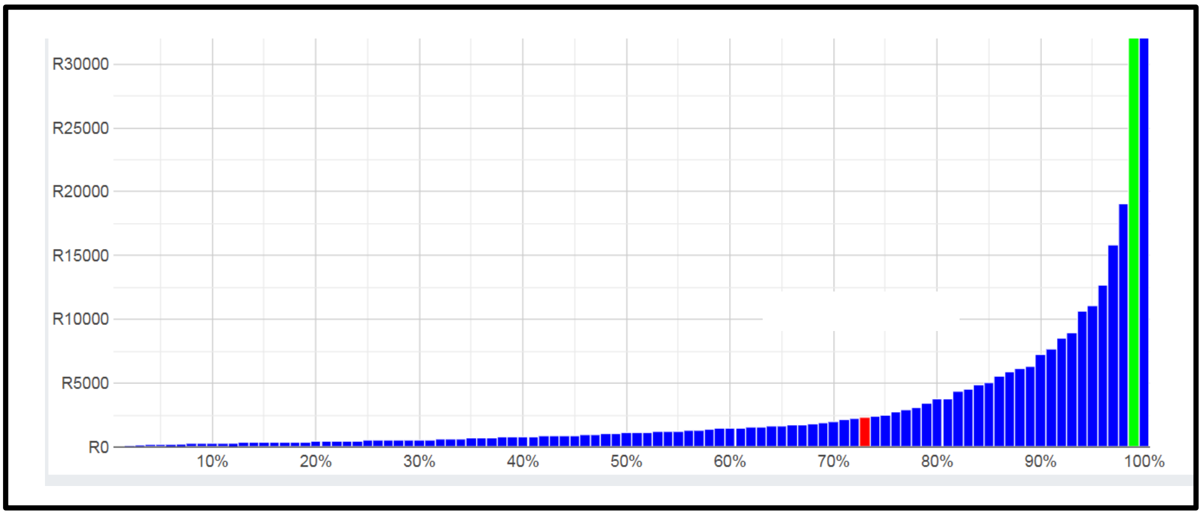
Figure: 2-15: South African Income Distribution



(Source: Worldbank, 2014)

Vodacom has a post-paid ARPU, that section of the population who can acquire a credit rating, of around ZAR400 (1Q'15 to 2Q'17), while the prepaid ARPU, those that cannot get a credit rating, for the same network and period is ZAR62.3 which is only about a fifth of post-paid spend (see Figure: 2-14 for more detail).

Figure: 2-16: Actual Monthly Income Distribution of Households in South Africa 2018



(Source: SALDRU, 2018: 1)

Figure: 2-16, which shows the actual after tax monthly income of South African Households in 2018 indicates that 46% of South African households have less than ZAR1000 per month of disposable income (SALDRU, 2018). Comparing these

ARPUs with this income distribution it means that the average ZAR62.3 prepaid ARPU equates to at least 6.2% of disposable income for 46% of South African Households. Again comparing this income distribution with the lowest cost of 1Gb of data, ZAR99, (Figure: 2-12; ICASA, 2018a) means that for that 46% of households the 1GB of data is going to cost at least 10% of their disposable income.

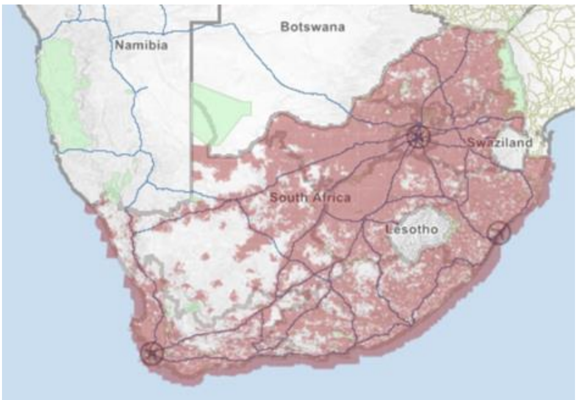
2.2.4.8.1 Distribution of the Coverage of Mobile Service Providers

As outlined in section 2.2.4.6 all of the mobile service providers have rolled out 2G, 3G and 4G LTE networks throughout South Africa, but section 2.2.3 shows that only 3G and 4G LTE networks have broadband data capabilities, while the 2G GPRS and EDGE networks have low speed data capabilities. However, if the coverage maps of the networks are examined, it appears that the coverage of the fast data networks are not uniformly dispersed around the country (ICASA, 2016).

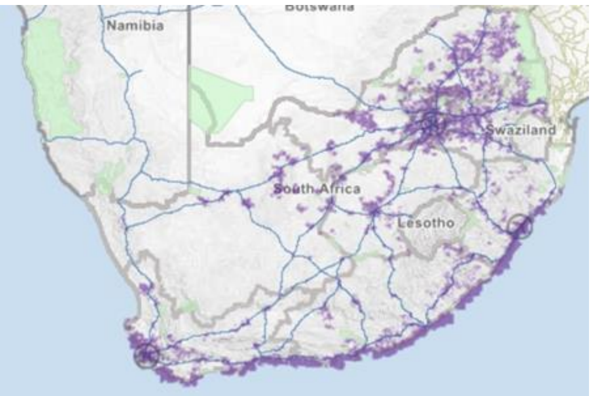
Figure: 2-17: Vodacom coverage maps for 2G EDGE, 3G and 4G LTE networks plus ICASA Coverage Map for the Limpopo Province

Vodacom 2G EDGE Coverage February 2018

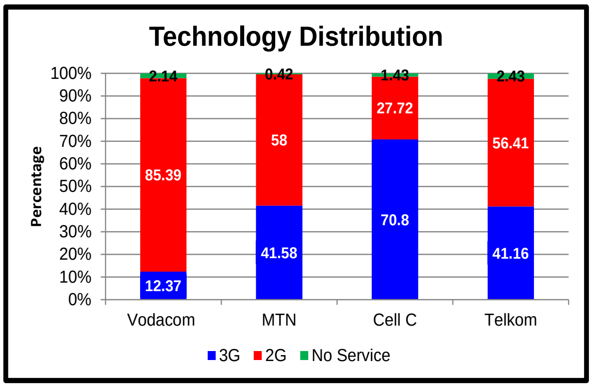
Vodacom 3G Coverage February 2018



Vodacom 4G LTE Coverage February 2018



Limpopo ICASA Determined Coverage, as per technology type, Q1 2016_17



(Source: Vodacom, 2018; ICASA, 2016)

Figure: 2-17 highlights this fact by showing as an example the Vodacom coverage maps of their 2G Edge data network, 3G network and 4G LTE network (Vodacom, 2018). The fourth map shows the coverage found in the Limpopo Province by the Independent Communications Authority of South Africa (ICASA), the Telecommunications Regulator, when they carried out testing in 2016 (ICASA, 2016).

The key output from these coverage maps is that there are significant parts of South Africa where there is no high speed data coverage and this prevents peoples' use of the service even if they want to use it.

2.2.4.8.2 Government Initiatives and Broadband Policy

On the 6th December 2013 the South African Government gazetted its new Broadband policy '*South African Connect: Creating Opportunities, Ensuring Inclusion*' (SA Connect). The following excerpt from the Executive Summary clearly outlines the Government's vision for ICT and broadband as the enabler.

"The national broadband policy and associated strategies and plan gives expression to South Africa's vision in the National Development Plan (NDP) of a seamless information structure by 2030 that will underpin a dynamic vibrant informational society and knowledge economy that is more inclusive, equitable and prosperous", (South Africa, 2013a: 2)

SA Connect ties up with the Presidential Infrastructure Co-ordinating Commission (PICC) Strategic Project (SIP) 15 of 2012 which is aimed at expanding access to communication technology. It plans "*to ensure universal service and access to reliable, affordable and secure broadband services to all South Africans, prioritising rural and under-serviced areas and stimulate economic growth*" (South Africa, 2013a: 2).

SA Connect has determined that there are 4 key variables that address the link between broadband and economic growth. They are,

1. Broadband must reach critical mass
2. Access to broadband must be affordable
3. Demand-side skills must be developed so that broadband can be used effectively

4. Supply-side skills must be developed so the economic and innovative effects of broadband can be exploited.

The policy sets down a vision that by 2020 "*100% of South Africans will have access to broadband services at 2.5% or less of the population's monthly income*" (South Africa, 2013a: 12). It also sets various speeds and coverage targets as can be seen in Table: 2-3

Table: 2-3: Broadband Targets in South Africa Connect

Target Area	Penetration Measure	Baseline 2013	By 2016	By 2020	By 2030
Broadband Access in Mbps per User	**% of Population**	33.7% Internet Access	50% at 5 Mbps	90% at 5 Mbps, and 50% at 100 Mbps	100% at 10 Mbps, and 80% at 100 Mbps
Schools	**% of Schools**	25%	50% at 10 Mbps	100% at 10 Mbps, and 80% at 100 Mbps	10% at 1 G bps
Health	**% of Health Facilities**	13%	50% at 10 Mbps	100% at 10 Mbps, and 80% at 100Mbps	10% at 1 Gbps
Government	**% of Government Offices**		50% at 5 Mbps	100% at 10 Mbps	100% at 100 Mbps

(Source: South Africa, 2013a)

This policy has serious repercussions for the market as a whole as it sets two critical targets that are going to affect it. These targets and effects are:

"By 2020 all South Africans will have access to broadband services (South Africa, 2013a: 12)": According to the International Telecommunications Union (ITU) in its '*Measuring the Information Society 2017*' (2017) in 2016, only 2.1 out of every 100 South Africans had a fixed broadband subscription while for mobile broadband it was 58.6 out of 100 which gives a maximum of 60.7 out of 100, assuming no duplication. Thus, there will have to be a significant roll-out if this target is to be met by 2020.

"2.5% or less of the population's monthly income (South Africa, 2013a: 12)": According to the ITU (2017) in 2012 South African fixed broadband prices were at 3.6% of monthly Gross National Income per Capita (GNI p.c.), but at the lowest speed offered, which in 2016 was 2 Mbps (Telkom, 2017). This is still far from the minimum of 5 Mbps. However, for mobile it was 1.3% of GNI p.c. for a 500MB

package and 1.0% of GNI p.c. for a 1 GB[13] package (International Telecommunications Union, 2017). (The reason that the 1 GB package is cheaper than the 500MB package is due to the methodology with which they are calculated, see section 2.2.4.8.5).

Drawing a line through the HCFE, 2.5% of income equates to about ZAR57, and with the current average prepaid spend being in the same region, (Vodacom's average pre-paid ARPU for 1Q'15 to 2Q'17 was ZAR63, see Figure: 2-14), and with the cheapest 500MB data bundle costing ZAR69 (see Figure: 2-12;) prices will still have to drop significantly to meet this target (BMI Research, 2017; South Africa, Statistics South Africa, 2017b; ICASA, 2018a).

In September 2017, in order to eliminate the duplication of telecommunications networks and infrastructure and have a more focused and cost effective drive of broadband into the rural areas, the South African government was reportedly planning to merge its wireline broadband infrastructure business, Broadband Infraco, with its broadcast signals distribution provider, Sentech (Reuters, 2017).

In October 2017, the South African Government revealed plans to merge all the regulatory bodies of the communications market into a single regulator. The departments involved are the Department of Telecommunications and Postal Services (DTPS), the Independent Communications Authority of South Africa (ICASA), the South African Domain Name Authority (.zaDNA), and the Universal Service Access Agency (USAASA) (MyBroadband, 2017a). The consolidated regulator would be responsible for all the functions previously carried out by the individual entities. The major reason for the consolidation was to try and curtail the inter-agency fighting which is hampering the efficient regulation of the industry.

Additionally, the government also announced that they were planning to modify the Electronic Communications Act of 2005 to provide new policy approaches on infrastructure rollouts and the allocation of scarce resources. It would also see the establishment of a Wireless Open Access Network, which would help to reduce the

[13] The convention is "b" (small b) means "bits" of data and it refers to the speed of the connection, i.e. a connection downloads data at speed of 2 Mbps. While a "B" (capital letter) means "Bytes" of data and refers to the amount of data transferred, i.e. the downloaded file was 100 MB of data. Note: 8 bits of data equals 1 Byte of data.

cost of communication services (MyBroadband, 2017a). However, with the change of the Presidency of South Africa in early 2018 plans appear to be on hold. In place of this the President promised in his State of the Nation Address to establish what he called a "*digital industrial revolution commission*" to ensure South Africa *"is in a position to seize the opportunities and manage the challenges of rapid advances in information and communications technology"* (Mcleod, 2018: 1).

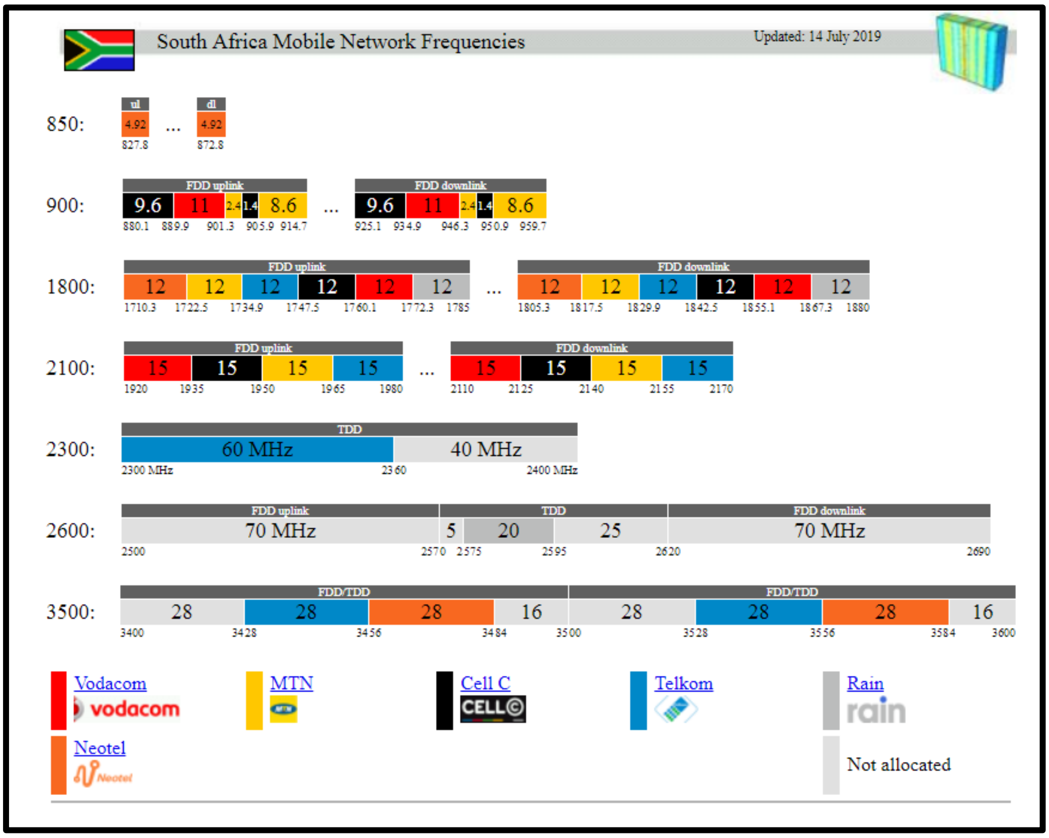
2.2.4.8.3 Spectrum Allocation

According to BMI Research and several other analysts the greatest bottleneck facing the South African mobile telecommunications industry is ICASA's failure to release the required spectrum in 700 MHz, 2.1 GHz and 2.3 GHz ranges. These spectrum ranges are the most efficient for the carrying of high bandwidth data for use in 3G and 4G mobile networks. The failure to release these spectrum ranges has constrained the 4G rollout of all the mobile networks (Businesstech, 2016; BMI Research, 2017). The industry has been requesting these spectrum ranges since 2003, but as of December 2017 there were still no concrete plans to release them (BMI Research, 2017; Businesstech, 2016; Clarke 2014; MyBroadband, 2017). Figure: 2-18 lists the current breakdown of spectrum allocated to the mobile and fixed line service providers in South Africa (Spectrummonitoring.com, 2019). In August 2017 Vodacom announced that they had run out of spectrum so they cannot continue to roll out their 4G LTE network in rural areas (Mcleod, 2017).

A further complication about spectrum availability is the failure of the South African Government to switch the television signal from analogue to digital in a process called 'Digital Migration'. The original deadline imposed by the International Telecommunications Union (ITU) was June 17th, 2015. The spectrum the analogue television uses are the 700 and 800MHz ranges, which are good frequency ranges for the rollout of mobile broadband services in rural low population density areas (Gerber, 2017; BMI Research, 2017).

A generally accepted principle in wireless technology is that the higher the frequency at which a transmitter operates the greater the amount of data that can be transmitted (Dasbit and Sikdar, 2009). However, the downside of this is that the higher the frequency, the shorter the effective range due to attenuation by vegetation and other natural factors. The reverse is also true, the lower the frequency the less data it can carry but the further it can carry the signal (Dasbit and Sikdar, 2009). Therefore, a mobile network is a mixture of high frequency cells in areas where the population density is high and low frequency cells where the population density is low (Dasbit and Sikdar, 2009).

Figure: 2-18: Current South African Mobile Service provider Spectrum Allocation



(Source: Spectrummonitoring.com, 2019)

The network service provider does this for economic and practical reasons, the building and maintenance of transmission cells is expensive and any change to the network layout, however small, would mean the operator has to re-planning that entire section of the network. Additionally, the availability of spectrum is the limiting factor in the ability of a network to offer its customers a high Quality of Service so operators are forced to use the limited spectrum in the most efficient method possible (Dasbit and Sikdar, 2009; Clarke, 2014).

2.2.4.8.4 South African Telecommunications in Comparison with the Rest of the World

The International Telecommunications Union (ITU) publishes an annual report named '*Measuring the Information Society'* (MIS) (International Telecommunications Union, 2017). The main objective of this report is to identify recent global and regional trends in ICT deployment and usage, on the basis of internationally comparable ICT statistics. It also gives two tools for benchmarking the information society: the ICT Development Index (IDI) and the ICT Price Basket (IPB).

The IDI consists of 11 separate measures that build up into one benchmark which serves to measure, monitor and compare the ICT development across countries. Figure: 2-19 shows the different components which make up the index and their various weightings (International Telecommunications Union, 2017).

Figure: 2-19: ICT Development Index

ICT Access	Reference Value	%	Weighting
Fixed telephone Subscriptions per 100 inhabitants	60	20	40%
Mobile cellular telephone subscriptions per 100 inhabitants	120	20	
International internet bandwidth (b/s) per internet user	976'696	20	
Percentage of households with a computer	100	20	
Percentage of households with internet access	100	20	
ICT Use	**Reference Value**	**%**	**Weighting**
Percentage of individuals using the internet	100	33	40%
Fixed Broadband Subscriptions per 100 inhabitants	60	33	
Active mobile-broadband subscriptions per 100 inhabitants	100	33	
ICT Access	**Reference Value**	**%**	**Weighting**
Mean years of schooling	15	33	20%
Secondary gross enrolment ratio	100	33	
Tertiary gross enrolment ratio	100	33	

(Source: International Telecommunications Union, 2017)

All methodologies which are used in the determination of the various indexes and measures are explained in the Annexures to the MIS report and are created by the International Telecommunications Union Expert Group on Telecommunication/ICT Indicators (EGTI) (International Telecommunications Union, 2017).

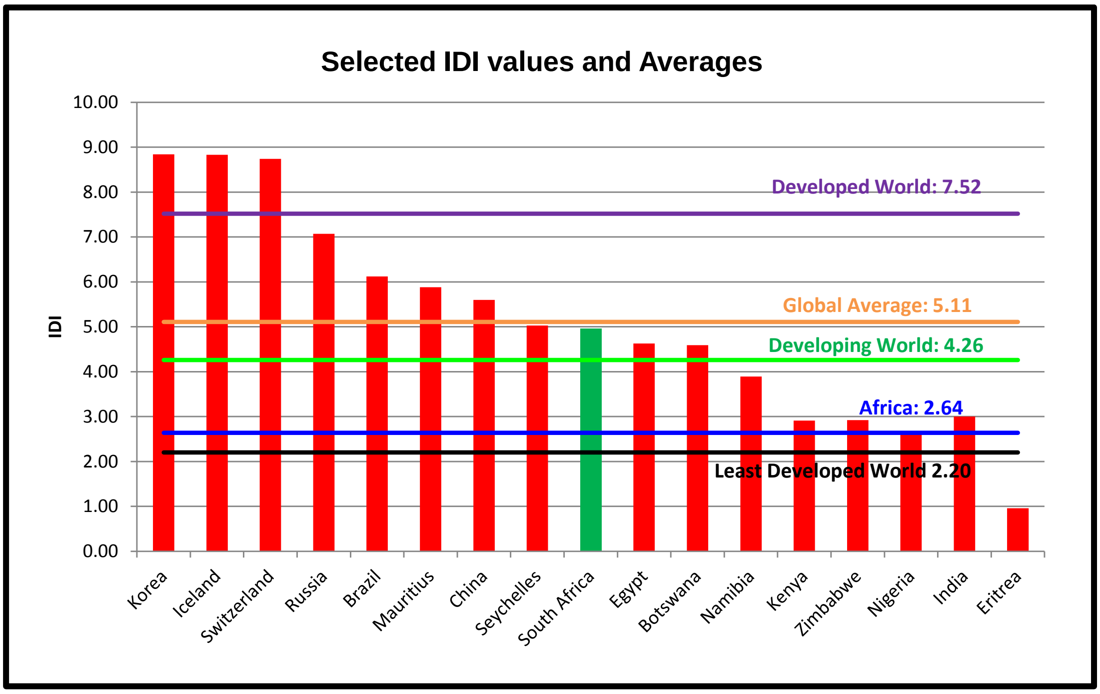
South Africa's global ranking for 2017 is 92, down four places from 2016 and 8 places from 2015. South Africa is below 90 for the first time in all three ICT sub-sections, being 90th in ICT Access (value 5.48), 95th in ICT Use (value 3.91) and 93rd in ICT Skills (value 6.00). The ICT Skills is of the most concern as it dropped 13 places from 2016, 80 to 93 with the value dropping from 6.23 to 6.00. Table: 2-4 above gives South Africa's IDI values and ranking (International Telecommunications Union, 2017).

Table: 2-4: IDI Values and Ranking for South Africa

Year	Global Ranking	Overall Value	ICT Access Value		ICT Use Value		ICT Skills Value	
			Rank	Value	Rank	Value	Rank	Value
2016	88	4.91	91	5.29	86	3.86	80	6.23
2017	92	4.96	90	5.48	95	3.91	93	6.00

(Source: International Telecommunications Union, 2017)

Figure: 2-20: IDI Values for Selected Countries and Global Average



(Source: International Telecommunications Union, 2017)

Figure: 2-20 gives the IDI values of several selected countries as well as the various global averages. The Republic of Korea has the highest value with 8.85 and Eritrea the lowest at 0.96. South Africa is third in Africa behind the Seychelles and Mauritius, and with the next two of Cape Verde and Botswana these are the only 5 Sub-Saharan African countries which have a value above the Developing World average of 4.26 (International Telecommunications Union, 2017).

2.2.4.8.5 South Africa and the ICT Price Basket (IPB)

Since 2009 the ITU has been measuring the ICT Price Basket with the objective of measuring the cost and affordability of the key ICT services, a cellular mobile basket that consists of both voice and SMS and fixed line broadband basket and compares them across 160 different countries (International Telecommunications Union, 2017). The fixed broadband is determined as the cheapest package of 1GB or larger from the dominant fixed line data provider (International Telecommunications Union, 2017) it is thus calculated in the fixed line broadband basket. Mobile data is charged by the amount of data transferred and payment type so it is not included in the mobile basket and there is a separate methodology for calculating its price for 500MB and 1GB packages.

The prices in the ICT Price Basket (IPB) are expressed as a percentage of Gross National Income per Capita (GNI p.c.) and also ranked in terms of Purchase Price Parity (PPP) in US$ in order to show them in relative terms and to be able to rank them. Table: 2-5 highlights the South African values for 2016 for both mobile telephony and fixed broadband. In Mobile telephony, South Africa is ranked 4th in Africa in terms of % GNI after Mauritius, Namibia and Seychelles. However, in terms of PPP (US$) it is only 8th at $19.29 with Kenya first at US$7.20. In the fixed broadband sub-basket in terms of GNI p.c. South Africa is 3rd in Africa and 4th in terms of PPP, while Mauritius which is ranked 3rd in Africa in terms of GNI p.c but is ranked 4th globally in terms of PPP (International Telecommunications Union, 2017).

The methodology used to determine the mobile telephony sub-basket is calculated using the OECD mobile-cellular low-user call distribution matrix (2009 methodology), on the cheapest low volume prepaid mobile voice package (Organisation for Economic Co-Operation and Development, 2010; International Telecommunications Union, 2017).

Table: 2-5: Data prices of South African vs Other African Countries (sorted according to Price in US$ at Purchase Price Parity)

Factor	Country	Year	As a % of GNI p.c.	Price in US$	Price in US$ PPC	GNI p.c. US$
Mobile Telephone sub-basket	South Africa	2015	1.25	7.07	15.81	6800
		2016	1.5	6.85	16.08	5480
	Kenya	2015	3.36	3.62	7.96	1290
		2016	2.3	2.65	6.00	1380
	Namibia	2015	0.92	4.33	9.54	5630
		2016	0.8	3.08	7.03	4620
	Nigeria	2015	2.12	5.25	10.17	2970
		2016	1.8	3.68	8.61	2450
	Ethiopia	2015	6.74	3.09	8.70	550
		2016	6.5	3.58	9.37	660
	Mauritius	2015	0.63	5.05	9.18	9630
		2016	0.6	4.88	10.49	9760
	World Average	2015	5.2			
	Africa Average	2016	14.2			
Fixed Broadband sub-basket	South Africa	2015	2.28	12.93	28.92	6800
		2016	3.6	16.44	38.58	5480
	Mauritius	2015	0.36	2.85	5.19	9630
		2016	0.3	2.44	5.25	9760
	Cape Verde	2015	3.46	9.96	21.10	3450
		2016	3.6	8.91	18.66	2970
	Seychelles	2015	1.28	15.10	23.68	14100
		2016	1.2	15.41	19.33	15410
	Gabon	2015	2.92	23.67	37.99	9720
		2016	3.1	18.63	43.19	7210
	Botswana	2015	4.75	28.65	57.86	7240
		2016	4.9	26.99	66.89	6610
	World Average	2015	13.9			
	Africa Average	2016	39.4			

(Source: International Telecommunications Union, 2017; Worldbank, 2017)

The methodology used to determine the mobile broadband prices is summarised below (International Telecommunications Union, 2017)

For the 500MB basket;

The price is for a 500MB prepaid mobile data package for use on a mobile handset from the mobile service provider with the largest mobile data market share. If no 500MB package exists, the cheapest 500MB package is created by the following: Use a package which is larger than 500MB on which the price is reduced to correspond with 500MB, (i.e. the price of a 1GB package is halved), or use a package less than 500MB, and add the additional data to make 500MB using the out of bundle price (International Telecommunications Union, 2017).

For the 1GB basket;

The price is for a 1GB post-paid mobile data package designed for use on a computer using a modem or WiFi router package again from the mobile service provider with the largest mobile data market share. If no 1GB packages exist the same methodology as described for the 500MB package is used to determine the lowest 1GB price (International Telecommunications Union, 2017).

Table: 2-6: South Africa Mobile Broadband Prices for 2016 Compared to Global Regions

Factor	Average Mobile Broadband Prices as a % of GNI p.c.							
	South Africa	Africa	Arab States	Asia & Pacific	CIS	Europe	The Americas	Global
Handset based - Prepaid - 500 Mb	1.3	9.3	4.5	2.7	1.4	0.6	2.5	3.7
Computer based – Post-paid – 1 Gb	1.0	17.7	5.5	3.4	3.1	0.6	5.7	6.8

(*Source: International Telecommunications Union, 2017; Worldbank 2017)*

It is worth noting that the 1GB package is cheaper in South Africa than the 500MB package. This highlights the difference in the methodologies used to calculate the prices but also underlines the difference between the cost of post-paid and prepaid data.

Table: 2-7: South African and Other African Mobile Broadband (500Mb and 1GB) Prices for 2016 sorted according to PPP in US$.

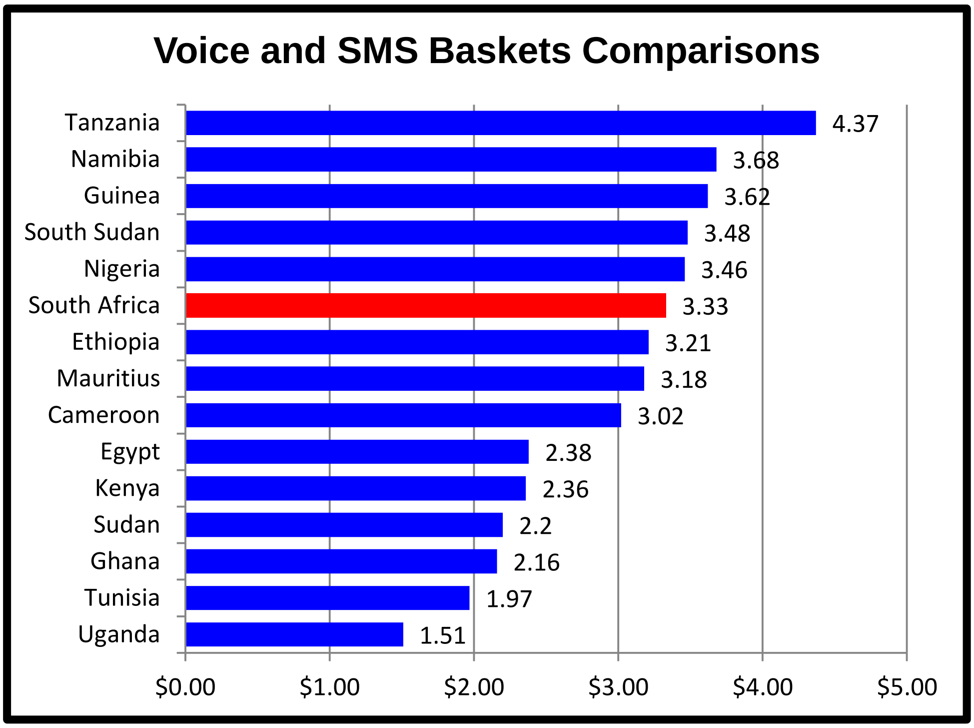
Factor	Country	As a % of GNI p.c.	Price in US$	Price in US$ PPP	GNI p.c. US$
Mobile Broadband 500MB Prepaid Data	South Africa	1.30	5.94	13.93	5480
	Nigeria	1.70	3.47	8.13	2450
	Kenya	4.40	5.06	11.48	1380
	Mauritius	0.70	5.69	12.24	9760
	Ethiopia	8.60	4.73	12.40	660
	Namibia	2.00	7.70	17.58	4620
Mobile Broadband 1GB Post-paid Data	South Africa	1.00	4.57	10.72	5480
	Nigeria	1.70	3.47	8.13	2450
	Kenya	4.40	5.06	11.48	1380
	Mauritius	1.00	8.13	17.48	9760
	Ethiopia	16.70	9.19	24.08	660
	Namibia	2.80	10.78	24.62	4620

(Source: International Telecommunications Union, 2017; Worldbank 2017)

Research carried out by Research ICT Africa (RIA) (Research ICT Africa, 2014), shows a far more negative picture in that the RIA research was carried out using the same methodology as the ITU (OECD Voice and SMS Bucket) but compared actual mobile prices instead of against GNI p.c. as used by the ITU (RIA, 2016)[14]. This measure shows that when actual prices are used, the result is considerably worse than at first perceived, see Figure: 2-20 .

[14] Voice/SMS basket (OECD basket): 30 voice calls for a total of 50 minutes and 100 SMSs per basket per month

Figure: 2-21: Actual African Mobile Prices using OECD Low Usage Voice and SMS Basket, Lowest Prices Available for 2016



(Source: RIA, 2016)

2.2.4.9 Summary of Findings

Section 2.2.4 investigated the telecommunications market in South Africa and from this investigation the following key factors emerged when considered in relation to the proposed study.

In South Africa the mobile market is the dominant market in terms of subscribers and revenues earned, with the fixed line market in decline in terms of subscribers, even though subscribers are changing technology from POTS to ADSL and now to optic fibre connectivity (South Africa, Statistics South Africa, 2017; BMI Research, 2017; ICASA, 2018). The mobile service providers have rolled out the latest 4G LTE technology and now operate fast mobile data networks with revenues generated by these data services rapidly catching up and even overtaking revenues from voice applications (ICASA, 2016, and 2018). The mobile service providers are ready for this move into pure data networks; however, there are certain factors, such the availability of the required spectrum, which are holding this up (Businesstech, 2016).

On the one hand the South African Government is appearing to push for the national rollout of broadband communications as they are aware of the growth potential this technology holds for the South African economy. However, as much as they talk and issue policy documents, such as '*South Africa: Connect'*, their actions belie the words (South Africa, 2013a). South Africa has still not fulfilled its obligation to the ITU to have carried out the Digital Migration of Television, which was due to have been completed by 17th June 2015. This means that the 700 and 800MHz spectrum, which is urgently needed for the rollouts of 4G LTE connectivity in rural areas, is still not available. They have also not released the spectrum in the 2.6GHz band that is needed for the high speed data networks in the metro areas (Businesstech, 2016; Gerber, 2017; BMI Research, 2017).

Finally, although South Africa has some of the lowest prices for mobile voice and data in Africa, when compared as a percentage of GNI p.c., the prices are still high in monetary terms when compared to other African countries (International Telecommunications Union, 2017; Research ICT Africa, 2014). Also the percentage of a South African's Household Final Consumption Expenditure that is spent on telecommunications is double that of most 1st world countries (South Africa, Statistics South Africa, 2017a; New Zealand, Statistics New Zealand, 2016: United Kingdom, Office of National Statistics UK, 2016; Eurostat, 2018).

2.3 ANALYSIS OF DIFFERENT FRAMEWORKS USED IN TELECOMMUNICATIONS MODELLING

The aim of this thesis is to develop a framework for the adoption of mobile data services in South Africa. In order to do this the existing models must be examined and the key points highlighted. An examination of the different models which have previously been used has the additional benefit of identifying all those factors which have previously been indicated as influencing the adoption of ICT services.

2.3.1 Introduction

There are basically four different classes of frameworks that have been developed and are used as frameworks to explain the adoption of ICT services. The four types of models are the following; Early fixed line telecommunications frameworks (Bernt and Weiss, 1993; Mbarika, 2000; Udo, *et al*., 2008); Frameworks based on Rogers Diffusion Theory (Rogers, 2003; Tornatzky and Klein, 1982; Moore and Benbasat, 1991); models based on human behaviour (Fishbein and Ajzen, 1975; Ajzen, 1991; Taylor and Todd, 1995; Morris and Venkatesh, 2000; Karahanna, Straub &

Chervany, 1999); and the final type is those used for predictive purposes using statistical methods (Turban, King & Lee, 2006; Fildes and Kumar, 2002a; Bass, 1969). However, the models based on human behaviour will be sub-divided into two sections, the first being the early general behavioural models and the second will cover the Technology Adoption Model (Davis, 1986 and 1989) and the developments of this model (Venkatesh and Davis, 2000; Venkatesh, *et al*., 2003; Venkatesh and Bala, 2000).

2.3.2 EARLY FIXED LINE COUNTRY LEVEL FRAMEWORKS

These frameworks were generally developed before the advent of mobile cellular communications and the exponential growth associated with them (GSM Association, 2018), so these frameworks were based on factors regarding the growth of fixed line telecommunications, and were all developed around the concept of growth in tele-density, number of lines per 100 inhabitants, and at a country level.

2.3.2.1 Bernt and Weiss Framework (1993)

Bernt and Weiss (1993) postulated a framework into which they categorised the factors which influence the increase in tele-density of a country into four separate groups of factors.

The first group was named the Organisational group and it covered factors which describe the structure of the market. Hence, it addressed factors such as telecommunications as a government monopoly versus free competition in the market. Other factors included in this group were deregulation and privatisation of the market (Bernt and Weiss, 1993).

The Financial group was the second group and it consisted of factors related to the country's financial standing and its ability to raise funds. Hence, factors in this group were the country's ability to raise funds, the country's overall economic situation based on Gross National Income per capita, a measurement that is still used by the ITU (International Telecommunications Union, 2017) and the level of its financial infrastructure (Bernt and Weiss, 1993).

The third group of factors were all Technological factors. Factors in this group involved the ability of the telecommunications service provider to purchase new equipment and maintain its existing equipment. Another factor was the age of the existing equipment in terms of how advanced is the technology and if it is old are there still spare parts to repair it. The next factor was related to the last one, in that it asks if there are adequate technical skills available to operate and maintain the equipment. The final factor in this group addresses whether there is adequate supporting infrastructure such as electricity and roads in all areas where the telecommunications infrastructure is located (Bernt and Weiss, 1993).

The fourth and last group of factors was Geographical. In this group the factors were based on if there was adequate financial income in areas where the network had not yet been rolled out to make it profitable for the service provider and if not, was there a government Universal Access Policy to help bridge this financial gap (Bernt and Weiss, 1993).

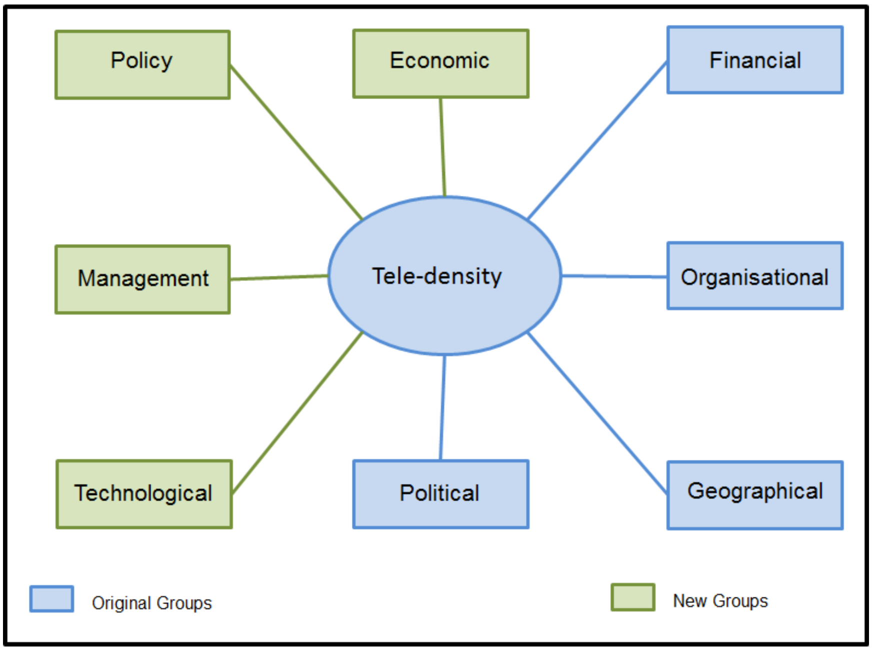
2.3.2.2 Modifications to the Bernt and Weiss Framework

In order to try and explain the obstacles to growth in tele-density in the Low Developed Countries (United Nations Conference on Trade And Development, 1999) Mbarika (2000) used a modified version of the Bernt and Weiss Framework (1993) instead of using the model to explain the adoption of telecommunication services he used it in a negative context namely to explain the obstacles to the adoption of telecommunication services.

To modify the model as such he made two major changes the framework, the first was to place the growth of tele-density at the centre of the framework. The second was the addition of four new groups of factors namely Economic; Policy; Management; and Political (Mbarika, 2000; Bernt and Weiss, 1993). Mbarika's (2000) modified framework is shown in Figure: 2-22.

Economic was the first of the four additional groups and it consisted of the following individual factors. Low Gross Domestic Product (Saunders, Warford & Wellinius, 1983) and Low Gross Domestic Product per capita were given as country level macro level constraints, while low levels of telecommunications traffic (Yatrakis, 1972), and low volumes of international trade indicated the perceived lack of need of telecommunications.

Figure: 2-22: Mbarika's (2000) modified Bernt and Weiss Framework



(Source: Mbarika, 2000)

The second group was Policy and was related to lack of adequate government policies to stimulate telecommunications growth. The individual factors in this group were the lack of private sector involvement and the perception that rural public telephones were not profitable (Saunders, 1982), so there was no reason to roll them out.

The third group was Management, and it referred directly to the lack of capabilities and skills in the telecommunications service provider. Hence, the two individual factors highlighted were: lack of internal organization and management (Wellinius, 1989); and an inappropriate organisational and managerial ability combined with the loss of trained staff (Kirunda-Kivenjinja, 1995).

The final group was named as Political and referred to the government's lack of political will and their resistance to the rollout of telecommunications services. The two major areas of resistance were due to the government's fear for national security (Pisciotta, 1992), and that the development of infrastructure could weaken their positions of power (Parker, 1994).

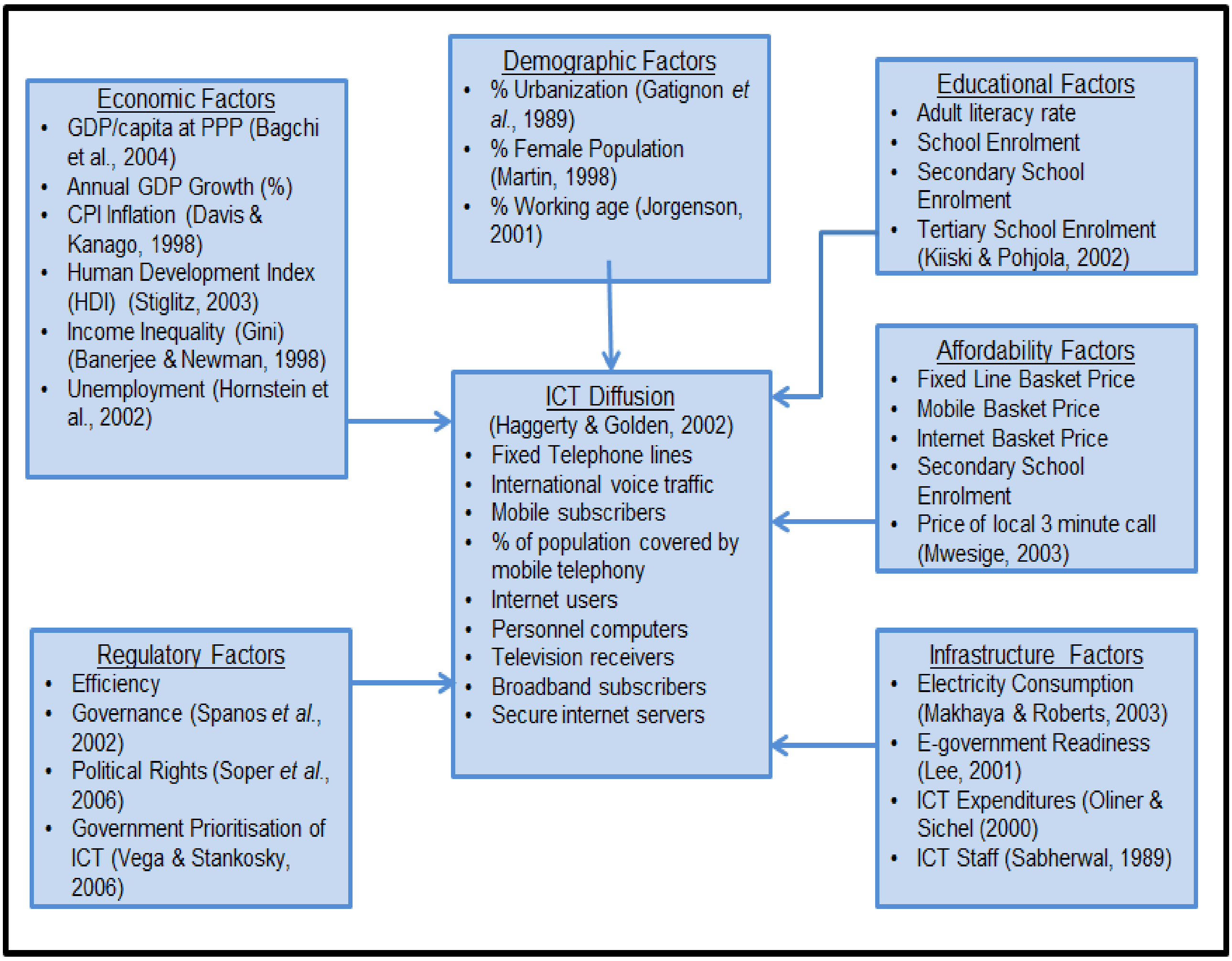
By 2004, Mbarika, *et al.*, had reduced it again to the initial four factors and just rearranged all the factors back into the original four group factors.

2.3.3 Udo, Bagchi and Kirs ICT Diffusion Framework

It must be noted here that although Udo, Bagchi & Kirs (2008) use the term diffusion of ICT's they were referring to the adoption of ICTs and were not directly referring to Rogers Theory of Diffusion of Innovations.

Udo, *et al*. (2008) had the concern that most of the studies concerning a nation's specific telecommunication factors were carried out on developed countries and very few were carried out on developing countries, particularly Sub-Saharan Africa. They built a model, see Figure: 2-23 and used it to compare two sets of developing countries, one each from Sub-Saharan Africa and a similar developing country outside of Africa which had a similar Gross Domestic Product per capita at Purchase Power Parity (GDP/c-PPP).The countries paired were, Zimbabwe with Albania and Namibia with Venezuela.

Figure: 2-23: Udo, Bagchi and Kirs ICT Diffusion Framework



(Source: Udo, et al., 2008)

The study showed two key findings;

The first was that there was at least one individual factor from each of the six factor groups that was substantially different between the paired countries indicating that it could be a factor in explaining differences in the adoption of ICT's. Hence, they deduced that the best way to investigate differences in ICT diffusion was by investigating the independent variables which differed between the paired countries (Udo, *et al*., 2008). The second finding was that the framework they had developed was appropriate for explaining ICT diffusion in developing countries (Udo, *et al*., 2008).

2.3.3.1 Key Outputs from this class of Models

The important thing to note with these models was that although they were focused at a country level and primarily at fixed line networks, the factors which they identified carry through to most of the other types of frameworks that were subsequently developed (Rogers, 2003; Tornatzky and Klein, 1982; Moore and Benbasat, 1991; Fishbein and Ajzen, 1975; Ajzen, 1991; Taylor and Todd, 1995; Morris and Venkatesh, 2000; Karahanna, *et al*., 1999; Turban, *et al.*, 2006; Fildes and Kumar, 2002a; Bass Model, 1969). The factors they identified: Economic (Matilla 2001; Fox and Duggan 2012; Margaret and Ngoma, 2013); Educational (Sulaiman, Jaafar & Mohezar, 2007; Rahman, 2015; Freeman and Mubichi, 2017) and Demographic factors (Oluwatayo, 2014; Khan, 2017) can be found in nearly all the subsequent classes of models. They also showed that the differences with regard to the factor Geographical be a substitute for cultural differences *(Udo, et al., 2008).*

2.3.4 Innovation Diffusion Theory Frameworks

In 1962, Rogers published his seminal work, the Diffusion of Innovations[15]. This is a very important framework as many of the concepts here appear in many subsequent behavioural models. In the preface to the third edition, Roger's states in the Preface that when he published the first edition, there were 405 publications concerning this topic and at the time of the third edition in 1983 there were 3085 publications on the topic and 2297 research reports (Rogers, 1983: xv).

---

[15] Rogers has updated the work several times with the latest edition being the 5th edition of 2003, and it this edition that is generally referenced in this thesis, although in certain specific cases the 3rd edition of 1983 is referenced. The first edition of 1962 is referenced when the research using the theory was published prior to 1983.

2.3.4.1 Rogers Diffusion of Innovations Theory

This is a very complex and comprehensive framework which has four interconnected areas that will be examined individually.

2.3.4.1.1 *Four Elements of Diffusion*

Rogers (2003: 5) began by defining diffusion as "*the process in which an innovation is communicated thorough certain channels over time among the members of a social system*". This definition highlights the four elements, namely:

Innovation:

"*An innovation is an idea, practice, or project that is perceived as new by an individual or other unit of adoption*" (Rogers, 2003: 12). It is important to note that the innovation does not have to be new at all, just new to the individual.

Communication Channels:

Rogers (2003: 5), defined communication as "*a process in which participants create and share information with one another in order to reach a mutual understanding*". He also stated that as diffusion is a very strong social issue, interpersonal communication is the most effective channel (Rogers, 2003).

Time Dimension:

Rogers (2003) remarked that the time dimension is missing from most behavioural models, and it is important as the innovation-diffusion process, adopter categorization, and rate of adoptions both include a time dimension.

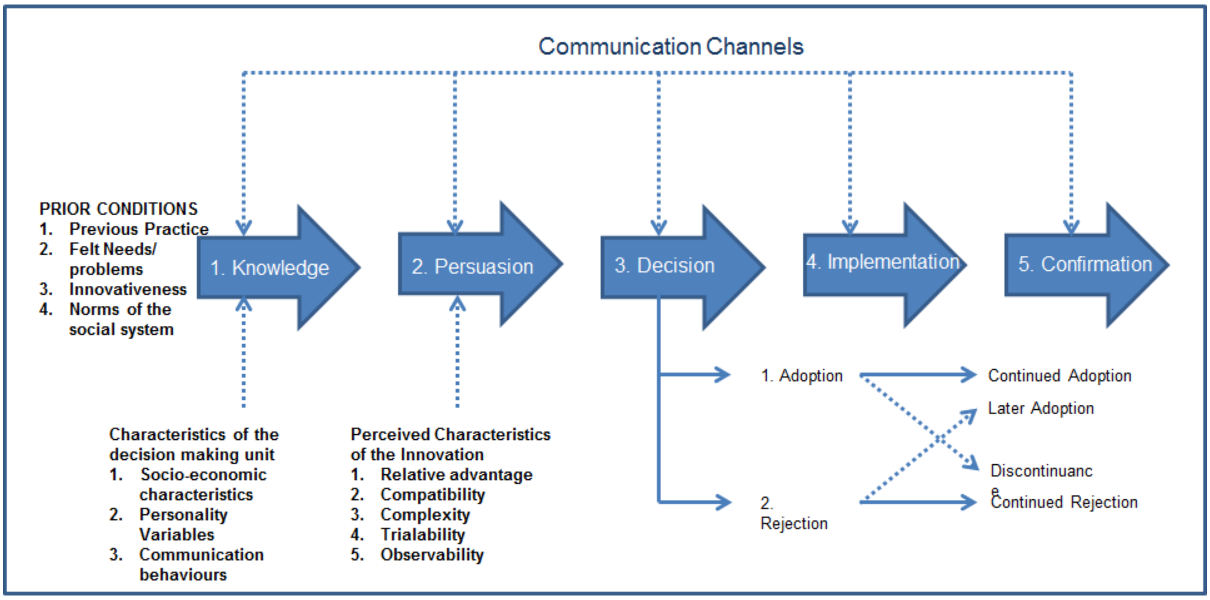
Social System:

Rogers (2003: 23) defined the social system as "*a set of interrelated units engaged in joint problem solving to accomplish a common goal*". Since the diffusion of innovations takes place in the social system, it is influenced by the social structure of the social system, and individuals' innovativeness, which is the main criterion for categorizing adopters, which in turn is affected by the nature of the social system.

2.3.4.1.2 The Innovation-Decision Process

The Innovation-Decision process is shown in Figure: 2-24 and it consists of five stages which follow each other consecutively.

Figure: 2-24: Roger's Innovation-Decision Process



(Source: Rogers, 2003)

1. *Knowledge Stage:*

The process begins with the first stage which is knowledge and here the three critical questions the individual asks are 'What?'; 'How?' and 'Why?' Answering these questions gives the individual three sources of knowledge: the 'Awareness-knowledge' which represents the knowledge of the innovation's existence; the 'How-to-knowledge' which contains information about how to use the innovation correctly; and the 'Principles-knowledge' which includes the functioning principles describing how and why an innovation works (Rogers, 2003).

The knowledge element has two sets of factors that influence it. The first set of factors is that of 'Prior Conditions' and four factors which play a role here, namely: Previous practice; Felt need or problems; Innovativeness and the Norms of the social system (Rogers, 2003).

The second set of factors are the 'Characteristics of the Decision Making Unit' and these factors are discussed in more detail in section 2.3.4.1.4 as they are also linked to adaptor categories which are explained in section 2.3.4.1.3.

2. Persuasion Stage:

The persuasion stage is where the individual shapes his or her attitude after he or she knows about the innovation, so the persuasion stage follows the knowledge stage in the innovation-decision process (Rogers, 2003). Rogers (2003) also highlights the fact that this stage is affective–(or feeling) centred, while the knowledge stage is more cognitive–(or knowing) centred. Hence, the individual is more influenced by those closest to them.

The persuasion stage is influenced by the five ‘Perceived Characteristics of the Innovation’ which influence the ‘Rate of Adoption’ and are explained in more detail in section 2.3.4.1.5.

3. Decision Stage:

At this stage, the individual chooses to adopt or reject the innovation. While adoption refers to “*full use of an innovation as the best course of action available*,” rejection means “*not to adopt an innovation*” (Rogers, 2003: 177).

Rejection is possible at all stages. Rogers (2003), defines two types of rejection, ‘active’ and ‘passive’ rejection. The first type of active rejection is an individual who tries an innovation and thinks about adopting it, but decides not to adopt it. The second type of active rejection is a discontinuance decision, which is the individual decides to reject an innovation after adopting it earlier. The passive rejection is when the individual does not think about adopting the innovation at all.

4. Implementation Stage:

At the implementation stage, an innovation is put into practice. It is at this stage that Reinvention, which is “*the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation,*” takes place (Rogers, 2003: 180). Rogers further indicates that the more reinvention takes place, the more rapidly an innovation is adopted and becomes institutionalized (Rogers, 2003).

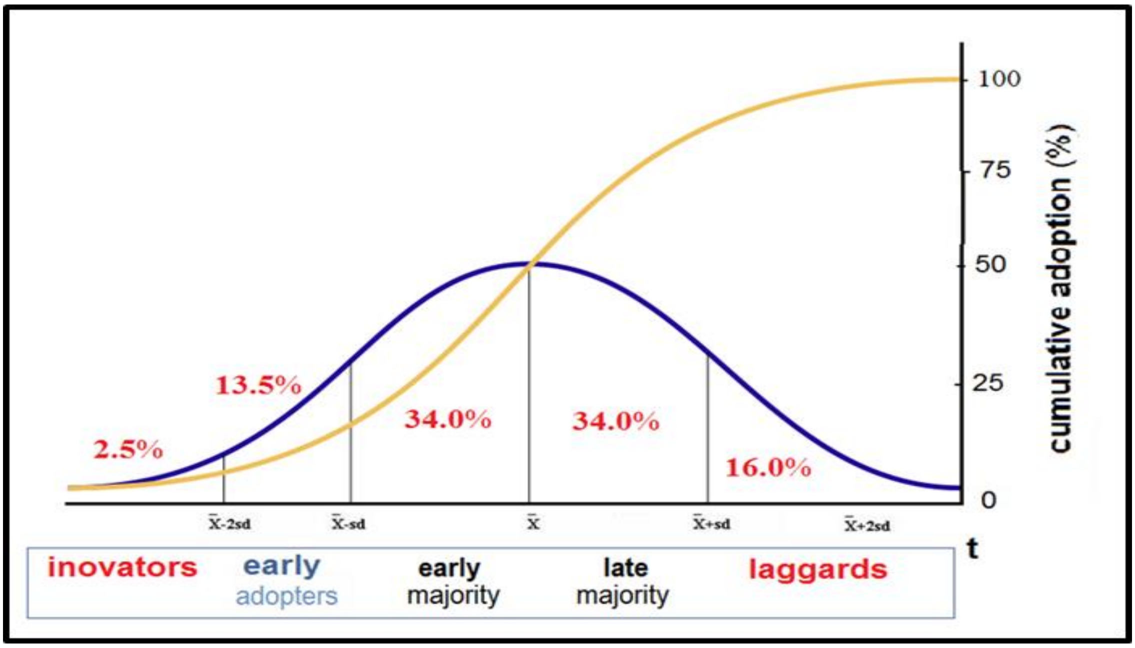
5. Confirmation Stage:

At this stage the decision has already been made but the individual is looking for confirmation that they have made the right decision. ‘Later adoption’ or ‘discontinuance’ happens at this stage. Discontinuance can either be ‘replacement discontinuance’ where a better innovation occurs or ‘disenchantment discontinuance’ when the individual is not satisfied with the innovation’s performance (Rogers, 2003).

2.3.4.1.3 Adopter Categories

Rogers postulated that not all people adopt an innovation at the same time, but rather they adopted it in a time sequence. Rogers (2003) developed a system based on the 'S' curve and the underlying bell curve. Rogers (2003: 22) defined the adopter categories as "*the classifications of members of a social system on the basis of innovativeness*". He describes innovativeness as "*the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system*" (Rogers, 2003: 22). He determined five categories, which are shown in Figure: 2-25 below, and tied them to a characteristic of the innovator and their position in the social structure.

Figure: 2-25: Rogers Categories of Adoption



(Source: Rogers, 2003)

The five categories are the following:

Innovators – Venturesome:

Innovators are very eager to try out new ideas and this leads them out of a local circle of peer networks and into a wider circle of social networks. They also act as gate keepers for new innovations (Rogers, 2003; Sahin, 2006).

Early Adopters – Respectable:

Rogers indicates that early adopters are likely to hold leadership roles in the social system; other members come to them to get advice or information about the innovation as role models, and hence are more constrained within their social system (Rogers, 2003; Sahin, 2006). They also have the greatest degree of opinion leadership in most social systems. Potential adopters look to early adopters for advice and information about the innovation. The early adopter is considered by many as 'the individual to check with' before using a new idea (Rogers, 2003: 283).

Early Majority – Deliberate:

The early majority are deliberate in adopting an innovation and they are neither the first nor the last to adopt it but they adopt it before the average individual. Thus, their innovation decision usually takes more time than it takes innovators and early adopters. The early majority have a good interaction with other members of the social system, but they do not have a leadership role (Rogers, 2003; Sahin, 2006).

Late Majority – Sceptical:

These are the one third of the population who wait for the others to accept the innovation before they do. Although they are sceptical about the innovation and its outcomes they will eventually accept it because of peer pressure or economic factors, (Rogers, 2003; Sahin, 2006).

Laggards – Traditional:

This group possess almost no opinion leadership, and are most bound to their local social system. Their point of reference is the past and so decisions are often made within the framework of what previous generations have done. These individuals interact primarily with others who also have relatively traditional values. They are last to adopt an innovation and often are so slow that the innovation has been superseded by something new (Rogers, 2003; Sahin, 2006).

2.3.4.1.4 Characteristics of the Decision Making Unit

Rogers and Shoemaker (1971) attempted to tie certain individual characteristics to the various adopter categories in what they called 'generalizations'. They created ninety one generalizations from meta-research, which they describe as "*the* *synthesis of empirical research results into more general conclusions at a theoretical level*" (Rogers, 1993: 127). The main method of meta-research they used is the propositional inventory, in which the written conclusions from each empirical research are tabulated in a series of propositions and then more general conclusions, generalizations are drawn. They chose various factors which fell within the three personal characteristics of socio-economic, personality variables and communication and related them to one of the adopter categories. For example, they made the statement "*Generalization 7-3: Earlier adopters have more years of education than later adopters have*" (Rogers 1993: 251). They then examined all the empirical research carried out on diffusion of innovations, and evaluated that statement in the light of these studies. The results were that 203 reports supported the statement, while 72 did not support it, giving a 74% ratification of the statement (Rogers, 1993: 260-261).

2.3.4.1.5 Attributes of Innovation and Rate of Adoption

The final interconnected area was that Rogers (1993: 238) drew up "*five attributes that can be used to describe innovations and show that the individuals' perceptions of these characteristics are predictive of the rate of adoption*". The five characteristics are:

*Relative Advantage***:**

Rogers (2003: 229) defined relative advantage as *"the degree to which an innovation is perceived as being better than the idea it supersedes*". The cost and social status motivational aspects of innovations are elements of relative advantage.

Compatibility:

Rogers (2003: 15) stated that *"compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters*".

Complexity:

Rogers (2003: 15) defined complexity as *"the degree to which an innovation is perceived as relatively difficult to understand and use*". It is negatively correlated with the rate of adoption and is thus opposite of all the attributes.

Trialability:

According to Rogers (2003: 16), “*trialability is the degree to which an innovation may be experimented with on a limited basis*”. The more often an innovation can be trialled the greater its rate of adoption and hence it is more positively correlated with the rate of adoption.

Observability:

Rogers (2003: 16) defined observability as “*the degree to which the results of an innovation are visible to others*”. Like the others it is positively correlated to the rate of adoption. Parisot (1997) indicated that Role Modelling (or peer observation) is the key motivational factor in the adoption and diffusion of technology.

2.3.4.2 Perceived Characteristics of Innovating (PCI) framework

Tornatzky and Klein (1982) identified a further 5 attributes of innovation and rate of adoption namely: cost, communicability, divisibility, profitability and social approval. In their work on ‘*Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation’*, Moore and Benbasat (1991) drew upon the work of Rogers (1983) to develop the belief constructs of the Perceived Characteristics of Innovating (PCI) framework, see Figure: 2-26. They took the five attributes which Rogers (1983), had identified and used them as the starting point of the Framework. They then examined the work of Tornatzky and Klein (1982) and realised from their discussion that divisibility and trialability were closely related as well as communicability and observability and so they discarded them. They also noted that on an individual level cost and profitability are not applicable and so they too were discarded.

Moore and Benbasat (1991) then changed the construct of Complexity to Ease of Use and to that adopted the remaining two Rogers’ constructs (Relative Advantage, Compatibility) and added four more constraints, namely; Image, Visibility, Results Demonstrability and Voluntariness of Use. Thus the seven constructs in the PCI framework are:

Relative Advantage:

"*The degree to which an innovation is perceived as being better than its precursor*" (Moore and Benbasat, 1991: 195).

Compatibility:

"*The degree to which innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adaptors*" (Moore and Benbasat, 1991: 195).

Ease of Use:

"*The degree to which an innovation is perceived as being difficult to use*" (Moore and Benbasat, 1991: 195).

Image:

"*The degree to which use of an innovation is perceived to enhance one's image or status in one's social system*" (Moore and Benbasat, 1991: 195).

Visibility:

"*The degree to which one can see others using the system in the organisation* (Venkatesh, *et al*., 2003: 431).

Results Demonstrability:

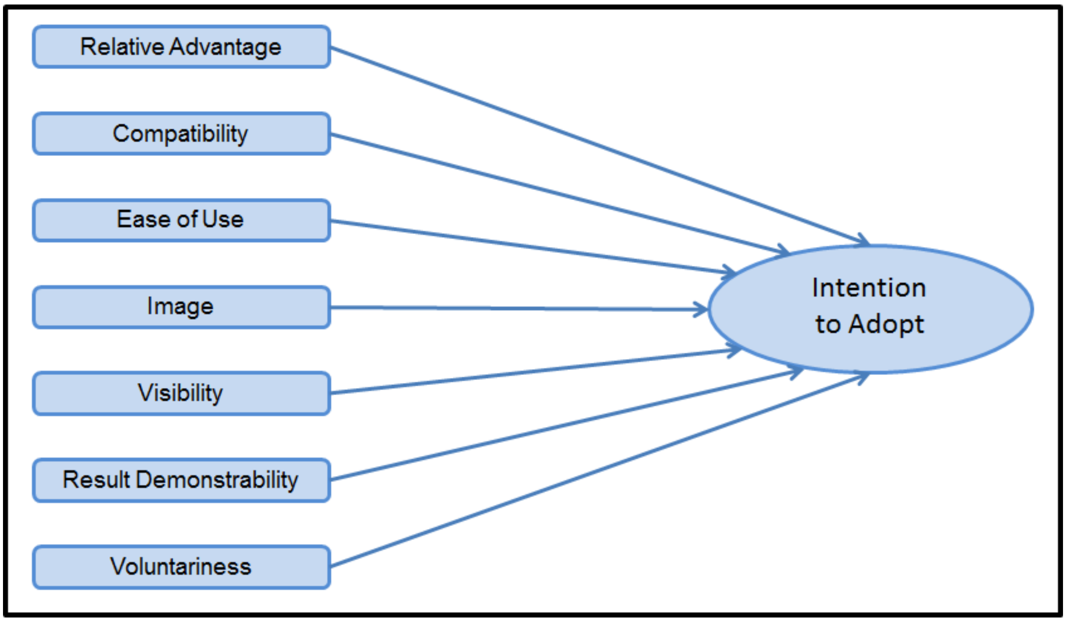
"The tangibility of the results of using the innovation, including their observability and communicability" (Moore and Benbasat, 1991: 203).

Voluntariness of Use:

"*The degree to which use of the innovation is perceived as being voluntary or of free will*" (Moore and Benbasat, 1991: 195).

Moore and Benbasat (1991) found predictive support for the constructs and developed a 34-item instrument comprising of 7 scales that can be used to investigate how perceptions affect individuals' actual use of information technology as well as other innovations. Agarwal and Prasad (1997 and 1998) found support for the framework's predictive validity as did Plouffe, Hulland & Vandenbosch (2001).

Figure: 2-26: Perceived Characteristics of Innovating (PCI) framework



(Source: Moore and Benbasat, 1991)

Karahanna, *et al*. (1999) conducted a between-subjects comparison to study the impact of innovation characteristics on adoption and usage behaviour. For usage behaviour only relative advantage and image were significant, while for adoption it was relative advantage, ease of use, visibility, results demonstrability and trialability.

2.3.4.3 Key Outputs from These Models

The innovation diffusion theory of frameworks is a vital step in the development of the theory of the adoption of innovations and information technology (Mazen, 2017; Freeman and Mubichi, 2017). A crucial point with regard to the framework is that it is comprehensive in that it looks at the four elements of diffusion, the stages and rates of adoption, and also the characteristics of the people and the attributes of the innovation itself and how they influence the rate of adoption (Mazen, 2017). The fact that this theory is still being used by researchers indicates its importance (Mazen, 2017; Freeman and Mubichi, 2017).

The work of Moore and Benbasat (1991) in their theory of the Perceived Characteristics of Innovating (PCI) is very important in that in previous diffusion research the attributes had been defined in respect of the innovation itself, while Moore and Benbasat reworded the definitions to be defined in terms of the user of the innovation (Mazen, 2017; Freeman and Mubichi, 2017). Thus, Relative

Advantage was reworded from *“the degree to which an innovation is perceived as being better than the idea it supersedes*” (Rogers, 2003: 29), as to read “*the degree to which using the innovation is perceived as being better than using its precursor”* (Moore and Benbasat, 1991: 196). They had moved the attribute of the innovation from the innovation itself, to the individual and how they perceived the attribute, thus tying innovation and technology to the perceptions of individuals. These models form a link between the diffusion of an innovation to that of the behaviour of individuals (Mazen, 2017; Freeman and Mubichi, 2017).

These models are important to this research in that they introduce two important concepts that will be used in the development of the framework. The first concept they introduce is the five concepts of Image, Visibility, Voluntariness, Results Demonstrability and Ease of Use which are all concepts that are included in the concept of Social Image in the framework.

The second concept that is of importance from this class of models, is the concept of the actual product itself (Mazen, 2017; Freeman and Mubichi, 2017) and hence the need to differentiate mobile data from mobile voice in the research as they have very different adoption characteristics.

2.3.5 Behavioural Frameworks

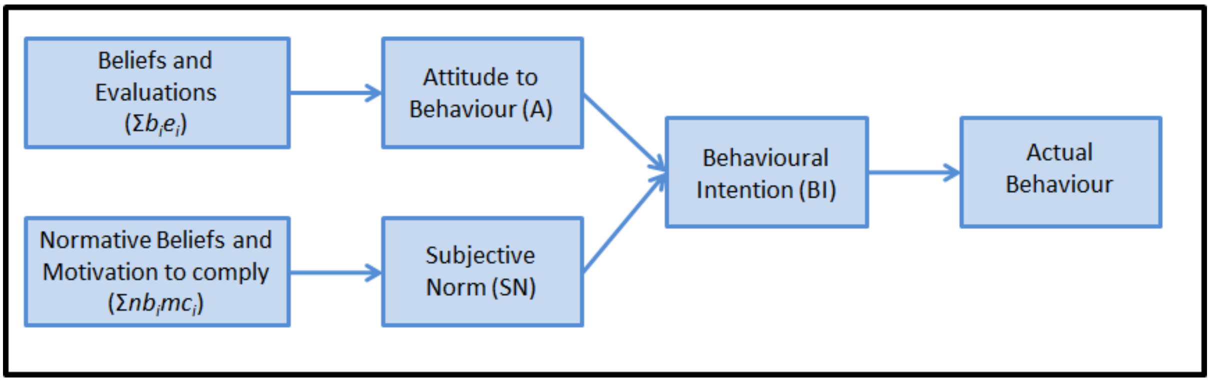
In this section the various types of behavioural frameworks which have been developed over time are examined. These frameworks all come out of the social sciences to explain human behaviour and have been used to predict a wide range of behaviours. The first fundamental frameworks serve as a basis and introduction into the behavioural frameworks which are specifically related the Adoption of ICT, namely the Technology Acceptance Model, (TAM) of Davis (1986 and 1989) and the subsequent developments of this framework.

2.3.5.1 Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975) was first introduced in an effort to understand the relationship between attitude and behaviour as there had been a significant amount frustration resulting from the repeated failure to predict behaviour from traditional measures of attitude (Fishbein, 1993). The TRA is one of the most important and fundamental frameworks of human behaviour. The TRA is very general and is “*designed to explain just about any human behaviour”*

(Fishbein and Ajzen, 1980: 4). It has been used to explain diverse subjects from 'Vote in a Presidential election' (Ajzen, Timko, and White, 1982) to 'Use birth control pills' (Davidson and Jaccard, 1979) and 'Watch the rerun of a particular TV program' (Loken, 1983). The Theory of Reasoned Action is shown in Figure: 2-27.

Figure: 2-27: Theory of Reasoned Action



(Source: Davis, et al., 1989: 984)

The TRA has the following two core constructs.

Attitude towards Behaviour:

"*An individual's positive or negative feelings (evaluative effect) about performing the target behaviour"* (Fishbein and Ajzen, 1975: 216). The theory goes further to state that an individual's attitude towards a behaviour is determined by that individual's salient beliefs (b_i) about the consequences of performing that behaviour multiplied by the evaluation *(e_i)* of the consequences (Davis, Bagozzi & Warshaw, 1989: 984)

Subjective Norm:

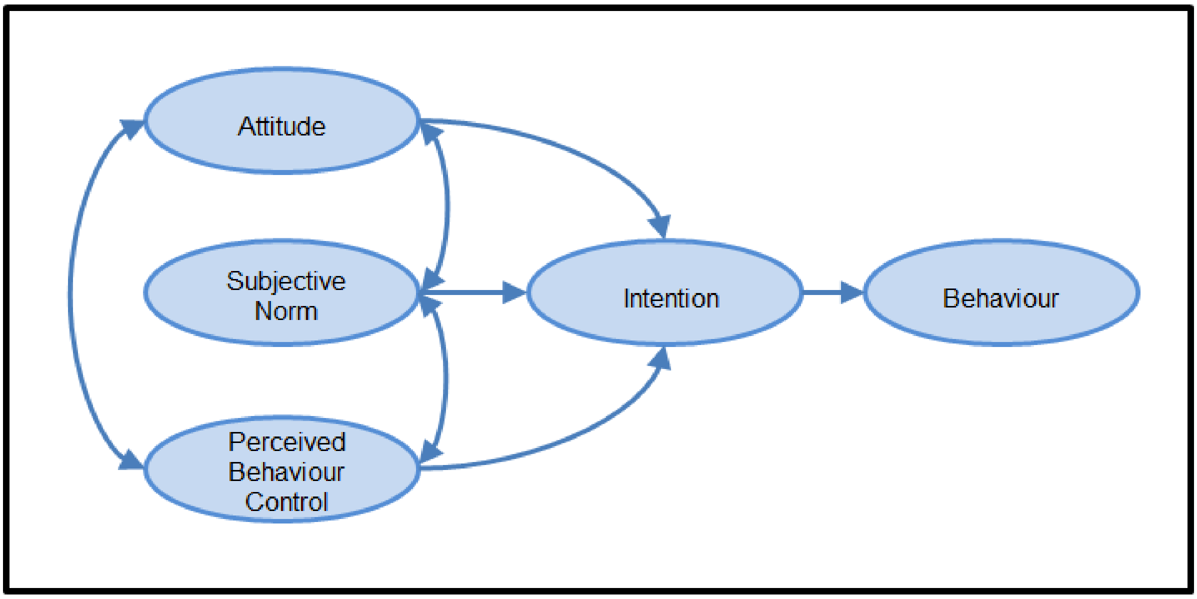
"The person's perception that most people, who are important to him, think he should or should not perform the behaviour in question" (Fishbein and Ajzen, 1975: 302). The theory states that the subjective norm is determined by the individual's normative beliefs *(nb_i)*, which are perceived expectations of specific referent individuals and groups, multiplied by the motivation to comply *(mc_i)* with those expectations (Fishbein and Ajzen, 1975: 302).

Davis, *et al*. (1989) applied the Theory of Reasoned Action to an individual's acceptance of technology and they found that the results were consistent with its use in predicting other behaviours. Davis, *et al*. (1989) examined the role of Experience on the model, using an empirical cross-sectional analysis of 107 MBA students, and found no discernible change in the determinants. Karahanna, *et al*. (1999) discovered that as experience increased, the subjective norm became less important and attitude became more important.

2.3.5.2 Theory of Planned Behaviour (TPB) (1991) and Decomposed Theory of Planned Behaviour (DTPB)

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) is an extension of the TRA with a third constructs, perceived behavioural control, added to the other determinants of attitude and the subjective norm. Perceived behavioural control is defined as "*the perceived ease or difficulty of performing the behaviour*" (Ajzen, 1991: 188). The Theory of Planned Behaviour is shown in Figure: 2-28.

Figure: 2-28: Ajzen Theory of Planned Behaviour

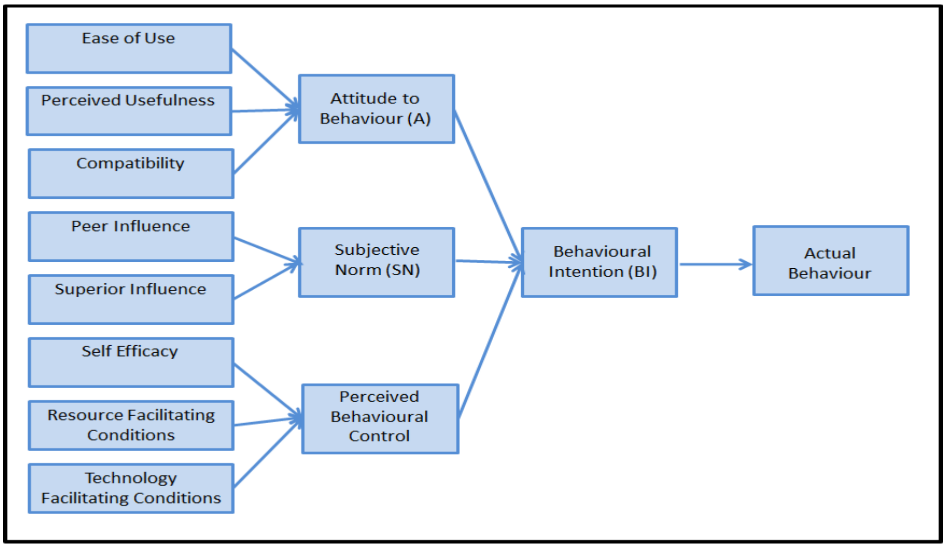


(Source: Ajzen, 1991: 182)

Ajzen (1991) presented several studies successfully using TPB to predict intention and behaviour in a wide range of subjects. Mathieson (1991) in a comparison of the TPB with the TAM found that it performed very well in being able to predict the use of an Information Technology system. Harrison, Mykytyn, & Riemenschneider (1997), in a study of 162 small businesses, found that TPB was a very good description of the process by which small business executives decide to adopt IT for competitive purposes.

The Decomposed Theory of Planned Behaviour (DTPB) (Taylor and Todd, 1995) is an extension of the Theory of Planned Behaviour where the three constructs of attitude, the subjective norm and perceived behavioural control are 'decomposed' into their underlying belief structures within a technology adoption context. Hence, in the context of Information Systems research perceived behavioural control becomes *perceptions of internal and external constraints on behaviour* (Taylor and Todd, 1995). Figure: 2-29 shows the Decomposed Theory of Planned Behaviour.

Figure: 2-29: Decomposed Theory of Planned Behaviour



(Source: Modified from Taylor and Todd, 1995: 146)

Further research was carried out by on TPB and DTPB with the following outcomes. Morris and Venkatesh (2000) confirmed the findings of Karahanna, *et al.* (1999) that with increasing levels of experience the subjective norm becomes less important. Morris and Venkatesh (2000) and Venkatesh, *et al*. (2003) found that age and gender had an influence on behaviour intention. While Hartwick and Barki (1994) determined that the subjective norm became more important the less voluntary the system became.

2.3.5.3 Motivational Model (MM)

The general Motivational Model (MM) is one of the main theories in psychology in predicting behaviour and has been supported by a significant body of research in many other fields. The main premise of the Motivation Model is that there are extrinsic and intrinsic motivations that shape the behaviour of the user (Vallerand, 1997). Davis, Bagozzi & Warshaw (1992) successfully applied motivational theory in the Information systems area to understand new technology adoption and its use. For their use of the framework Davis, *et al*. (1992) defined the two constructs as:

Extrinsic Motivation:

Extrinsic motivation is the perception that users will want to perform an activity "*because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself such as improved job performance, pay or promotions",* (Davis, *et al*., 1992: 1112).

Intrinsic Motivation:

Intrinsic motivation is the perception that users will want to perform an activity "*for no apparent reinforcement other than the process of performing the activity per se"*, (Davis, *et al*., 1992: 1112).

Examples of extrinsic motivation are perceived usefulness, perceived ease of use, and subjective norm, while an example of the intrinsic motivation is the extent of enjoyment that a person derives from playing with a computer (Sharma and Mishra, 2014).

2.3.5.4 Social Cognitive Theory (SCT)

The Social Cognitive Theory (SCT) (Bandura, 1978 and 1986) is one of the most powerful theories of human behaviour (Venkatesh, *et al*., 2003). The focus of the SCT in technology adoption, as used by Compeau and Higgins (1995), is on the concept of self-efficacy which is defined as "*the judgment of one's ability to use a technology to accomplish a particular job or task*" (Bandura, 1978: 241). In the SCT the behaviour of the user is influenced by the outcome related to personal and performance gains, with self-efficacy influencing the outcome of both. Esteem and a sense of achievement are the expected personal outcomes, while job performance expectations are job related outcomes (Bandura, 1978). In the SCT there are two opposing factors that influence the outcomes. The factor affect, which is the extent to which the individual enjoys their job, is the positive contribution, while the negative contribution is anxiety which is the extent to which the individual is anxious about performing unfamiliar tasks (Bandura, 1978). Compeau and Higgins (1995) used the factor Usage as their dependant variable, while Venkatesh, *et al*. (2003) adapted it to both Intention and Usage as the dependent variables.

2.3.5.5 Model of Personal Computer Utilisation (MPCU)

Triandis (1997) recognised the key role played by both social factors and emotions in forming intentions as well as the importance of past behaviour on the present. He proposed a Theory of Human Behaviour in which intentions are immediate antecedents of behaviour, but also crucially, that behaviour is mediated by habits. Also, both intentions and habits are moderated by facilitating conditions. The theory of Triandis differs from the Theory of Reasoned Action (Fishbein and Ajzen, 1975), in that it makes a distinction between cognitive and affective components of attitudes with Beliefs belonging to the cognitive component of attitudes. To summarise, Triandis, behaviour is determined by what people would like to do, attitudes what they think they should do, social norms what they have usually done, habits, and by the expected consequences of their behaviour (Triandis, 1997).

Thompson, *et al*. (1991) adapted this theory to create a framework, the Model of Personal Computer Utilisation (MPCU), to explain the utilisation of a PC by a worker when it is not made mandatory by the organisation, see Figure: 2-30. In this framework they defined six constructs as the following:

Job-fit:

Job fit is "*the extent to which an individual believes that using [a technology] can enhance the performance of his or her job"* (Thompson, *et al*., 1991: 129).

Complexity:

Is "*the degree to which an innovation is perceived as relatively difficult to understand and use"* (Thompson, *et al*., 1991: 128).

Long-term Consequences:

*Long-term consequences are defined as "outcomes that have a pay-off in the futu*re" (Thompson, *et al*., 1991: 129).

Affect Towards Use:

Are "*feelings of joy, elation, or pleasure, or depression, disgust, displeasure or hate associated by an individual with a particular act"* (Thompson, *et al*., 1991: 127).

Social Factors:

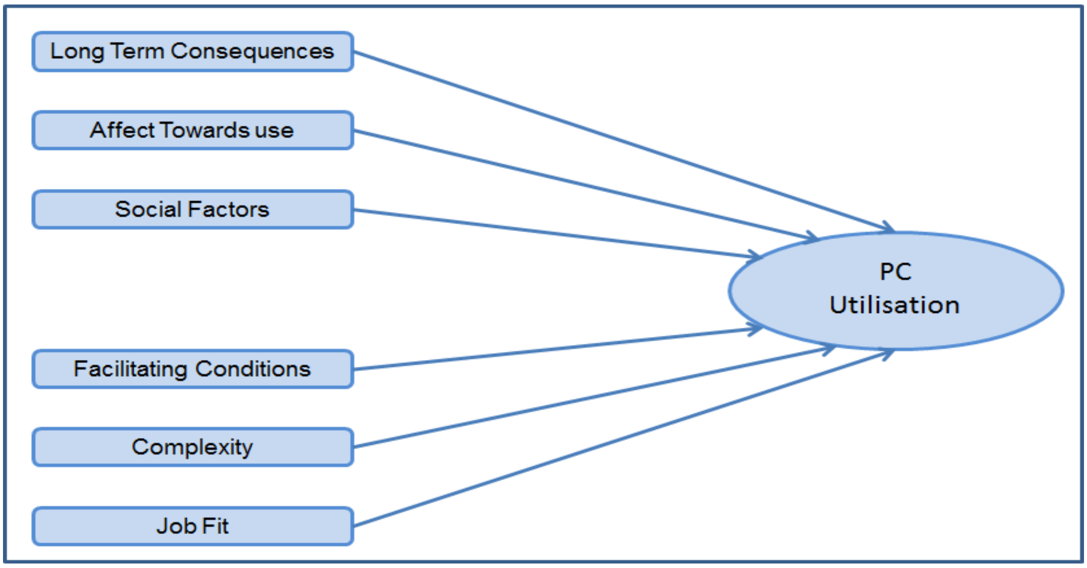
Social factors are "*the individual's internalisation of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations"* (Thompson, *et al*., 1991: 126).

Facilitating Conditions:

Facilitating factors are factors which make the act of doing easier to accomplish, for example, the "*provision of support for users of PCs may be one type of facilitating condition that can influence system utilisation"* (Thompson, *et al*., 1991: 129).

Further research by Thompson, Higgins, & Howell in 1994, found that the lower the experience the more important become the constructs of complexity, particularly the affect toward use, social factors and facilitating conditions.

Figure: 2-30: Model of Personal Computer Utilisation (MPCU)



(Source: Thompson, et al., 1991)

2.3.5.6 Key Outputs from These Models

The behavioural models described in this section are important in that they form the theoretical basis for the technology acceptance models which follow.

The models are important in introducing the concepts of internal and external motivation as well as reinforcing the factors of peer influence and other social factors influencing the adoption of services. Another key output was the issue of complexity with the service, as mobile data is more difficult to set up and operate than mobile voice; hence complexity of the service could possibly be an inhibitor.

An important output of this class and the previous classes of models was that they had an influence on the analysis of the interviews and they also had a direct input into the questionnaire in terms of possible inhibitors and moderating factors.

2.3.6 Technology Acceptance Models

The Technology Acceptance Model (TAM) (Davis, 1986 and 1989) and its subsequent modifications are some of the most significant models used for explaining the adoption of technology. (According to Google Scholar, the number of citations of the original article had reached, as of July 2019, nearly 44500 (Google Scholar 2019). There has been a steady progression in the development of the Technology Acceptance Model and according to Rondan-Cataluña, Arenas-Gaitán and Ramírez-Correa (2015), it is still developing. Originally the studies were based on the introduction of computers into the workplace, but as with ICT it has moved into all walks of life and society. Currently, it is most often used in explaining the adoption of new technologies in the consumer environment. However, the most important thing with this model and its developments is the fact that they explain the success or failure of new technologies (Rondan-Cataluña, *et al*., 2015)

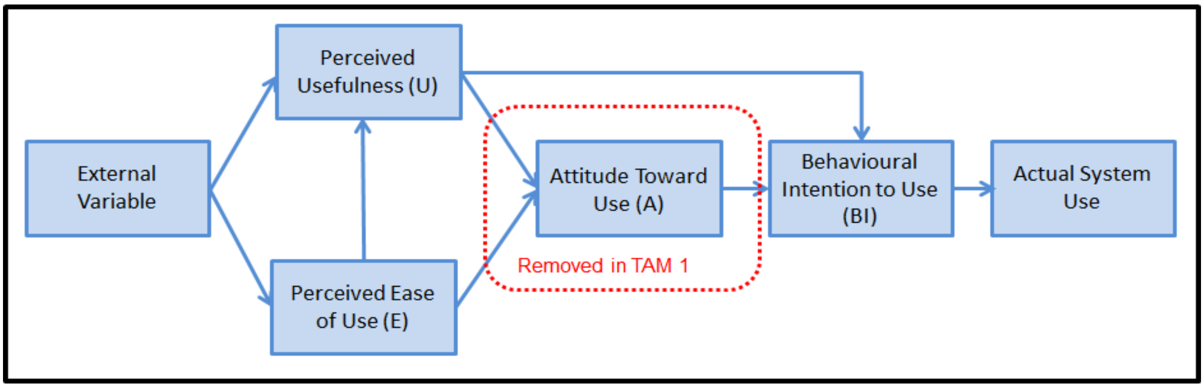
2.3.6.1 Technology Acceptance Model (TAM)

The original Technology Acceptance Model was developed by Davis in 1986 as a specific model to explain the acceptance of Personal Computers in an organisation. It was later extended to explain the adoption of new information technologies and related systems in organisations.

The strength of the model lies in the fact that it only has two constructs (Sharma and Mishra, 2014) and has been found empirically correct in numerous studies (Venkatesh and Davis, 2000). The model is very versatile and has been used to explain the adoption of many different systems in the Information Systems environment. The following examples highlight the wide expanse of applications to which it has been successfully applied: ‘the acceptance of a web site’ (Huang, 2005);

'the implementation of an ERP system' (Gyampah and Salam, 2004); 'the use of the World-Wide-Web for e-learning' (Lin and Wu, 2004); and 'the adoption of e-banking in Tunisia' (Raida and Néji, 2013).

Figure: 2-31: Technology Acceptance Model, TAM 0



(Source: Davis, et al., 1989; Venkatesh and Davis, 1996)

The original TAM model (TAM 0), (Figure: 2-31), was developed out of the Theory of Reasoned Action (Ajzen and Fishbein 1975) by Davis (1986 and 1989), with the three constructs taken from the following frameworks:

Table: 2-8: Source of Constructs of TAM

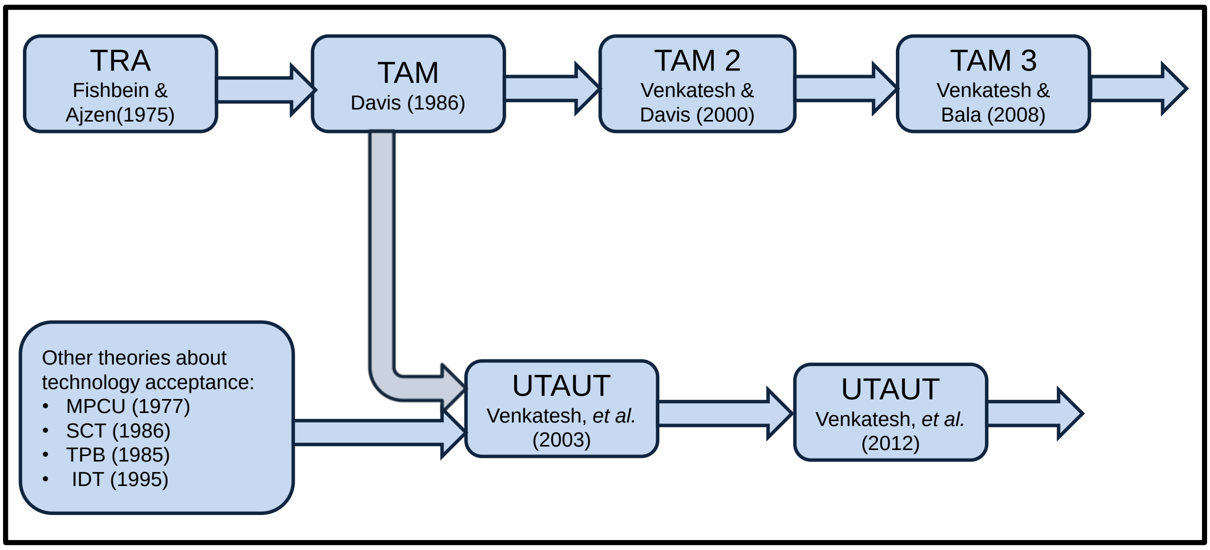
Construct	Definition	Theoretical Background
Perceived Ease of Use (PEU)	The degree to which a person believes that using a particular system would be free of effort, (Davis 1989: 320)	Rogers and Shoemaker, 1971, Innovation of Diffusion Theory
Perceived Usefulness (PU)	The degree to which a person believes that using a particular system would enhance his or her job performance, (Davis 1989: 320)	Bandura, 1978, Self-efficacy theory
Attitude Towards Use (A)	Feelings of joy, elation, or pleasure, or depression, disgust, displeasure or hate associated by an individual with a particular act, (Thompson *et al*., 1991: 127)	Thompson, *et al*., 1991, Model of Personal Computer Utilisation (MPCU)

Further work on the model by Davis and others determined that the effect of attitude toward use (A) diminished with time so it was removed from the updated TAM 1 model of Venkatesh and Davies (1996).

2.3.6.2 Evolution of Technology Acceptance Models

The basic Technology Acceptance Model was developed in 1986 and has been in use since that time. However, over time it has been developed and has been improved upon particularly in the area of factors and conditions which have an effect on the main constructs of the model. A major step in this progression was the development of the Unified Technology Acceptance and Usage Model (UTAUT) of Venkatesh, *et al*. (2003). Figure: 2-32 shows the sources of the TAM and how it has evolved into two main streams of model, the TAM and the UTAUT (Rondan-Cataluña, *et al*., 2015).

Figure: 2-32: Progression and Development of the Technology Acceptance Model



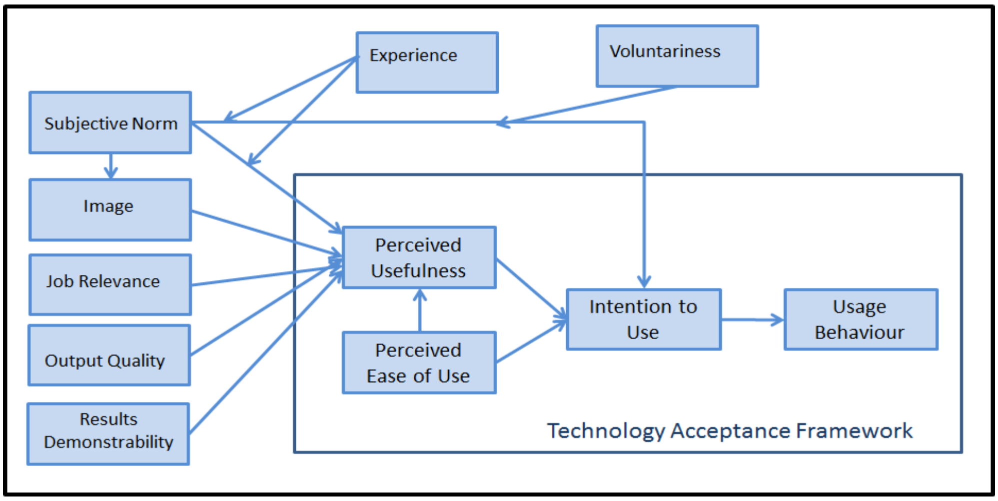
(Source: Adapted from Rondan-Cataluña et al., 2015)

2.3.6.2.1 Technology Acceptance Model 2 (TAM 2)

In 2000 Venkatesh and Davis extended the original TAM by including key determinants of Perceived Usefulness (PU) and Behavioural Intention to Use (BI). They added the social influence processes of Subjective Norm, Voluntariness and Image. The construct for the subjective norm was the same from the theory of Reasoned Action, namely "*the person's perception that most people who are important to him think he should or should not perform the behaviour in question*" (Fishbein and Ajzen, 1975: 302). The subjective norm acted upon both perceived usefulness and intention to use as well as image. They also added the cognitive instrumental processes of job relevance, output quality and results demonstrability. In addition they included the construct of experience to act on the relationships of the subjective norm with both perceived usefulness and behavioural intention to use.

Venkatesh and Davis (2000), concluded that TAM 2 "*extends the TAM by showing that the subjective norm exerts a significant direct effect on usage intention over and* *above perceived usefulness and perceived ease of use for mandatory systems*", (Venkatesh and Davis, 2000: 198), see Figure: 2-33.

Figure: 2-33: Technology Acceptance Model 2



(Source: Venkatesh and Davis, 2000)

2.3.6.2.2 Technology Acceptance Model 3 (TAM 3)

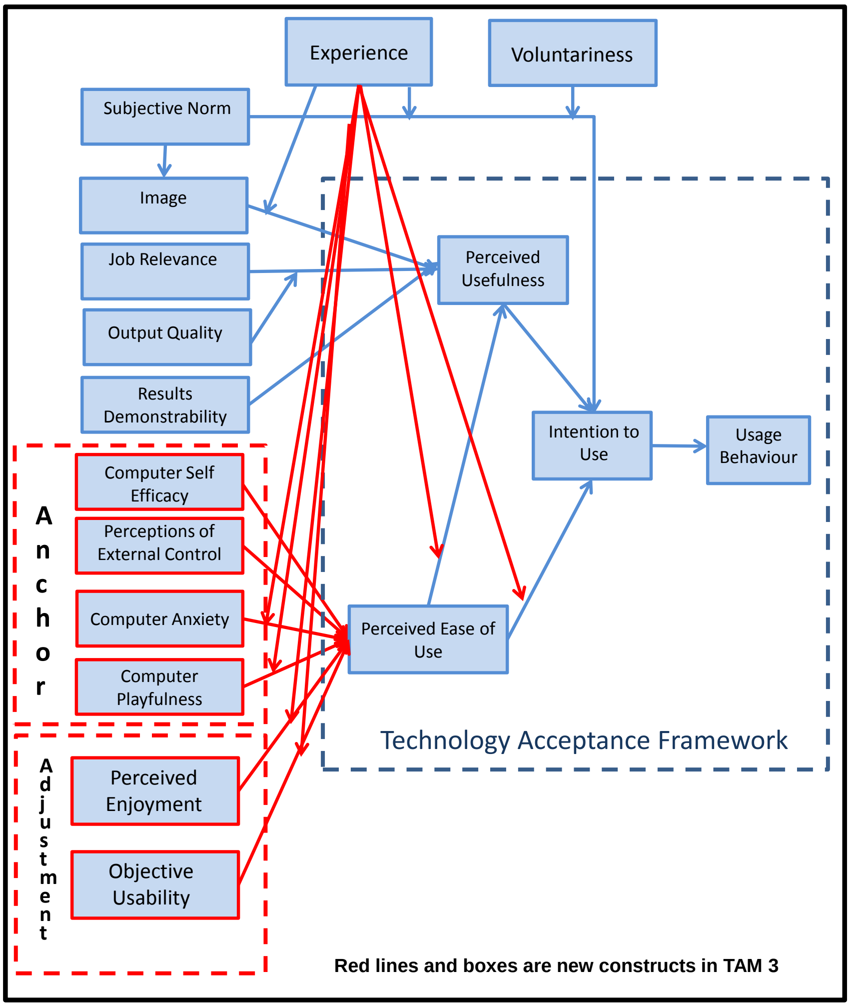
In 2008 Venkatesh and Bala extended the Technology Acceptance Model again by adding the antecedents of Perceived Ease of Use (PEU). They added two sets of factors that had already been identified by Venkatesh in 2000. For the first factor Venkatesh (2000) had argued that individuals have general beliefs regarding computers and computer usage and these will anchor the early perceptions of perceived ease of use of a system. The first three anchors, 'computer self-efficacy', 'computer anxiety' and 'computer playfulness', represent individual differences related to the individuals' general beliefs associated with computers and computer use (Venkatesh and Bala, 2008).

Venkatesh (2000) further suggested that individuals will adjust their initial judgements based on hands on experience with the system. He proposed an additional set of factors namely the two system adjustment characteristics – related adjustments of perceived enjoyment and objective usability. Venkatesh and Bala, (2008) proposed that over time computer self-efficacy and the perceptions of external control would continue to be strong, while the effects of the other two anchors, computer playfulness and computer anxiety would diminish (Venkatesh and Bala, 2008).

Table: 2-9: Additional Constructs of TAM 3 *(*Venkatesh and Bala, 2008*)*

Construct	Definition	Theoretical Background
Computer Self-Efficacy	The degree to which an individual believes that he or she has the ability to perform a specific task/job using the computer	Compeau and Higgins, 1995, 1995a
Computer Anxiety	The degree of "*an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers*".	Venkatesh, 2000: 349
Computer Playfulness	*"the degree of cognitive spontaneity in microcomputer interactions"*	Webster and Martocchio, 1992: 204
Perceived Enjoyment	The extent to which "*the activity of using a specific system is perceived to be enjoyable in its own right aside from any performance consequences resulting from system use*"	Venkatesh, 2000: 351
Objective Usability	A "*comparison of systems based on the actual level (rather than perceptions) of effort required to completing specific tasks*".	Venkatesh, 2000: 350–351
Perception of External Control	The degree to which an individual believes that organizational and technical resources exist to support the use of the system.	Venkatesh, *et al*., 2003

Figure: 2-34: Technology Acceptance Model 3



(*Source: Venkatesh and Bala, 2008*)

The additional constructs used in TAM 3 are explained in Table: 2-9 while the complete framework is given in Figure: 2-34.

2.3.6.2.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

In 2003 Venkatesh, *et al.* took data from four different organisations regarding adoption of information services (IS) over a six month period and used this data to test eight existing behavioural frameworks that were being used to explain the adoption of IS (see Table: 2-10). They carried out longitudinal field studies on the four organisations as the new technology was introduced in the workplace. They evaluated the users perceptions of the technology over a period time as the users' experience with the technology increased.

Table: 2-10: The 8 Frameworks used in the development of the UTAUT Theory

Theory	Core Constructs	Theoretical Background
Theory of Reasoned Action (TRA)	• Attitude Toward Behaviour • Subjective Norm	Fishbein and Ajzen, 1975
Information Diffusion Theory (IDT)	• Relative Advantage • Ease of Use • Image • Visibility • Compatibility • Results Demonstrability • Voluntariness	Rogers, 2003
Theory of Planned Behaviour (TPB)	• Attitude Toward Behaviour • Subjective Norm • Perceived Behavioural Control	Ajzen, 1991
Motivational Model (MM)	• Extrinsic Motivation • Intrinsic Motivation	Davis, *et al*., 1992
Social Cognitive Theory (SCT)	• Outcome Expectation - Performance • Outcome Expectation - Personal • Self-efficacy • Affect • Anxiety	Bandura, 1986
Model of PC Utilisation (MPCU)	• Job-fit • Complexity • Long-term consequences • Affect Toward Use • Social Factors • Facilitating Conditions	Thompson, *et al*., 1991
Technology Acceptance Model 2 (TAM 2)	• Perceived Usefulness • Perceived Ease of Use • Subjective Norm	Venkatesh and Davis, 2000
Combined TAM and TPB (C-TAM-TPB)	• Attitude Toward Behaviour • Subjective Norm • Perceived Behavioural Control • Perceived Usefulness	Taylor and Todd, 1995

(Source: Venkatesh et al, 2003)

Table: 2-11: Table of Constructs in UTAUT Model

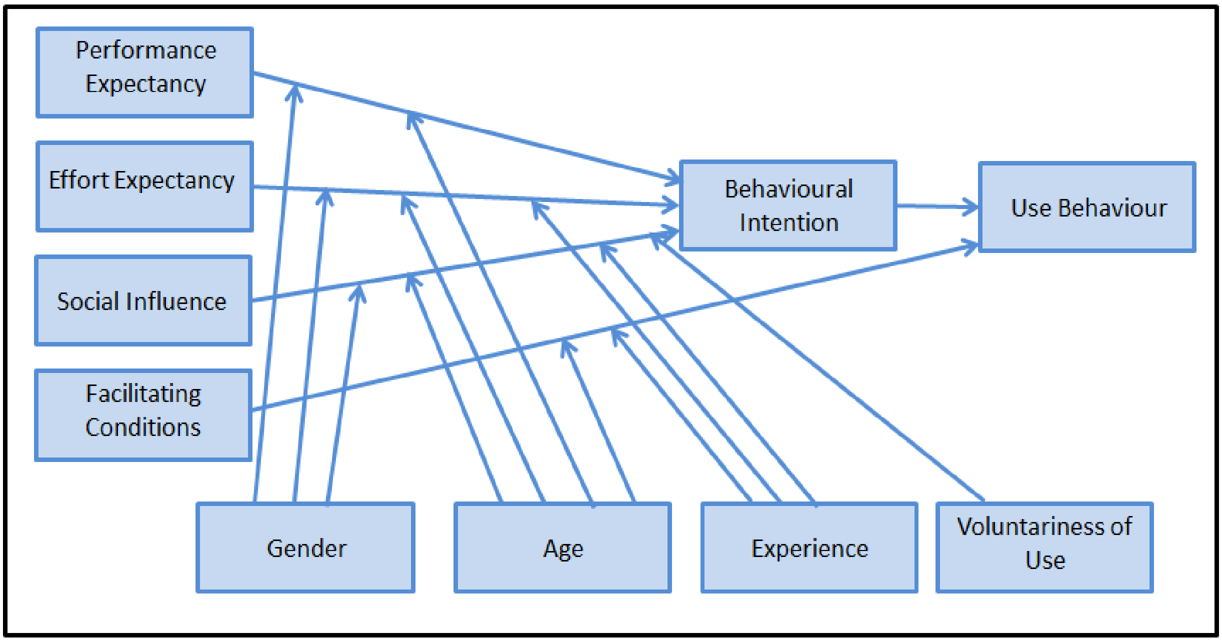
Group	Constructs and Source	Definition
Performance Expectation	**Perceived Usefulness** (Davis, 1989; Davis, *et al*., 1989)	The degree to which an individual believes that using the system would enhance their job performance.
	Extrinsic Motivation (Davis, *et al*., 1992)	The perception that users will want to perform an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay or promotions.
	Job-fit (Thompson, *et al*., 1991)	How the capabilities of a system enhance an individual's job performance
	Relative Advantage (Moore and Benbasat, 1991)	The degree to which using an innovation is perceived as being better than using its precursor.
	Outcomes Expectations (Compeau and Higgins, 1995a)	Outcome expectations relate to the consequences of behaviour, and based on empirical evidence they are separated into performance expectations and personal expectations.
Effort Expectancy	**Perceived Ease of Use** (Davis, 1989; Davis, *et al*., 1989)	The degree to which an individual believes that using a system would be free of effort.
	Complexity (Thompson, *et al*., 1991)	The degree to which a system is perceived as relatively difficult to understand and use.
	Ease of Use (Moore and Benbasat, 1991)	The degree to which a an innovation is perceived as being difficult to use.
Social Influence	**Subjective Norm** (Ajzen 1991; Davis, *et al*., 1989; Fishbein and Ajzen, 1975; Mathieson, 1991; Taylor and Todd, 1995)	The individual's perception that most people who are important to them think they should not perform the behaviour in question.
	Social Factors (Thompson, *et al*, 1991)	The individual's internalisation of the reference groups subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations.
	Image (Moore and Benbasat, 1991)	The degree to which use of an innovation is perceived to enhance one's image or status in one's social system.
Facilitating Conditions	**Perceived Behavioural Control** (Ajzen, 1991, Taylor and Todd, 1995)	Reflects perceptions of internal and external constraints on behaviour and encompasses self-efficacy, resource facilitating conditions and technology facilitating conditions.
	Facilitating Conditions (Thompson, *et al*., 1991)	Objective factors in the environment that observers agree make an act easy to do, including the provision of computer support.
	Compatibility (Moore and Benbasat, 1991)	The degree to which an innovation is perceived as being consistent with existing values, needs and experiences of potential adopters.

(Source: Venkatesh et al, 2003)

The framework,ks individually explained between 17% and 53% of the variance in users' intentions to use information technology.

Using the results they determined that seven constructs were significant direct determinants of intention or usage in one or more of the frameworks (Venkatesh, *et al*., 2003). They determined that four would play a significant role as direct determinants of user acceptance and usage behaviour. They also determined that there were four important moderators. They combined them and postulated a theoretical framework called the Unified Theory of Acceptance and Use of Technology (UTAUT). The model and core constructs are shown in Figure: 2-35 and Table: 2-11.

Figure: 2-35: Unified Theory of Acceptance and Use of Technology (UTAUT) Model



(Source: Venkatesh, et al., 2003)

Venkatesh, *et al*. (2003) tested the theoretical framework against the original data from the four organisations as well as new data from a further two organisations and UTAUT was able to account for 70 percent of the variance (adjusted R^2) in intention which was considerably greater than any of the eight original frameworks and their extensions (Venkatesh, *et al*., 2003). Performance expectancy appears to be a determinant of intentions in most situations, while the strength of the relationship is stronger for men and younger workers. The effect of effort expectancy is again moderated by gender and age but this time it is stronger for women and older workers (Venkatesh, *et al*., 2003).

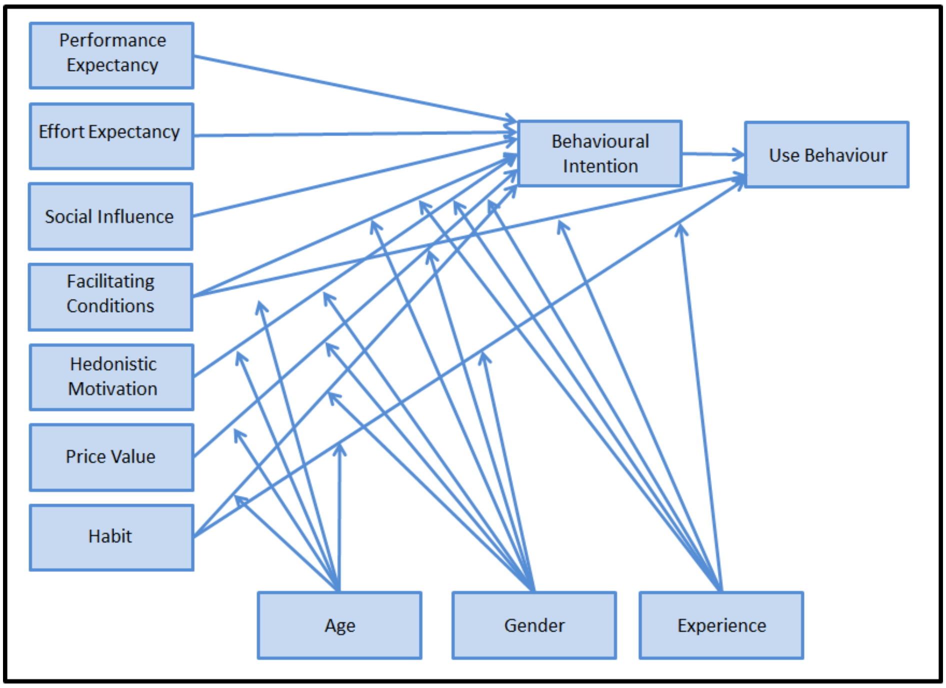
Several studies in addition to the original study of Venkatesh, *et al*. (2003) have empirically tested UTAUT and found it superior to other current competing frameworks (Park, Yang, & Lehto, 2007; Venkatesh and Zhang, 2010), although little UTAUT-based research exists in where it is directly compared to TAM or TPB–based research (Yu, 2012).

In Yu's (2012) study '*Factors Affecting Individuals to Adopt Mobile Banking: Empirical evidence from the UTAUT Model*' the UTAUT model was able to explain 71.2% of the variance in intention and 73.8% of the variance in the behaviour to adopt mobile banking.

2.3.6.2.4 Unified Theory of Acceptance and Use of Technology 2 (UTAUT 2)

Like the TAM and TRA models the UTAUT model was designed from the perspective of the adoption of technologies in a business organisation. Therefore, in order for it to be applicable to consumer technologies Venkatesh, Thong & Xu (2012), added three new determinants of Behavioural Intention (BI) namely, 'hedonistic motivation', 'price value' and 'habit'. They also extended habit to relate to use behaviour as well as behavioural intention. The UTAUT 2 model is illustrated in Figure: 2-36.

Figure: 2-36: Unified theory of Acceptance and Use of Technology 2 (UTAUT 2)



(Source: Venkatesh, et al., 2012)

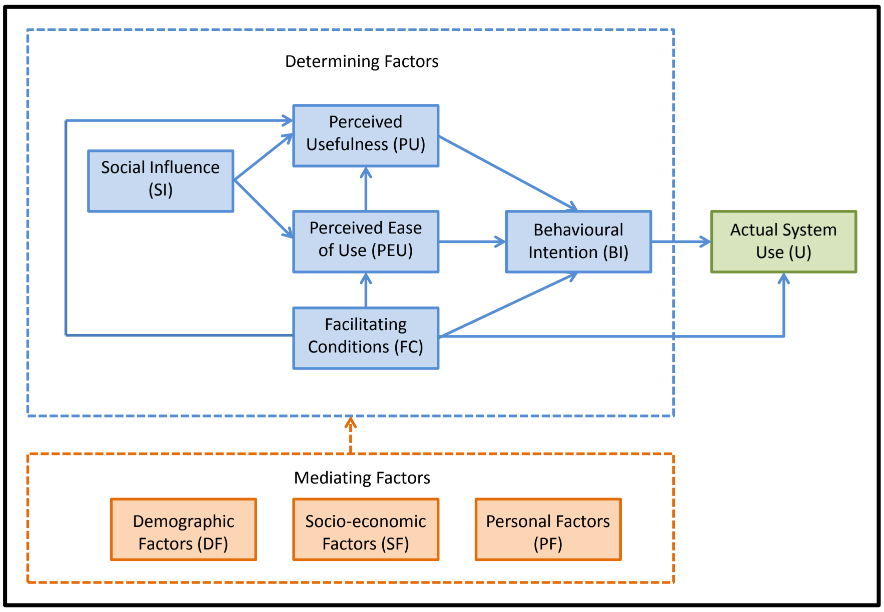
Rondan-Cataluña, *et al*. (2015) tested the TRA, Original TAM (with Attitude towards Use (A)), TAM (without A), TAM 2, TAM 3, UTAUT and UTAUT 2 on a sample of Mobile Internet users in Chile. They found that UTAUT 2 obtained the best explanatory power (R^2 of Use) of all the models at 0.247. The R^2 of Use of the UTAUT model was 0.232 and of all the TAM models was 0.196. Rondan-Cataluña, *et al*., 2015 highlighted the fact that the levels of R^2 of Use were low in all models, although the R^2 of BI to Use for mobile internet in Chile was close to the typical values (Venkatesh, *et al*., 2003 and 2012).

2.3.6.3 Further Recent Development and Modifications to TAM

While the major models based on the Technology Acceptance model and their development are highlighted in the previous section, the development has not ended as there are researchers still are developing extensions and modifications to the models especially with regard to using them to explain an individual's actions.

Among the more recent developments is the MOPTAM of Van Biljon (2006) which extends the model for usage on the adoption of mobile phones in a South African environment. In this research van Biljon highlights the research of Jones and Marsden (2005) who postulate that mobile phone interaction lies at the intersection of the infrastructural, social and cultural factors that determine a user's mobile phone experience and that models such as Kwon and Chidambaram (2000), which do not take mobile phone infrastructure into account, lack accuracy. Hence, infrastructural factors are seen as an important factor and included in the model. Based on prior research in the field of technology adoption on mobile phones Van Biljon deduced two factors that had special significance for mobile phones (Lee, Kim & Chung 2002; Pedersen, 2005; Teo and Pok, 2003; Kleijnen, Wetzels & DeRuyter, 2004; Kwon and Chidambaram, 2000; Roberts and Pick, 2004). The first was the 'social influence' (also known as the subjective norm in the TRA) and encompasses the pressure exerted on an individual by the opinions of others including cultural influences (Fishbein and Ajzen, 1975; Urbaczewski, Wells & Sarker, 2002; Teo and Pok, 2003; Pedersen, 2005). The second was the 'infrastructure factors' or 'facilitating conditions' as the model refers to them and includes variables such as system services, system quality, cost of handsets and the cost of services (Kleijnen, *et al*., 2004; Roberts, 2004; Meso, *et al*., 2005).

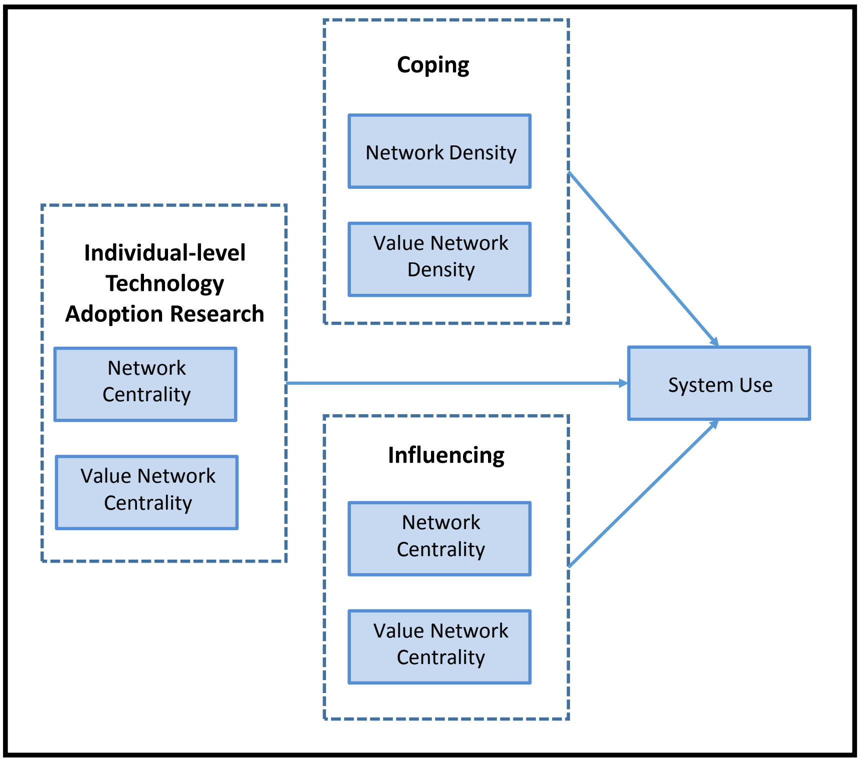
Figure: 2-37: MOPTAM Model of van Biljon



(Source: van Biljon, 2006)

Sykes, Venkatesh & Gosain (2009) proposed the Model of Acceptance with Peer Support (MAPS) framework that integrates the TAM models with earlier research into individuals and constructs from social networking, see Figure: 2-38.

Figure: 2-38: Model of Acceptance with Peer Support (MAPS) framework



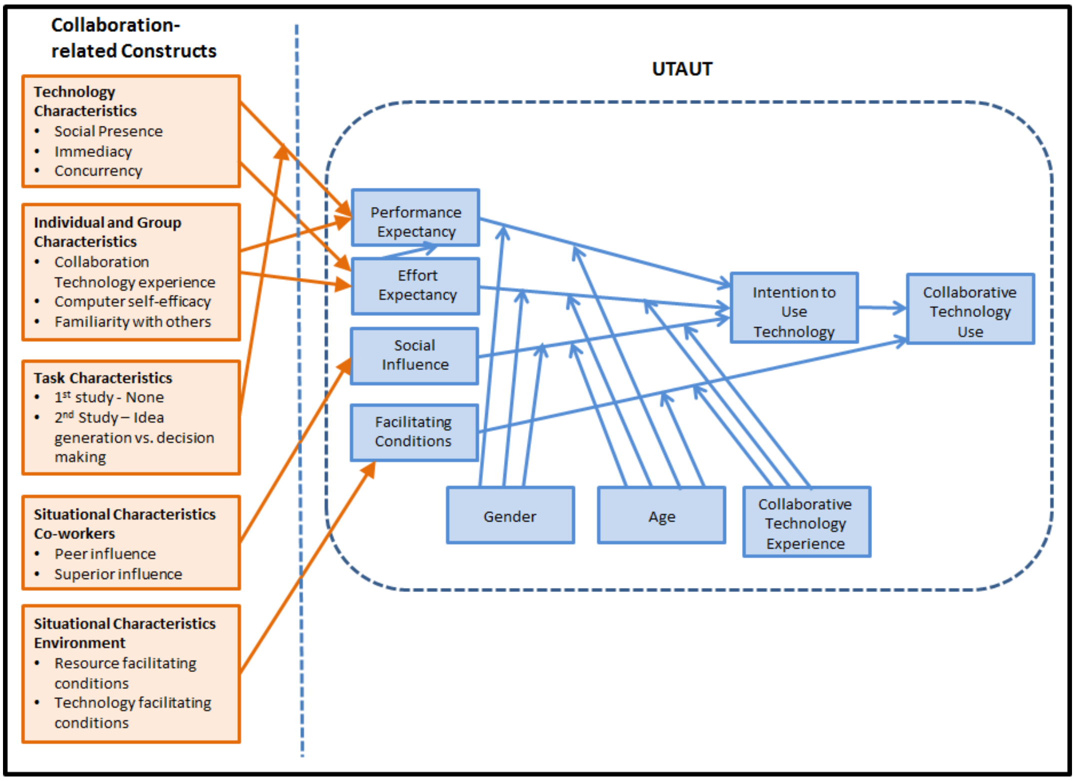
(Source: Sykes, et al., 2009: 376)

They propose two types of social ties. The first get-help refers to an employee obtaining help from co-workers that can result in an increase in the knowledge for using the system. The second tie is give-help and refers to giving assistance to fellow employees thus enabling better understanding of configuration and deployment of the system (Sykes, *et al.,* 2009)**.**

The following two models are described here in a little more detail as they clearly highlight the development of the TAM and UTAUT models. In these models the basic TAM and UTAUT models remain but additional constraints were added on to the front end of the model to be more encompassing with regard to factors of perceived ease of use and perceived usefulness.

The TAM model was criticised by Legris, Ingham & Collerette (2003) for not including organizational and social factors. Brown, Dennis and Venkatesh (2010) then attempted to rectify this problem by including Collaborative Technology aspects to the UTAUT model, see Figure: 2-39.

Figure: 2-39: Combined UTAUT Model with Collaboration Technology



(*Source: Brown, et al., 2010*)

Collaboration technology is a package of hardware and software that can provide one or more of the following functions: support for communication among participants; information-processing support; support to allow better working methods and training, (Dennis, Wixom & Vandenberg, 2001; DeSanctis and Gallupe, 1987; Zigurs and Buckland, 1998).

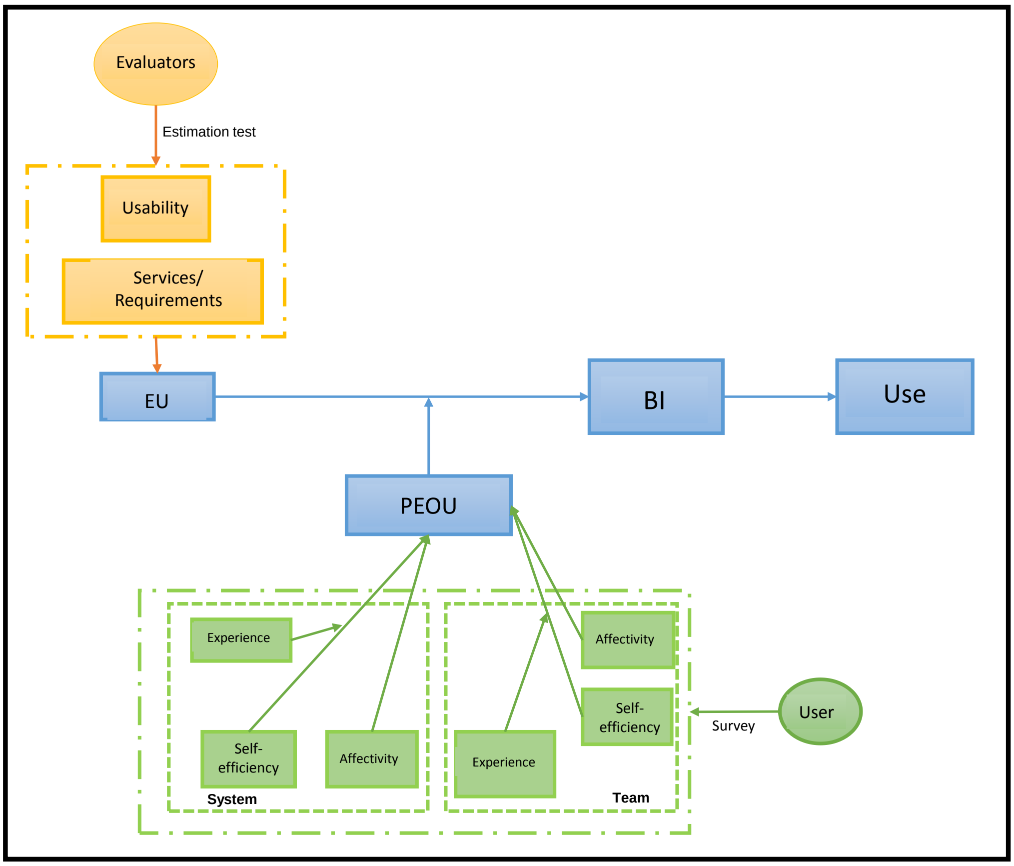
The final model is the e-Business Technology Acceptance Model (EBTAM) the model of Leyton, Pino and Ocha (2015), see Figure: 2-40. They proposed a model which was based on TAM but added several variables from TAM 2, TAM 3 and UTAUT.

Leyton, *et al*., (2015) proposed that usage is often an obligation with a technology, so to employ the construct of 'Use' as a measure of success is not realistic. They proposed behaviour intention to be used as the measure of success instead. They also indicated that is often difficult to predetermine 'Perceived Utility' and therefore proposed a variable called 'Estimated Utility' (EU).

The EU was determined in two actions, by using evaluators, people who know the services that the solution offers. The first was to determine whether all the requirements required were being met by the services offered by the system in a matrix format. The matrix is then scored as a weighted average percentage using a weighting that scores the requirements in terms of criticalness. The second is to use the same evaluators to estimate how usable the system is, a variable called estimate usability (EUSA). They postulate that if the system does not pass a minimum usability level it will not be used in real life. Therefore, this variable is a binary value, with 1 if the system passes the minimum level and a 0 if it does not. The final EU is the sum of the two actions.

The model also looks at Perceived Ease of Use (PEU) and estimates this again by taking two variables of TAM 3: anxiety and self-efficacy and by adding a third factor of experience as a moderating variable on self-efficacy. These factors were evaluated and estimated with respect to the system twice, the first time the users evaluate it as individuals and secondly time as a collaborative team working together in a survey. The final model with both estimations is shown in Figure: 2-40.

Figure: 2-40: EBTAM Model of Leyton, Pino and Ocha, 2015



(Source: Leyton, et al., 2015)

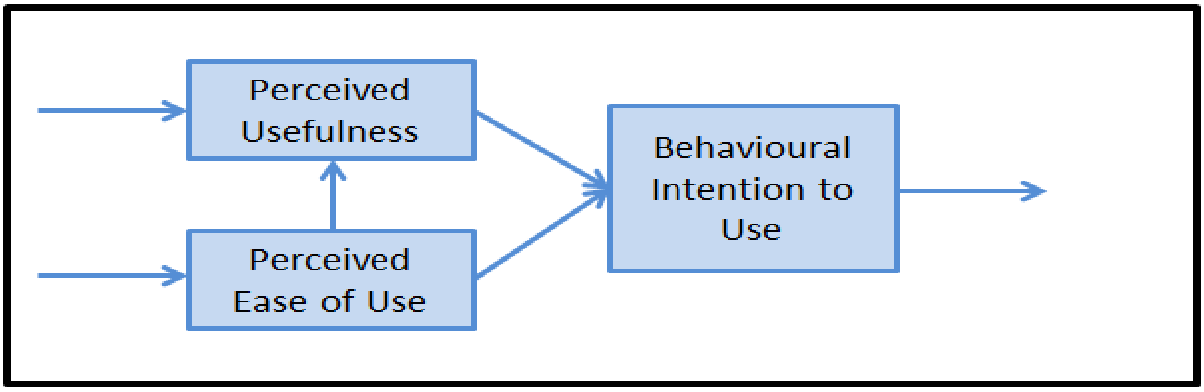
2.3.6.4 *Key Outputs from the Technology Acceptance Models*

An analysis of the behavioural frameworks which are described in this section show two key factors which are relevant to this study.

The first factor is that all the frameworks started as simple behavioural models and over time researchers' added factors and constructs as they attempted to make the frameworks more suitable for a particular use. This shows that the basic behavioural frameworks are just that, a basis from which to work and develop a framework that fits that particular application more. It also shows that the basic frameworks only explain a certain amount of the behaviour and that there is a leftover amount that still needs explanation. This in turn allows for adaptations to the frameworks while it shows the robustness of these frameworks.

The triangle of perceived usefulness (PU) and perceived ease of use (PEU) leading into the behavioural intention to use is the key of the Technology Acceptance Model, see Figure: 2-41. This triangle will form the basis of the preliminary framework which is developed in Chapter 4.

Figure: 2-41: Key Triangle of the Technology Acceptance Model



(Source: Venkatesh and Davies, 1996)

The second factor is that most of the additional constructs in the models have been applied in some other formulation of a behavioural model, although it might have a different name. An example of this is the factor peer influence which occurs in the Decomposed Theory of Planned Behaviour (DTPB), (Taylor and Todd, 1995) and Technology Acceptance Model with Collaboration Technology Model (Brown*, et al.,* 2010) but it also appears in the Universal Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, *et al.*, 2003) where it is called social influence.

2.3.7 Techno-economic Statistical Forecasting Models

There has been a significant body of work carried out on the forecasting of the take-up of telecommunications services particularly mobile services and a growing body of research on the adoption of e-services (health, banking, education, government services, that are supplied over the internet or by some other electronic communication system) with the use of statistical models using technical and economic data, (Turban, *et al*., 2006).

2.3.7.1 International Journal of Forecasting; Telecommunications forecasting methods

In 1988 the International Journal of Forecasting first published a series of papers on telecommunications forecasting (International Journal of Forecasting 1988, Volume 4, Issues 2 and 4). The emphasis was on forecasting established services where many years of data could be used, while only one article examined the development of a new competitive service (Fildes and Kumar, 2002a). However, with the advent of mobile communications and the internet a rapidly changing telecommunications market has become the order of the day and the key question in any forecasting problem of telecommunications demand forecasting, is where to draw the system boundaries. This difficulty in defining the boundaries has undermined the established econometric approaches and highlighted the need for large databases (Fildes and Kumar, 2002).

Standard models of demand for voice services are generally two-stage models, where first usage (number of minutes) is modelled as a function of economic factors such as price and income which are conditional on access, while access is modelled through a model using individual choices (Fildes and Kumar, 2002). A significant number of the aggregate models of usage and access that use cross sectional time series, which have been found to be flawed due to the changing and unequal price elasticities, (Taylor, 1994; Das and Srinivasan, 1999). The analysis of Udo, *et al*. (2008) using paired countries shows the fallacy of using telecommunications adoption from a country to estimate adoption in another country.

For new products significant problems occur, particularly how they interact with existing services and where they fall on a continuum from totally compatible as in fixed voice to mobile voice to totally incompatible such mobile voice to fax and telex (Lyons, Lynch & Skelton, 1995). Also, various barriers to adoption of a new service will exist even before the service is adapted and this will lead to a typical S-shaped diffusion path (Parker, 1994). A significant amount of research has been conducted regarding the large number of complex variables involved in the adoption of new products (Baptista, 1999; Geroski, 2000), but from a forecasting perspective they have been disappointing as they generally do not lead directly to predictive models. Hence, for new product adoption the trend has gone towards the new-product diffusion models of which the best known is the Bass Model (1969) (Mahajan, *et al*., 1990)

2.3.7.2 Bass Model, 1969

The basic Bass Model has many apparent limitations, the most important of which is the calibration of the parameters when limited data are available, which unfortunately is generally the case with new products. Many different studies have been conducted to overcome this limitation and they include using: genetic algorithms (Fildes and Kumar, 2002); the use of meta parameters (parameters estimated from earlier diffusions) for similar products or for the same product but in another geographical area (Easingwood, 1989); and Stochastic Frontier Analysis which was used on 2G mobile services in China to help forecast the uptake of 3G services in the same area (Lim, Nam, Kim, Rhee, Lee & Lee, 2012).

Additionally, there have been many innovations and extensions to the basic Bass Model aimed at overcoming the limitations of its market assumptions. Some of these are the following: the addition of market drivers particularly relating to advertising (Simon and Sebastian, 1987); the addition of economic drivers with multivariate growth models (Islam and Meade, 1996); incorporating of cross-sectional effects (Ganesh, Kumar & Subramaniam, 1997); incorporating the effects of different generations and marketing (Islam and Meade, 1996; Danaher, Hardie & Putsis, 2001); incorporating the effects of competition (Krishnan, Bass & Kumar, 2000); and using a 3-stage model with restrictions on the supply of products in a supply restricted market (Jain, Mahajan and Muller, 1991).

2.3.7.3 International Research Houses

For most firms it is very difficult to have large in-house forecasting teams so they will make use of large consulting or market research houses for forecasts. The following gives the forecast methodologies of two of the largest research houses operating in the South African Telecommunications market.

2.3.7.3.1 Business Monitor International Research (BMI)

BMI Research uses time series and causal-economic modelling (BMI Research, 2012). Depending on the industry or factor to be forecast, they use vector auto regressions which allows them to forecast a variable using more than just its own history as explanatory information (BMI Research, 2012). An example would be to forecast the price of mobile voice services by taking into account mobile penetrations, mobile termination fees and market shares of the various mobile service providers in the original or similar countries. If there is an adequate reliable history of the variable they will use a univariate model such as an autoregressive moving average model (ARMA) (BMI Research, 2012).

Sources of data would be national telecommunications ministries or regulators, officially released service provider data, industry organisations, national news agencies as well as international organisations such as the IMF, World Bank and ITU (BMI Research, 2012).

2.3.7.3.2 Informa Media and Telecommunications (Informa)

Informa produces the WCIS+ forecasting service for both fixed line and mobile services on a global basis. The following outlines the methodology used in their Subscription Forecast Model (Informa Media and Telecom: WCIS+, 2012).

They use a Gompertz Curve methodology, with the formula:

$$Y_t = Le^{-ac^{-bt}}$$

Where:

L = the limiting factor of the output

a = x displacement

b = Rate at which the initial households/ penetration must grow to reach L

The forecast is then built into 3 sections, Country forecast, Service Provider Market Share and Technology Migration (Informa Media and Telecom: WCIS+, 2012).

For the Country Forecast, the key is to calculate the achievable penetration level. It is carried out using socio and economic factors and telecommunications factors. These are then weighted and the market calculated. A significant factor is the level of fixed mobile substitution (Informa Media and Telecom: WCIS+, 2012).

The Service Provider Market Share is calculated on the premise that service providers will try and maximise their market share so it involves calculating Acquisition (New Entrants + Positive Churn) and Retention (Existing subscribers – Negative Churn). Other factors here are regulatory effects as well as market pricing (Informa Media and Telecom: WCIS+, 2012).

The Technology Migration is carried out using a technology growth function that uses existing migration flow, achievable migration percentage, time to reach critical mass and in some cases an end of life date (Informa Media and Telecom: WCIS+, 2012).

2.3.7.4 Key Outputs from Socio-economic Statistical Models section

This section highlights the fact that there are numerous statistical models well suited for the forecasting of the adoption of telecommunications services and they work very well when there is a significant amount of data available with regard to the service from that market, or the behaviour of similar products. The problem occurs with new products where there is no data available or where it is directly competing with existing products, for example the way mobile communications has superseded fixed line communications (Temple, 2018), and the practice of taking data from a second similar type country where the product has been launched has been shown by Udo, *et al.* (2008) to be unreliable.

Another important point to emphasise here is that although the Socio-economic statistical model will not be used in the preliminary framework, several statistical analyses will be performed on the data obtained from the survey conducted in Phase 2 of the research to test the framework.

2.4 ICT AND THE INDIVIDUAL

2.4.1 ICT and demographics

The demographic factors of individuals comprising characteristics such as income, education, age, gender, and livelihood activities are generally assumed to be important indicators for the adoption of mobile information and communication technology (Khan, 2017; Oluwatayo, 2014). These factors are examined in more detail in this section.

2.4.1.1 Gender

The topic of gender as a moderator in the adoption of mobile telecommunication services has been discussed widely in literature, with the general consensus being that gender affects the adoption of mobile services.

Riquelme and Rios (2010) found that with the Technology Acceptance Model (TAM), gender was a complimentary factor in the adoption of mobile banking. They also found that female users of mobile banking find the ease of use inherent in using a mobile device leads to an increase in the perception of the usefulness of the device for use in banking applications. Additionally, they found that gender has a moderating effect on social norms, perceived ease of use and perceived usefulness (Riquelme and Rios, 2010). Khedhaouria, *et al*. (2013) again using the TAM model, confirmed these findings in determining that females were more influenced by the perceived ease of use, perceived usefulness and social influences than males. Additionally they determined that the effect on 'perceived ease of use' was only present when the application being used was intrinsic to the main uses of mobile internet services (MIS) but was absent when the applications were extrinsic, or not directly related to the primary tasks of MIS.

Venkatesh and Morris (2000) found that males were more strongly influenced by their perceptions of usefulness than females while women were more affected by the perceptions of ease of use and subjective norm. However, with regard to the decision to use a new technology they concluded that men consider perceived usefulness to a greater extent than women. In a study in Mozambique, Freeman & Mubichi (2017) showed that there were gender differences in the type of information gathered with mobile services.

Motwani (2016) found that female customers considered the factors of usefulness, guidance and support and device control features important in using mobile banking, while male customers were the same but also added flexibility. Sooryamoorthy (2015) discovered that there was a difference in mobile technology usage between male and female South African university engineering students.

Gerpott (2010) found confusing results with respect to gender in a study of early mobile internet users in Germany, where for analysis purposes the users were divided into four segments based on the amount of data they used in a month. The study showed a significantly positive β-weight in the ordinary least squares regression for male users, however, if the regression was performed with a reduced sample where all the largest data users were excluded this was not present. An examination on the quantities of female respondents in the study showed that for the segment of highest data users women were under-represented when compared to the overall percentage of females in the total sample but were heavily over-represented or in the next highest data users segment.

Chawla and Joshi (2017) confirmed the findings of Amin, Hamid, Tanakinjal & Lada (2006) that gender plays an important role in determining intention to use mobile banking whereas their role in influencing attitude was insignificant. However, Chawla and Joshi (2017) differed from Amin, *et al.* (2006) in that they found that there was no difference between genders in the inclination to use mobile banking whereas the latter found there was a slight bias towards males actually using mobile banking over females.

Lee and Lee (2010), using a model based on the diffusion of innovation theory (Rogers, 1995) found that the usage by males and females for both the most used and least used mobile services was equal. However, they found that males used the following mobile services: gambling, educational services, and informational services related to entertainment and business/finances, significantly more than females.

Additionally, there are also a number of studies indicating there is no difference between the genders with regard to the early adoption of the mobile internet (Cheong and Park, 2005; Hong and Tam, 2006; Lee, *et al*., 2007; Hong, Thong, Moon & Tam, 2008; Kuo, Wu & Deng, 2009; Kuo and Yen, 2009). Nysveen, Pedersen & Thorbjornsen (2005) found that gender was not a moderating factor on perceived ease of use. Selvabaskar, Prasanna Sivagami, & Aishwarya (2017) found that apart from skin care applications, which were download more by female users, there was no difference in gender in the downloading of mobile-health applications.

In light of the above previous studies and the fact that gender is a large, easily identifiable segment that is commonly used in market segmentation studies, (Nysveen, *et al*., 2005), gender was tested as a possible moderator in the adoption of mobile services in South Africa (Maharaj, 2012).

2.4.1.2 Age

There is a significant body of knowledge regarding the use of age as demographic factor in various adoption studies and it has long been used as a basic demographic factor to differentiate in the adoption of technology (Morris and Venkatesh, 2000). One of the major ways in which age has been used is to divide a population into various age cohorts or generations and treat each cohort as a distinct population group. This is based on the theory that each generation is moulded by the distinctive experiences which occur during its critical development period and it captures the culture of being brought up in that period. Hence, it can be seen as a distinct psychological variable (Caspi, 1987; Stewart and Healy, 1989; Twenge and Campbell, 2008). Figure: 2-42 illustrates the time line of the most recent generation cohorts. (Various sources use different names and slightly different dates but this does not affect the basic characteristics of the cohorts.)

Figure: 2-42: Time-line and classification of generations

Period	Cohort
1925 - 1946	Veteran Generation
1946 - 1960	Baby Boomers
1960 - 1980	Generation X
1980 – 1995	Generation Y / Millennials
1995 - 2010	Generation Z
2010+	Alpha

(Source: Bencsik, Horváth-Csikós, and Juhász, 2016).

A significant amount of research has gone into determining the different characteristics of these generational cohorts. The Millennials or Generation Y has attracted a significant amount of attention from researchers as they are considered to have different characteristics, values and behaviours from earlier cohorts (Eastman and Lui, 2012; Garau, 2012). Millennials are described as the first high-tech generation (Norum, 2003) and digital natives (Bess and Bartolini, 2011). Rainie (2010) stated that millennials believe it is this core role of technology in their lives that sets them apart from other generations. This generation has been immersed in the digital world since early childhood (McMahon and Pospisil, 2005) and has invaded all aspects of their lives including patterns of consumption and social lives, (Young and Hinesly, 2012; Rainie, 2010). This generation, with their digital devices have a never ending on-line presence and their communications mainly occur in virtual space (Bencsik, *et al*., 2016).

Several early studies have shown that age is a moderating factor in the adoption of mobile technologies and services. Morris and Venkatesh (2000) found that chronological age does influence the adoption of technology in both the short term and long term. However, they did add a rider in that age could act as a surrogate for other organisational phenomena. Pagani (2004) showed that age is a factor which affects the factors such as perceived usefulness and ease of use. Yang and Jolly (2008) found that the lower perceived ease of use for Baby Boomers leads to a lower attitude and behavioural intention to use mobile data services than for Generation X. However, the effect of perceived usefulness on attitude to use mobile data services appeared greater for baby boomers than Generation X making mobile data services more useful for the boomers. While Schewe, Meredith & Noble (2000), Dholakia and Uusitalo (2002) and Khare, *et al*. (2012) all found age to be a major factor in user acceptance of intention to shop online.

However, recent research by Sobhanifard, *et al*. (2017) found that there was no relationship between mobile banking usage and age

With this research planning to cover 4 age cohorts from the Baby Boomers (1946-1960) through Generations X and Y and the first 5 years of Generation Z (1995-1999) and prior research indicating that age was a possible moderating factor in the adoption of mobile services this factor was included in the research.

2.4.1.3 Education

Becker (1970) indicated that to a large extent educational achievement affects an individual's cognitive preferences, system of values and ability to learn. Education has been studied in several research projects with regard to the adoption of electronic and mobile services, and like with gender and age it has given mixed results.

In a study in Bangladesh regarding the opportunities and challenges to the adoption of mobile services it was found that literacy had a direct relationship with the intention to adopt mobile services. It was observed that the higher the level of literacy, the greater the intention to adopt mobile services (Rahman, 2015) while Freeman and Mubichi (2017) obtained a similar result in rural Mozambique. Crabbe, Standing, Standing & Karjaluoto (2009) found that education influenced adoption of mobile banking in Ghana: while Sulaiman, Jaafar & Mohezar (2007) found a similar result in the urban population of Malaysia. Margaret and Ngoma (2013) found that education played a role in the adoption of internet banking in Zimbabwe and Juwaheer, Pudaruth & Ramdin (2012) found similar results in Mauritius, as well as in rural India (Narula and Arora, 2010). Awa, Baridam and Nwibere (2015) found that the level of education of the decision makers in small and medium enterprises had an effect on the adoption of e-commerce in their enterprises in Nigeria. Sobhanifard, *et al.* (2017) found that of the 10 sub-factors which they found having an effect on online banking usage, the level of education of customers was ranked number 5 in importance after attitude but before customer experience and ease of use.

Howcroft, Hamilton & Hewer (2002) found that in Great Britain the level of education was not a significant factor in the adoption of internet banking, while Laukkanen and Cruz (2012) found a similar result in relation to mobile banking in Finland and Portugal. Laforet and Li (2005) also found that the level of education was not a factor in online and mobile banking in urban China.

As a number of the prior studies which had been carried out in Africa had showed that the level of education was a moderating factor in the adoption of mobile services, it was included in this study.

2.4.1.4 Income

As with the previous mentioned demographic factors there are various studies that show income levels have an influence on the adoption of internet and mobile services, while there are those that show that income levels do not have an influence on the adoption of services. Table: 2-12 highlights a few of the studies which show income having an influence on adoption and those that show that it has no effect.

An interesting fact with the above analysis is that the results are not dependent on the countries' development status. There are developed countries in both groups alongside undeveloped countries. Again, with such mixed results from prior studies income was included in the study.

2.4.1.5 Ethnicity

South Africa is a very diverse country in terms of ethnicity, with the South African Statistical Service classifying the population in four ethnic groups, namely: Black African; Coloured; Indian/Asian and White (Statistics South Africa, 2017). However, in the Census of 2011 it further subdivides these classifications into a further 12 sub-divisions based on the home language spoken (Statistics South Africa, 2012).

Table: 2-12 : Studies showing effects income on adoption of ICT services

Year	Author	Theory	Country	Area of Study	Findings
Studies indicating that income has an effect on adoption					
2001	Matilla	Descriptive and inferential analysis	Finland	Internet banking	Household income and education significantly influences mobile banking adoption
2002	Karjaluoto, Matilla & Pento	Rodgers diffusion of innovation model (IDT)	Finland	Internet banking	Household income and education significantly influences mobile banking adoption
2004	Suoranta and Matilla	Bass Diffusion Model and IDT	Finland	Mobile banking	Household significantly influences mobile banking adoption
2007	Sulaiman, Jaafar & Mohezar	Descriptive and inferential analysis	Malaysia	Mobile banking	Age, gender, personal income and educational background affects the adoption of mobile banking services
2012	Juwaheer, Pudaruth & Ramdin	Descriptive and inferential analysis	Mauritius	Internet banking	Income level is a key construct to influence the adoption of internet banking services
2012	Fox and Duggan	Descriptive and inferential analysis	USA	Mobile Health	Income is positively associated with mobile health adoption
2013	Margaret And Ngoma	Descriptive and inferential analysis	Zimbabwe	Internet banking	Relationship between internet banking adoption and education level, occupation age and income
Studies that income has NO effect on adoption					
2008	Laukkanen and Pasanen	Rodgers diffusion of innovation model	Finland	Mobile banking	Education, occupation, household income and household size do not influence mobile banking adoption
2009	Al-Somali, Gholami & Clegg	Technology Acceptance Model	Saudi Arabia	Internet banking	Once customer experienced, income no longer influences mobile banking adoption
2012	Izogo, Nnaemeka, Onuoha, & Ezema	Descriptive and inferential analysis	Nigeria	E-banking	Gender, religion and income do not have a significant effect on adoption
2015	Lee and Han	Structural equation modelling with linear structural relations	South Korea	E-Health	Age, gender and income do not influence adoption intention
2017	Sobhanifard, Kharazan & Alikhani	Explanatory Factor Analysis and Analytic network Process	Iran	Mobile Banking	No relationship between level of mobile banking usage and gender, occupation, level of income and marital status

There has been very little research carried out with regard to the influence of ethnicity on mobile services. Lee and Lee (2010) found that African Americans were the most engaged users of all mobile services, and European Americans were the least engaged.

Additionally, they found that there was a difference in the use of specific services offered through mobile devices with black Americans being heavier users of informational services related to health and business/finance, payment/billing services, and purchasing products (Lee and Lee, 2010). Similar results were also found by Lee and Lee (2007) and the Pew Internet and American Life Project (Horrigan, 2008) found that Hispanic and African American users generally used more mobile services than European Americans. Prieger (2015) found that in the US blacks were more likely to access the Internet using a mobile phone than whites, while there was no significant gap in mobile broadband usage between ethnic minorities and European Americans. Hudson (2010), while investigating the use of mobile services on an American university found that White females were the largest population who requested e-book and e-magazines on their mobile phones (84 percent versus 10 percent of White males; 1 percent of African American males; 61 percent of African American females; and 45 percent of Asian females).

Some studies have shown ethnic differences in the development and use of mobile commerce in different countries (Cheong and Park, 2005; Li and McQueen, 2008).

Nair, Han, Lee, Goon & Muda, 2012, have looked at ethnicity in relation to the diffusion of mobile phones in Malaysia and found that ethnicity does not play a role. While Zaimović (2015) found that in the post-conflict environment of Bosnia and Herzegovina the *ethnic affiliation* of the different mobile carriers, as perceived by the different ethnic groups, was the main factor in the choice of mobile carriers.

Other researchers intimate that ethnicity is a possible factor in predicting the adoption of various mobile services and either control the ethnicity factor in their analyses or just do no analysis on it (Suki, Ramayah & Ly, 2012; Cingel, Lauricella, Wartella & Conway, 2013; Weiss 2013).

2.4.2 ICT and Culture

CARLA defines culture as "*the shared patterns of behaviours and interactions, cognitive constructs, and affective understanding that are learned through a process of socialization. These shared patterns identify the members of a culture group while also distinguishing those of another group*" (CARLA, 2013:1).

2.4.2.1 Hofstede Model on National Culture

Hofstede's model on national culture variables and cultural differences (Hofstede, 1991) is frequently used to analyse conflicts between values embedded into and behaviours required by ICT and the national culture of developing countries (Leidner and Kayworth, 2006).

Hofstede (1991: 14) defines a dimension of culture as "*an aspect of a culture that can be measured relative to other cultures*" and develops the following five dimensions, see Table: 2-13

Table: 2-13: Description of Hofstede's 5 Dimensions of Culture

Dimension	Definition
Power Distance (PDI)	"*The extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally. 'Institutions' are the basic elements of society like the family, school, and the community; 'organizations' are the places where people work*." (Hofstede, 1991: 14)
Individualism/ Collectivism (IDV)	"*Individualism pertains to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family. Collectivism as its opposite pertains to societies in which people from birth onwards are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty*." (Hofstede, 1991: 51)
Masculinity/Femininity (MAS)	"*Masculinity pertains to societies in which social gender roles are clearly distinct (i.e., men are supposed to be assertive, tough, and focused on material success whereas women are supposed to be more modest, tender, and Aligning Technology with Culture concerned with the quality of life); femininity pertains to societies in which social gender roles overlap (i.e., both men and women are supposed to be modest, tender, and concerned with the quality of life)*."(Hofstede, 1991: 82-83)
Uncertainty Avoidance (UAI)	*"The extent to which the members of a culture feel threatened by uncertain or unknown situations. This feeling is, among other things, expressed through nervous stress and in a need for predictability: a need for written and unwritten rules*." (Hofstede, 1991: 113)
Long- vs. Short-Term Orientation (LTO)	This dimension refers to the selective promotion of particular set of ethics found in Confucian teachings. Particular teachings that lead to economic development include thrift, perseverance, a sense of shame, and following a hierarchy. Other Confucian teachings are less emphasized such as tradition, and protecting face. It is based on Bond's Chinese Value Survey. (Hofstede and Bond, 1988)

2.4.2.2 Schwartz Framework of Cultural Values

Another framework used to describe culture is that of Schwartz (1999 and 2006). This framework uses seven cultural values, with a cultural value representing the implicitly or explicitly shared abstract ideas about what is good, right, and desirable in a society (Williams, 1968). "*These cultural values (e.g. freedom, prosperity, security) are the bases for the specific norms that tell people what is appropriate in various situations. The ways that societal institutions (e.g. the family, education, economic, political, religious systems) function, their goals and their modes of operation, express cultural value priorities"* (Schwartz, 1999: 25).

The framework consists of seven types of values on which cultures can be compared by considering the three issues which all cultures have to face.

Issue 1: Individualism – Collectivism

This issue asks a culture to define the nature of the relationship between the individual and the group. In doing so it must answer the following two fundamental questions: 1) to what extent are persons autonomous vs. embedded in their groups? 2) Whose interests should take precedence, the individual's or the groups? The two extremes of this dimension are '*Conservatism'* and '*Autonomy'*.

Conservatism:

Conservatism is defined as "*A cultural emphasis on maintenance of the status quo, propriety, and restraint of actions or inclinations that might disrupt the solidary group or the traditional order (social order, respect for tradition, family security, wisdom)*" (Schwartz, 1999: 27). Cultures which are in this cultural group view an individual as an entity who is embedded in the collective and finds meaning in life largely through social relationships, through identifying with the group and participating in its shared way of life (Schwartz, 1999).

Autonomy

Autonomy is at the other end of the continuum from conservatism. An autonomous culture is defined as one "*in which the person is viewed as an autonomous, bounded entity who finds meaning in his or her own uniqueness, who seeks to express his or* *her own internal attributes (preferences, traits, feelings, motives) and is encouraged to do so*" (Schwartz, 1999: 27).

Autonomy consists of two separate values:

Intellectual Autonomy:

Intellectual Autonomy is "*A cultural emphasis on the desirability of individuals independently pursuing their own ideas and intellectual directions (curiosity, broadmindedness, creativity)"* (Schwartz, 1999: 27).

Affective Autonomy:

Affective Autonomy *is* "*A cultural emphasis on the desirability of individuals independently pursuing affectively positive experience (pleasure, exciting life, varied life)*" (Schwartz, 1999: 27).

Issue 2: Hierarchy - Egalitarianism

The next issue that all societies are confronted by is how to guarantee responsible behaviour that will preserve the social fabric. This issue regards how people must be persuaded to consider the welfare of other members of the society and interact with them in a socially acceptable manner. The two extremes of this dimension are Hierarchy and Egalitarianism and they are defined as follows:

Hierarchy:

Hierarchy is "*A cultural emphasis on the legitimacy of an unequal distribution of power, roles and resources (social power, authority, humility, wealth)*", (Schwartz, 1999: 27). In this extreme the unequal power of a hierarchical society is used to obtain the required behaviours.

Egalitarianism:

Egalitarianism is "*A cultural emphasis on transcendence of selfish interests in favour of voluntary commitment to promoting the welfare of others (equality, social justice, freedom, responsibility, honesty)",* (Schwartz, 1999: 28). At this extreme people are socialised to recognize their fellow members as equals and voluntarily look out for their fellow member's interests.

Issue 3: Mastery - Harmony

The third issue that all societies have to face is the relationship of humankind to their natural and social world. One extreme is to actively try and master the world and change it to our benefit. This extreme is called Mastery and is defined as follows:

Mastery:

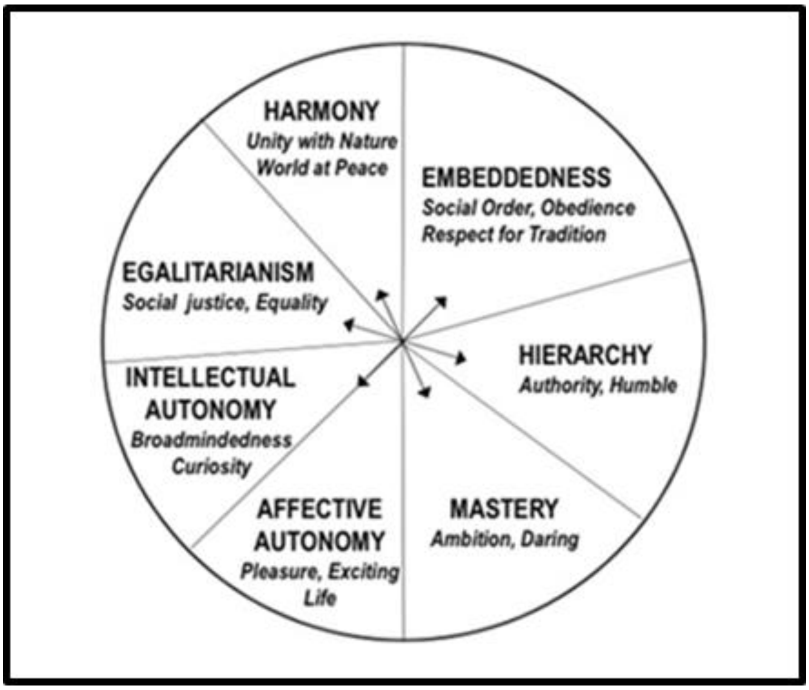
Mastery is "*A cultural emphasis on getting ahead through active self-assertion (ambition, success, daring, competence)*" (Schwartz, 1999: 28).

The opposite view to this is where we accept the world as it is and try to adapt to it rather than exploit and change it. This extreme is called Harmony and is defined as follows:

Harmony:

Harmony is "*A cultural emphasis on fitting harmoniously into the environment (unity with nature, protecting the environment, world of beauty)",* (Schwartz, 1999: 28).

Figure: 2-43: Diagram of Schwartz Culture Values



(Source: Schwartz, 1999)

Figure: 2-43 is a diagrammatic representation of the seven cultural values. Note that pairs of value types that are in opposition go out in opposing directions from the centre while pairs of value types that are compatible are located in close proximity to each other as they go round the circle. This means that Hierarchy is directly opposite in the circle to Egalitarianism, while Harmony which is complimentary to Egalitarianism located next to it, (Schwartz, 1999).

Schwartz makes a clear distinction between cultural values at individual levels, (Schwartz, 2012), and cultural values at group or national level (Schwartz, 2006). Schwartz's work is a large scale study that in many ways improves upon previous cross-cultural research (Berry, Guillen & Zhou, 2010), and on the whole has advantages that make it suitable for empirical research (Yeganeh, 2011), it is Hofstede's framework that is primarily found in prior research regarding cultural influence on the adoption of ICT and mobile services.

2.4.2.3 Influence of Culture on Mobile Services

Several studies have been carried out to determine how these factors are related to the adoption of Information Technology at a national level. Studies have also been carried out to look at the adoption of technology at the level of individuals. The cultural values at an individual level are called espoused cultural values and are defined as "*the degree to which an individual embraces the values of his or her national culture*" (Srite and Karahanna, 2006: 681). The optimal way to examine the effect of culture is to examine each of Hofstede's dimensions separately in terms of their role in the adoption of Information Technology and Mobile Services.

Power Distance (PDI):

Bagchi, *et al*. (2004) determined that there is a strong inverse relationship between the adoption of PC's and mobile technology. This finding was confirmed by Geissler (2006) in relationship to information technology as a whole. Littrel and Valentin (2005) determined that in countries with a high PDI it was easier to attract subscribers with marketing communications messages. This was confirmed by Liu, Sinkovics, Pezderka & Haghirian (2012) who found that countries with a High PDI were more likely to respond to mobile advertising than those with a low FDI. Again with regard to Mobile Advertising, Islam (2017) found that PDI has a moderating effect on the relationships of informativeness and credibility on an individual's attitude towards mobile advertising. In a study with regard to e-filing of taxes in India, Zaidi, Henderson & Gupta, (2017), found that espoused PDI moderated the relationship between Perceived Ease of Use and User Satisfaction and that individuals from countries with a high PDI were positively influenced into using a mandated service such as e-filing of taxes. PDI is found to negatively influence the development of e-government and the digital economy (Zhao, 2011; Zhao, Wallis & Singh, 2015). Phonthanukitithaworn, Sellitto & Fong (2015) used the approach where they employed the subjective norm as a cultural factor, and determined this construct could be used to assess adoption of mobile-payments in cultures that have a high power distance index such as Thailand.

However, Gong, Stump & Li (2014) found that PDI did not influence the adoption of social networking sites.

Individualism/ Collectivism (IDV):

Bagchi, *et al*., (2004) found that nations that score higher in Individualism (IDV) combined with a higher cultural Femininity and lower Power Distance show a greater diffusion of information technologies than other nations lower in IDV. They also found that the strongest relationship between the adoption of PCs, the Internet and the telephone were with countries where the IDV was high. Geissler (2006) confirmed that countries with a high IDV were most likely to adopt services such as telecommuting; video conferencing; online shopping as well as have a greater requirement for high-speed internet connections. Zhao, Wallis & Singh (2015) found IDV as the strongest predictor of the digital economy.

Lee, *et al*. (2007) found that IDV was found to significantly and positively affect users to perceive more usefulness, more enjoyment, more ease of use, and more monetary value in the mobile Internet in Korea, Hong Kong and Taiwan. Jiménez and San-Martín (2017) in a study which compared the attitude toward m-advertising and m-repurchase in Spain and Mexico found that Mexicans were more likely to turn mobile-advertising into mobile-purchases. They postulated that because Mexico has a greater inter-group collectivism than Spain, it was this closeness in the existing personal relationships that was influencing the social environment and causing users to have a better attitude towards use of that m-purchasing. Phonthanukitithaworn, *et al*. (2015) argued that the subjective norm (SN), in the extended TAM, could be reflected in Collectivism as well as in PDI in the Thai society and found that the SN influenced the adoption of m-payments in Thailand.

Masculinity/Femininity (MAS):

Bagchi, *et al*. (2004) found that there was a strong correlation between the feminine characteristics of culture and the adoption of telephones and cell phones. Zaidi, *et al*. (2017) found a positive and significant relationship between perceived ease of use (PEU) and user satisfaction (US) that was moderated by espoused masculinity and suggested that the higher the espoused masculinity, the higher the effect of PEU on US. Phonthanukitithaworn, *et al*. (2015) argued that the compatibility, in the extended TAM, could reflect the Feminism cultural dimension. They found that this construct was the strongest with regard to influencing the early adoption of mobile-payments in Thailand.

In contrast Geissler (2006) discovered that there was no significant correlation between the Masculinity/Femininity and the adoption of Information Technology. Hung and Chou (2014) examined the social influences on the selection of mobile business in Malaysia and Taiwan and discovered that masculinity (MA) had diverse impacts on PEU and perceived usefulness (PU) in the different countries.

Uncertainty Avoidance (UAI):

Lee, *et al*. (2007) found that the higher the uncertainty avoidance (UAI) in a country the more it led to users perceiving less usefulness, less enjoyment, less ease of use, and less monetary value in the mobile Internet. In a study on mobile advertising it was found that higher UAI has a negative effect on the attitude towards mobile advertising (Islam, 2017). Ktoridou, Epaminonda & Kaufmann (2008) when discussing the challenges and consumer perceptions of the use of mobile marketing in Cyprus determined that culture, particularly, UAI, is likely to influence the levels of familiarity, perceptions and consumer acceptance of mobile advertising. What they also determined with respect to UAI is the extent to which consumers worry about the sharing or miss-use of personal data.

In contrast, Bagchi, *et al*. (2004) and Geissler (2006) found that UAI was the dimension of culture which had the least correlation with technology adoption. Zaidi, *et al*. (2017) in a study with regard to e-filing of taxes in India, found that espoused uncertainty avoidance does not moderate the relationship between information systems quality and user satisfaction.

Long- vs. Short-Term Orientation (LTO):

It was found in global studies of e-government that countries with a high Long-Term Orientation (LTO) tend to have higher levels of e-government (Zhao, 2011; Nguyen, 2016)**.** Gong, Stump & Li (2014) found that LTO negatively influenced the adoption of social networking sites. Phonthanukitithaworn, *et al*. (2015) as they had done with Hofstede's other dimensions of culture, postulated that the LTO of the Thai society could be equated with perceived cost and this construct influenced the adoption of mobile-payments in Thailand. LTO plays a significant moderating role in technology acceptance and use at the individual level, albeit in the mobile social media application context (Hoehle, Zhang & Venkatesh, 2015).

Zhao, Wallis & Singh (2015) found that LTO did not influence the adoption of the digital economy or e-government.

2.4.2.4 South African Cultural Differences

As discussed above 2.4.2.3 culture plays a significant role in the adoption and usage of ICT's. According to Leider and Kayworth (2006) national culture variables and cultural differences (Hofstede, 1991) are frequently used to analyse conflicts between values embedded into and behaviours required by ICT and the national culture of developing countries.

A comparison of the Hofstede variables of South Africa and of neighbouring countries gives an interesting insight into the culture and consequently some insights into ICT adoption see Table: 2-14.

Table: 2-14: Hofstede Cultural Variables for South Africa and Surrounding Countries

Cultural Variable	Country						
	South Africa	Kenya	Malawi	Mozambique	Namibia	Tanzania	Zambia
Power Distance	49	70	70	85	65	70	60
Individualism	65	25	30	15	30	25	35
Masculinity	63	60	40	38	40	40	40
Uncertainty Avoidance	49	50	50	44	50	50	50
Mobile Penetration (%)	153.1	81.3	40.3	54.1	109.2	74.4	74.9
Individual users of the internet	54	26	9.6	17.5	31	13	25.5

(Source: Geert-Hofstede, 2014: International Telecommunications Union, 2017)

It is worth noting that the results for South Africa (Geert-Hofstede, 2018) are only for white South Africans, which only constitute 8.0% of the population (South Africa, Statistics South Africa, 2017), while the results for the surrounding countries are for the whole population.

It is also, worth comparing the percentage of individuals using the internet in Tanzania and Malawi. Both countries have a similar mobile penetration of around 75% but Malawi with a lower PDI and higher IDV has a usage of the internet nearly double that of Tanzania.

2.4.2.5 Summary

Prior research has shown that culture has a major influence on the adoption of Information and Communication technologies in general but particularly with regard to mobile services. Although the actual dimensions or combination of dimensions which affect the adoption are often different due to type of service being adopted, the research is almost unanimous in the fact that different cultures interact with and adopt mobile services differently.

2.4.3 Choice of Ethnicity vs Culture in this Research

South Africa is a very diverse country in terms of culture and ethnicity, with the South African Statistical Service classifying the population in four ethnic groups, and twelve separate cultural divisions or tribes based on the home language spoken (Statistics South Africa, 2012). Additionally, these 12 different cultural groups are not homogeneously divided across the country but occur in separate areas, with some groups almost exclusively in rural areas. This makes any research based on these cultural groups very difficult to conduct.

Additionally, the research of Hudson (2010) and Lee and Lee (2010) showed that the different ethnic groups in the United States had different adoption rates with regard to mobile services, thus making ethnicity a viable variable.

In light of the above and because the research was aimed at mobile data users which are primarily located in the urban areas it was decided to use ethnicity as a variable and discard culture.

2.4.4 Brand, Image and Aspirational Qualities of Mobile Communications

There appears to be very little research conducted with regard to the importance of brand, image and the aspirational qualities of mobile communications. Where there is research regarding brand in mobile communications with regard to emerging markets it is generally related to mobile handsets (Odoom, 2016). However, two studies were found that go beyond this to indicate the importance of mobile communications in African markets.

The first study was to investigate the factors that influence the growing African middle class (middle of pyramid; MOP) consumers' purchase decision making. The study examined the growing middle class in four African countries with South Africa being one the countries examined (Chikweche and Fletcher, 2014).

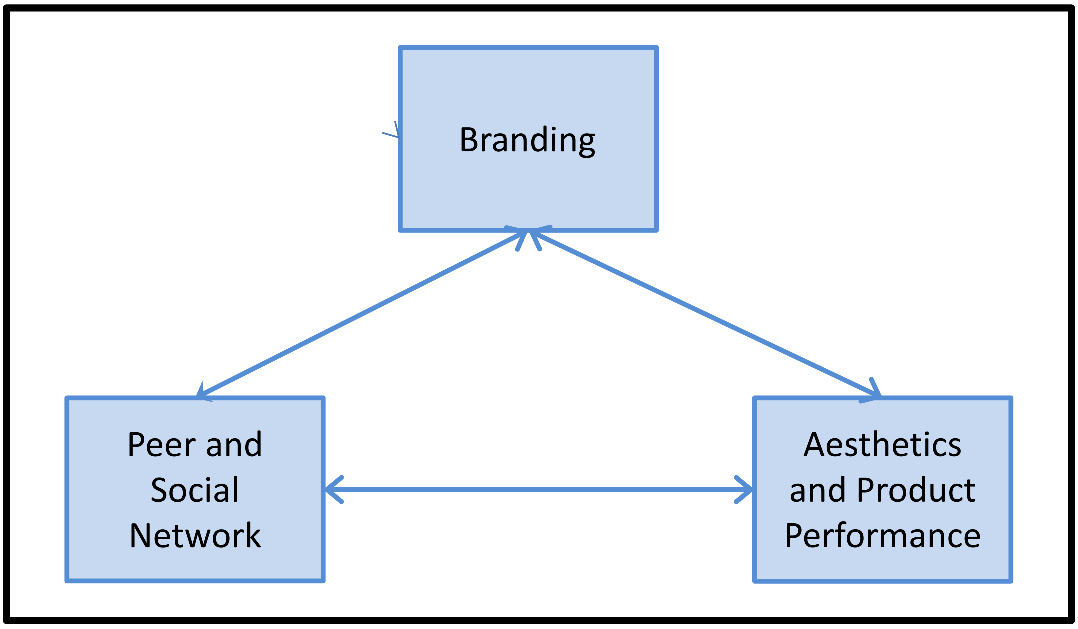
The research examined three research questions, the first being "*What are the key indicators of middle class status in Africa*?" (Chikweche and Fletcher, 2014: 29). One of the key infrastructure indicators was that MOP consumers generally regarded access to the internet and mobile services as a key to their lifestyle.

The second research question was "*What are the products and services purchased by the MOP consumers which they deemed or perceived to be important in shaping their lifestyle as members of the MOP?*" (Chikweche and Fletcher, 2014: 29). Again access to internet services was identified as a "*must have*" product.

The third research question of '*What are the factors that influence purchase decision making of the MOP in Africa?'* (Chikweche and Fletcher, 2014: 29), was also to prove very insightful. The first key insight was the intertwining of brand, social networks and product performance, see Figure: 2-44.

Brand plays a major role in any purchase decision and that a branded product bought is used in a person's social networks to show their status. Another key insight was in the areas of technology and new products where the importance of Social Media, in particular Facebook, as a key technology influencer for the MOP consumers was highlighted. This was because it was a platform that provided an opportunity for getting information on new trends and also for sharing and in some cases for showing off purchases which confirmed one's middle class status. This research highlights the importance of mobile data as opposed to mobile voice as being of importance as an indicator of status in the South African emergent middle class.

Figure: 2-44: Key Intertwined Influencers



(Source: Chikweche and Fletcher, 2014)

The second study was an exploration of customer loyalty in the South African telecommunications market (Morgan and Govender, 2017). This study highlighted the fact that brand image, which they indicate as a cluster of associations that a customer connects to a brand name in their mind as per Dobni and Zinkhan (1990), cannot be ignored while examining customer loyalty. It has a statistically significant positive effect on customer satisfaction and is an indirect antecedent to loyalty through it impact on customer satisfaction.

2.4.5 Review of Research on the Adoption of Mobile Services

In order to determine which currently were the mobile services most investigated to determine the adoption of a mobile service as well as the most used frameworks and statistical techniques in determining the adoption of that particular mobile service, a search on the Proquest and EbscoHost data bases for peer reviewed research, using the key words Mobile Services and Adoption for the period 1st March 2017 to 28th February 2018 was undertaken. The original searches highlighted 901 items, but this number was reduced to 345 once the search criteria was limited only to those articles which were published in scholarly journals, conference proceedings, and reports and for which the full text article was available. These items were individually examined and finally 41 items were found to meet the criteria of discussing, explaining or analysing the adoption of a mobile service. These 41 reports were further examined to determine, the mobile service which was being examined, the theoretical basis of any framework which was used and the statistical techniques used in the analysis. The analysis is given in Table: 2-15; the details of the latest 20 articles are given in Table: 2-16 and the final 21 in Table: 2-17.

Table: 2-15: Summary of Mobile Services, Theoretical basis of Frameworks and Statistical techniques used in 41 Research articles regarding the Adoption of Mobile Services published between 1st March 2017 and 28th February 2018 by EbscoHost and Proquest

Mobile Service Investigated							
	Advertising	Banking	Commerce	Education	General	Health	Others
Number of Incidences	3	15	5	5	1	5	8
Theoretical Basis used in the Research							
	Technology Acceptance Model (TAM)	Unified Theory of Acceptance and Use of Technology (UTAUT)	Diffusion of Innovation (DOI)	Hofstede's 5 Dimensions of Culture	Theory of Planned Behaviour (PBT)	Others	
Number of Incidences	16	5	4	2	3	11	
Statistical Methods of Analysis							
	Structural Equation Modelling						
	Partial Least Squares (PLS)	Covariance Based (CB)	Confirmatory Factor Analysis (CFA)	Exploratory Factor Analysis (EFA)	Regression & Correlation	Others	Descriptive Statistics
Number of Incidences	6	5	8	5	7	5	36

(Source: Proquest and EbscoHost Databases)

Table: 2-16: First 20 articles regarding Adoption of Mobile Services published 1st March 2017 to 28th February 2018

Author	Title	Service Focus	Theoretical Basis	Adoption Factors	Methodology	Findings
Almasri, 2018	New mobile learning process model for higher education students in Jordanian Universities	Mobile Education	Technology Acceptance Model (TAM)	Perceived Ease of Use: Perceived Usefulness: Mobile Readiness: Attitude towards Use: Perceived Interaction	Descriptive Statistics: Covariance Based Structural Equation Modelling	Perceived Ease of Use and Mobile Readiness had significant effect on Perceived Usefulness. Perceived Usefulness and Perceived Ease of Use and Perceived Interaction had significant effect on individual Attitudes.
Bendary and Al-Sahouly, 2018	Exploring the extension of Unified Theory of Acceptance and Use of technology, UTAUT2, factors effect on perceived usefulness and ease of use on mobile commerce in Egypt	Mobile Commerce	Unified Theory of Acceptance and Use of Technology, UTAUT2	Perceived Ease of Use: Perceived Usefulness: Hedonic Motivation: Convenience: Social Influence	Descriptive Statistics: Confirmatory Factor Analysis	Social influence was fully mediated with Hedonic Motivation and Convenience. Convenience, has the greatest effect on perceptions of consumers usefulness and ease of use Convenience, it has a strong mediation effect between social influence and mobile commerce user's perceptions
Alzubi, Al-Dubai & Farea, 2018	Using the Technology Acceptance Model in understanding citizens' behavioural intention to use m-marketing among Jordanian citizens	Mobile Marketing	Technology Acceptance Model (TAM)	Perceived Ease of Use: Perceived Usefulness: Attitude towards Use: Perceived Trust	Descriptive Statistics: Partial Least Squares Structural Equation Modelling	The trust factor has a positive and significant impact on perceived ease of use and perceived usefulness. Ease of use and perceived usefulness has the stronger impact on customers' attitude, which in turn influences customers' intention to use m – marketing services.

Law, Thome & Lindeman, 2018	Student use and perceptions of mobile technology in clinical clerkships - Guidance for curriculum design	Mobile Education			Descriptive Statistics	Technology use was seen as beneficial by 97.6% of students. Classes that used technology extensively were preferred by 54% of students, although 47.2% perceived decreased faculty/classmate interaction.
Chawla and Joshi, 2017	High Versus Low Consumer Attitude and Intention Towards Adoption of Mobile Banking in India: An Empirical Study	Mobile Banking	Technology Acceptance Model (TAM)	Perceived Ease of Use: Attitude towards Use: Perceived Trust: Perceived Lifestyle Compatibility: Perceived Efficiency: Perceived Convenience	Descriptive Statistics: Exploratory Factor Analysis: Confirmatory Factor Analysis	Perceived trust, perceived ease of use (PEU), perceived lifestyle compatibility, perceived efficiency and perceived convenience significantly impacted user attitude. User attitude was not found to differ significantly between demographic variables Perceived trust, PEU, perceived lifestyle compatibility and perceived efficiency were found to positively and significantly affect user intention. User intention was found to significantly vary across demographic groups based on gender and household income.
Sánchez-Prieto, 2017	Motivation and innovation: Acceptance of mobile technologies in teachers in training	Mobile Education	Technology Acceptance Model (TAM)	Perceived Ease of Us: Perceived Usefulness: Perceived Enjoyment: Resistance to Change: Behavioural Intention	Descriptive Statistics: Partial Least Squares Structural Equation Modelling	Perceived entertainment and perceived utility important in the adoption process, Ease of use has the low importance in the adoption process
Islam, 2017	Capturing consumer attitude toward mobile advertising: an empirical investigation among different national cultures	Mobile Advertising	Hofstede 5 Dimensions of Cultural		Descriptive Statistics: Principal Factor Analysis	Power Distance Index (PDI) of national culture has positive moderating effects on the relationships of informativeness and credibility, Attitude toward mobile advertising and the Uncertainty Avoidance Index (UI) of national culture has a negative moderating effect on the interactivity of mobile ads.

Mazan, 2017	Investigating maturity of mobile commerce adoption: a qualitative study	Mobile Commerce	Diffusion of Innovation (DOI); Technology Acceptance Model (TAM); Social Exchange Theory (SET); Protection Motivation Theory (PMT).	Trust: Ease of Use: Relative Advantage: Security: Compatibility: Subjective Norm: Mobile Commerce Communication Level: Mobile Commerce Transaction Level	Qualitative Research	Achieving Mobile Commerce Communication Level • Trust is a precondition to use • Ease of use, subjective norm, security, relative advantage and compatibility are important
Bankole, Bankole & Brown, 2017	Influences on cell phone banking adoption in South Africa: an updated perspective	Mobile Banking	Diffusion of Innovation (DOI); Technology Acceptance Model (TAM); Unified Theory of Acceptance and Use of Technology (UTAUT)	User Satisfaction: Utility Expectancy: Effort Expectancy: Trust: Cost: Facilitating Conditions	Descriptive Statistics: Partial Least Squares Structural Equation Modelling	Utility expectancy and user satisfaction play a key determinant role in the adoption behaviour of cell phone banking users in South Africa.
Sarfaraz, 2017	Unified theory of acceptance and use of technology (UTAUT) model-Mobile banking	Mobile Banking	Unified Theory of Acceptance and Use of Technology (UTAUT)	Performance Expectancy: Effort Expectancy: Trust: Social Influence: Risk	Descriptive Statistics: Partial Least Squares Structural Equation Modelling	Performance expectancy; effort expectancy and risk perception significantly influence user's intention to adopt mobile banking services No significant relationships could be established for social influence and trust

Ahmed, Kader, Rashid & Nurunnabi, 2017	User perception of mobile banking adoption: an integrated TTF-UTAUT model	Mobile Banking	Task Technology Fit (TTF); Unified Theory of Acceptance and Use of Technology (UTAUT)	Task Characteristic: Technology Characteristic: Performance Expectancy: Effort Expectancy: Facilitating Conditions: Social Interaction	Descriptive Statistics: Exploratory Factor Analysis: Confirmatory Factor Analysis	Social influence (SOI) is most important factor. Task-technology fit (TTF), Technology characteristics (TEC), Performance expectancy (PE), Facilitating conditions (FAC), Task characteristics (TAC), and User adoption (USE) have a big influence on users' perception and attitude towards mobile banking services.
Abdinoor and Mbamba, 2017	Factors influencing consumers' adoption of mobile financial services in Tanzania	Mobile Banking	Technology Acceptance Model (TAM)	Individual Awareness: Perceived Usefulness: Perceived Benefit: Cost Effect	Descriptive Statistics: Regression Analysis	The adoption of Mobile financial service is: • Positively related to individual awareness, perceived usefulness and perceived benefit • Negatively related to cost effects. • Demographic characteristics of respondents (sex, age and income level) are moderating factors
Bakare, Owusu & Abdurrahama, 2017	The behavior response of the Nigerian youths toward mobile advertising: An examination of the influence of values, attitudes and culture	Mobile Advertising	Hofstede's 5 Dimensions of Culture		Descriptive Statistics: Partial Least Squares Structural Equation Modelling	Mobile advertising value and attitude toward mobile advertising have significant impacts on the behaviour response of Nigerian youths to mobile advertising. Regarding, the moderating effect, culture moderated between attitude and behaviour response, however it did not moderate between mobile advertising value and behaviour response toward mobile advertising.
Shirazi and Iqbal, 2017	Community clouds within m-commerce: a privacy by design perspective	Mobile Commerce	Privacy Enhancing Technologies Model (PET): Privacy by Design (PbD) framework		Descriptive Statistics	Research establishes the link between community clouds and m-commerce.

Sihare, 2017	Role of m-Banking for Indian Rural Consumers, its Adaptation Strategies, and Challenges: Consumer Behavior Analysis	Mobile Banking	Theory of Planned Behaviour (PBT); Diffusion of Innovation (DOI); Technology Acceptance Model (TAM);		Descriptive Statistics	Although mobile devices or handheld devices like PDA (Personal Digital Assistance) applications are wide due to its cost, ease of use, efficiency, and effectiveness, the use for mobile banking is inhibited by social misconceptions such as security and not maintaining transparency before, during and after transactions.
Mahande, Susanto & Surjono, 2017	The Dynamics of Mobile Learning Utilization in Vocational Education: Frame Model Perspective Review	Mobile Education	FRAME Model	Device Aspect: Learning Aspect: Social Aspect: Device Usage: Interactive Learning: Social Technology	Descriptive Statistics	The three aspects of utilization content, user intention, and socio-cultural support emphasized the importance m-learning utilization.
Amornkitpinyo and Piriyasurawong, 2017	The Concept Framework of Structural Equation Model of Mobile Cloud Learning Acceptance for Higher Education Students in the 21st Century	Mobile Education	Satisfaction and Technology Acceptance Models (TAM)	Perceived Ease of Use : Perceived Usefulness: Social Clouds: Information Quality: Satisfaction: Basic Digital Literacy	No Analysis	• Basic digital literacy, Information Quality and Social Cloud are included in the model as the exogenous latent variables. • Satisfaction and TAM model are included as the mediating latent variables. • Actual Use is the outcome of the model's latent variable
Selvabaskar, Sivagami & Aishwarya, 2017	Consumer Perception and Attitude towards the Usage of M-Health Applications	Mobile Health		Functionality: Benefits of Usage: Perceived Risk	Principal Component Method Factor Analysis: Regression Analysis	Functionality (factor 1) and benefits of usage (factor 2) are significant while perceived risk (factor 3) is insignificant at the 0.05 level

Sobhanifard, Kharazian & Alikhani, 2017	Consumer based modeling of mobile service consumption using explanatory factor analysis and analytic network process	Mobile Services	Hawkins Model for Consumer Behavior	Internal factors; Attitude; Trust; Ease of use: External factors; government Support; Technology Support; Banking Activities: Usefulness; Internal; External: Education: Internet Experience	Descriptive Statistics: Exploratory Factor Analysis: Analytical Network Process Modelling	• Mobile banking service usage can be explained by a consumer based model. • Mobile banking service usage is affected by 3 factors namely internal factor, external factor and usefulness factor. These 3 factors confirm the 3 factors of the Hawkins consumer behavior model with the only difference being the lifestyle factor named usefulness but with them being synonymous.
Aslam, Ham & Arif, 2017	Consumer behavioural intentions towards mobile payment services: an empirical analysis in Pakistan	Mobile Banking	Technology Acceptance Model (TAM)	Perceived Security: Perceived Compatibility: Perceived Usefulness: Perceived Ease of Use: Subjective Norm: Attitude Towards Usage	Descriptive Statistics: Exploratory Factor Analysis: Confirmatory Factor Analysis: Covariance based Structural Equation Modelling	• Perceived compatibility, perceived usefulness, and subjective norm are significant predictors of consumer attitude towards the use of mobile payment services, • The impact of perceived security and perceived ease on attitude is insignificant.

(Source: Proquest and EbscoHost Databases)

The additional twenty one articles are in Table: 2-17, below.

Table: 2-17: Remaining 21 articles examined.

Author	Title
Saif Almuraqab and Jasimuddin, 2017	Factors that Influence End-Users' Adoption of Smart Government Services in the UAE: A Conceptual Framework
Yadav, 2017	Active Determinants for Adoption of Mobile Wallet
Goswami, 2017	Are customers ready to use mobile technology for banking transactions? An investigation
Moorthy, Ling, Fatt, Yee, Yin, Yee & Wei, 2017	Barriers of Mobile Commerce Adoption Intention: Perceptions of Generation X in Malaysia
Bharali and Borman, 2017	Mobile Banking for Financial Inclusion: Adoption and Challenges
Chen, and Li, 2017	Understanding Continuance Intention of Mobile Payment Services: An Empirical Study
Koloseni and Mandari, 2017	Why mobile money users keep increasing? Investigating the continuance usage of mobile money services in Tanzania
Bećirović, Plojović & Ujkanović, 2017	Mobile Network Operators as Banks – Opportunities and Threats
Roy, 2017	App Adoption and Switching Behavior: Applying the Extended Tam In Smartphone App Usage
Jiménez and San-Martín, 2017	Attitude toward m-advertising and m-repurchase
Armstrong, Hoyt, Kinn, Ciulla & Bush, 2017	Mobile Behavioral Health Applications for the Military Community: Evaluating the Emerging Evidence Base
Fawzy and Esawai, 2017	Internet banking adoption in Egypt: Extending technology acceptance model
Carter and Yeo, 2017	From Hedonism and Utilitarianism to anticipated actual behavior: do UK and Malaysian postgraduate students behave differently to mobile apps?
Markland, Rempel & Bridges, 2017	Mobile Website Use and Advanced Researchers: Understanding Library Users at a University Marine Sciences Branch Campus
Wechuli, Franklin & Jotham, 2017	User Perceived Secure Mobile Banking Service Provision Framework
Asnafi, Moradi, Dokhtesmati & Pakdaman, 2017	Using Mobile-Based Social Networks by Iranian Libraries: The Case of Telegram Messenger

Bhardwaj, Wodajo, Gochipathala, Paul & Coustasse, 2017	Can mHealth Revolutionize the Way We Manage Adult Obesity?
Verhees, van Kuijk & Simonse, 2017	Care Model Design for E-Health: Integration of Point-of-Care Testing at Dutch General Practices
Birkhoff and Smeltzer, 2017	Perceptions of Smartphone User-Centered Mobile Health Tracking Apps Across Various Chronic Illness Populations: An Integrative Review
Shih and Kang 2017	Silicon Storefronts: Exploring the Evolution of M-Commerce's Effect on Service Industries
Yuan, Tsai, Dai, Chen, Chen, Wu, Li & Wang, 2017	An empirical research on relationships between subjective judgement, technology acceptance tendency and knowledge transfer

(Source: Proquest and EbscoHost Databases)

2.4.6 Key Observations from the Research on the Adoption of Mobile Services

The research showed that the Technology Acceptance Model (TAM) (Davis, 1986) was used in some format 16 times or 39% of the research articles, with the Universal Theory of the Acceptance Use of Technology (UTAUT) (Venkatesh*, et al.,* 2003) being used 5 times and the Theory of Planned Behaviour (PBT) 3 times bringing the use of behavioural models to 24 times out of the 41 articles or 59%. Rogers Diffusion of Innovation (DOI) was used 4 times and Hofstede's Dimensions of culture twice. Other models used singly included Hawkins Model for Consumer Behavior (Sobhanifard, *et al*., 2017), Privacy Enhancing Technologies Model (PET) (Shirazi and Iqbal, 2017), Privacy by Design (PbD) Framework (Shirazi and Iqbal, 2017) Task Technology Fit (TTF) model (Ahmed, *et al*., 2017) and Framework for the Rational Analysis of Mobile Education (FRAME) Model (Mahande, *et al*., 2017).

However, the models had a large number of factors in addition to the normal constructs of the various models given above included Internet Experience (Sobhanifard, *et al*., 2017), Basic Digital Literacy (Amornkitpinyo and Piriyasurawong, 2017), Cost Effect and Individual Awareness (Abdinoor and Mbamba, 2017), Mobile Commerce Communication and Mobile Commerce Transaction Levels (Ali, 2017), Perceived Enjoyment and Resistance to Change (Sánchez-Prieto, 2017) and Perceived Lifestyle Compatibility and Perceived Efficiency (Chawla and Joshi, 2017).

As was expected in all 36 articles where there was some form of analysis conducted descriptive statistical analysis was used in all of them. Structural Equation Modelling was used 11 times with Partial Least Squares Structural Equation Modelling used 6 times and Covariance Based Structural Equation Modelling used 5 times. Factor Analysis was used 13 times with Confirmatory Factor Analysis (CFA) 8 times and Exploratory Factor Analysis (EFA) 5 times, while Regression and Correlation used 7 times.

This analysis indicated that use of the TAM model, and the statistical analysis methodology were some of the most common currently being utilised in explaining the adoption of mobile services.

Mobile banking was clearly the most investigated topic with 15 of the 41 research articles or 37% involving it. This combined with the 5 articles on mobile commerce means that nearly 50% of all articles revolved around financial matters.

2.5 SUMMARY OF LITERATURE REVIEW

This literature review covers a significant amount of research that has been carried out with regard to the adoption of ICT and particularly mobile data communications. The literature covered four areas.

The first was to show how a technology that was created for the purpose of supplying voice services to people has developed into a data network that has voice as just one application among many and how it has made a fundamental shift in people's lives in terms of communication and connectivity.

The second was to show all the frameworks that had been developed with regard to the adoption of ICT services and all the factors that had been identified as affecting adoption. From this two significant factors emerged, the first was that no matter where the methodology of the framework emerged, similar key adoption factors were visible. The second was with regard to the behavioural models where the emphasis of researchers was the antecedents of these models and adding factors to try and increase the veracity of these models.

The third area covered was the factors that affected the adoption of mobile services, such as age, gender, education etc. What was evident from the research was that almost all the factors examined in detail showed that they had an effect on the adoption in some circumstances, but there were also an almost equal number of circumstances where they had no effect. This indicated that these factors must be evaluated separately in all research as there was no certainty they would have an effect on the adoption of mobile data services in South Africa.

The final area was an evaluation of the current research being carried out on the adoption of mobile data services and this review indicated that the Technology Acceptance Model (TAM) of Davis (1986 and 1989) was the framework which formed the basis of most of the current research combined with structural equation modelling as the statistical technique.

CHAPTER THREE

OVERALL METHODOLOGY AND EXECUTION OF PHASE 1

This section describes the methodology and requirements of qualitative research used in conducting Phase 1 of the research.

3.1 INTRODUCTION

This section starts by examining the basic strategy of inquiry of Phase 1 and then leads into a short description of qualitative research. It continues by examining the sampling methodology, followed by the research approach which includes the methods and instruments used to collect the data. It then goes on to describe the data analysis techniques before finishing with a demonstration of the quality and rigour of this phase of the research.

3.2 DESCRIPTION OF STRATEGY OF INQUIRY

The first tenant of this research was to determine the key drivers of adoption and inhibitors of mobile data telecommunications services in South Africa and develop a preliminary framework which could be tested in Phase 2. Section 2.3 of the literature survey has indicated that if all the different factors that have been shown to influence the adoption of ICT are added together, there are well over 50 factors. For example, the ICT Diffusion of Network of Udo, *et al*. (2008) alone has 6 groups of factors which have a combined number of 26 separate factors that influence the adoption of ICT products of which mobile data telecommunications services is a sub-sector. It is impractical to test this number of factors in a survey. Hence, Phase 1 of this research project was designed to highlight the key drivers and inhibitors in a South African context and reduce them to manageable proportions and postulate how they interact to create a preliminary framework. In order to achieve this goal a qualitative research design was devised, where 8 semi-structured interviews were conducted with individuals or groups of individuals who were expert in the mobile telecommunications market in South Africa. The interviews were conducted with two aims; the first was to reduce the number of drivers of adoption to a maximum of 8, and the second was to gain the experts' insight into what they would consider as the factors which would moderate the adoption of mobile data services.

3.2.1 A Classification of Phase 1 of the Research Design

The characteristics of this research mean that it is implemented in two distinct phases, Phase 1 being a qualitative study while Phase 2 is a quantitative study. This means that the research characteristics of Phase 1 vary from the overall research design and apply only to this phase. These differences are highlighted in the following section.

Phase 1 was used to develop an initial hypothesis of key market drivers and inhibitors and interactions that were used to derive the preliminary framework, as well as being instrumental in the formation of the survey questions which were tested in Phase 2. It involved the use of small scale research based on experience surveys of key knowledge carriers in the field. Hence the type of research in Phase 1, which would be classified as ‘Exploratory Research’ according to the characteristics laid out by Kotzé (2011), versus the overall research design which again using the same source would be classified as ‘Evaluative Research’

The second characteristic that varies is that of data type collected. The overall research design uses Quantitative (Numerical data) while Phase 1 collects Qualitative Data (Non-numeric data) which according to Saunders, *et al.* (2009) is data that is not only non-numerical but is also not quantified. The qualitative data collection method used in this study was semi-structured, involving face-to-face interviews of individual experts or in one case a group of two experts. The data obtained was coded using a mixture of predetermined and emerging codes.

3.2.2 Sampling

The following sections describe the sampling carried out for Phase 1 of the research.

3.2.2.1 Units of Analysis

The units of analysis were the same as those defined in the overall research design, namely individuals who use a mobile data telecommunications service, namely mobile data users in the four metropolitan areas of Johannesburg, Pretoria, Cape Town and eThekwini.

3.2.2.2 Sampling Method

The sampling for Phase 1 was 'purposive sampling' or 'judgemental sampling'. This is a non-probability sampling method where the researcher's judgement is used to determine which units are to be interviewed as they will give the most representative and useful data (Babbie, 2008; Saunders, *et al*., 2009).

3.2.2.3 Sampling Units

The sampling units in this case were of experts in the field of mobile data telecommunications in South Africa. These experts were either Senior or Principal Analysts from the major research houses which analyse and predict the South African Mobile Telecommunications market or the Marketing and Strategy Executives of Mobile Telecommunications Service Providers. These experts were interviewed either face to face or via video conference. The majority of the experts and their level of knowledge were known to the researcher. Those that were not known were recommended by senior management in their organisations as having the required expertise. Table: 3-1 gives the positions held by the experts as well as the type of organisations from which they came.

At this stage it must be clearly stated that the experts were participating in their personal capacity and not as official representatives of their organisations. In all 9 experts participated in the research.

Table: 3-1: List of Experts who participated in the Interviews for Phase 1

Position Held	Organisation Type
Research Manager	Research House/ Academic Institution
Senior Analyst	Research House
Senior Manager: Marketing Support	Mobile Operator
Senior Research Analyst	Research House
Managing Director	Research House
Director	Research House
Managing Executive: CRM, Loyalty & Insights	Mobile Operator
Associate Vice President Sub-Saharan Africa	Research House

3.2.3 Data collection

The following section discusses the specific approach, method and instruments used in the collection of the data, including the specific forms of data collection and the pilot testing done for the study. At the end this of section there is a discussion of who was involved in the data collection and the length of data collection period.

3.2.3.1 Specific approach, method and instruments to be used in the collection of the data

Primary data was the specific form of data collected for this study. Primary data refers to data that was collected specifically for a research project being undertaken (Saunders, *et al*., 2009).

3.2.3.2 Specific Research Method

The format for data collection in this phase was 'qualitative interviewing', which is indicated by Mason (2002) to be in-depth, semi structured or loosely structured forms of interviews. The interviews had a discussion guide which was used to initiate the discussions and helped the interviews remain on the topic.

The advantage of this type of face to face interview was that the researcher was not only gaining information from what was being said but was also obtaining additional information from the social cues of the interviewee such as voice, intonation, and body language. It also had the advantage in that the answer of the interviewee was more spontaneous, without an extended reflection, which in turn strengthened the validity of the answer (Opdenakker, 2006). The interactive nature allowed the interviewer to focus on the detail of the other's knowledge and allowed the interviewer to review the framework and focus of the questioning if alternative information emerged (Anderson, 2010). Additionally, as there was only one interviewer asking the same questions it meant that the results were more standardised (Opdenakker, 2006). However, it had the disadvantage as described by Wengraf (2001: 194), as double attention, which highlights the fact "*that you must be both listening to the informant's responses to understand what he or she is trying to get at and, at the same time, you must be bearing in mind your needs to ensure that all your questions are liable to get answered within the fixed time at the level of depth and detail that you need".*

3.2.3.3 Data collection method

The following is an overview of the data collection process which followed the interviews.

In all the interviews the researcher was the moderator and observer. The researcher made both written notes and digital audio recordings using audio recording equipment. Although the telephonic interviews were carried out using a system that supplied both audio and visual images only the audio portion was recorded. The decision to only make audio recordings in both the one-on-one interviews and telephonic interviews was at the request of the participants.

The audio recordings were transcribed by an external supplier into a format that was compatible with Atlas.ti, the software program used for the qualitative analysis.

3.2.3.4 Pre- / Pilot Testing

To ensure that the discussion guide and the proposed format of the interviews gave acceptable and useful data they were evaluated after the first interview and slight modifications where made (Forza, 2002; Hutchinson, 2004).

3.2.3.5 Length of the data collection period

The data was collected between June and August 2016, a period of three months. The period was chosen in order to fit in with the busy schedules of the participants. In order to use the period most effectively and to help focus the subsequent interviews, transcribing began after an interview had been conducted and, after checking, was uploaded to the qualitative software and the coding with the predetermined coding scheme was carried out.

3.2.4 Research Procedure

The study commenced by listing the possible participants of the study in a prioritised list. The list was composed in three separate groups. The first group was made up of all the mobile service providers, prioritised by largest to smallest in terms of data subscribers. Each of the providers was contacted and the relevant people were identified.

The second group comprised of the research houses that produced analysis of the South African mobile telecommunications market and the names of their local analysts.

This list was again split into two sections, the first of which was of research houses that were based in South Africa and had Africa as their main analysis focus. This group was then prioritised using the researcher's knowledge of the relevant analysts and their insights and analysis of the market as perceived by the researcher.

The third group was of the international research houses which had a presence in South Africa and an analysis team based in South Africa. Again, this group was prioritised using the researcher's knowledge of the analysts and their perceived insights and analysis of the market. It must be stressed that all the analysts and their research houses were personally known to the researcher and that the researcher had interacted with all of them several times in a professional capacity.

All the identified persons were contacted by the researcher and asked if they were willing to participate in the research and whether they would like to participate in their individual capacity or on behalf of their organisations. All participants who agreed to participate indicated that they would participate in their individual capacity.

Of the mobile service providers the relevant persons from two of the service providers declined to participate. However, the two that participated represented more than 50% of the market.

The numbers participating from the second and third group were balanced with three people interviewed from each group giving a final breakdown of interviews of two from the service provider group, three from the South African based analyst houses and three from the international research groups.

Once the participants agreed telephonically the request letter was sent (see Appendix 2, for a copy of the letter). The letter informed the participants that this was official research sanctioned by the University of South Africa, School of Business Leadership. It gave a description of the research including what data was to be collected and the method of collection. It requested that the participants sign to indicate that they were giving their consent to participate in the research and use of the data which they supplied. They were also given the contact details of the supervisor and the promise to be supplied with a summary of the results if requested.

Only once the signed consent letter was returned by the participant was the interview scheduled at the convenience of the participant. Two weeks before the interview, a copy of the discussion guide (Appendix 3) was sent to the participant to prepare and collect any data or documentation that was relevant.

During the interview the researcher acted as a facilitator for the interview and as an observer. The researcher did not participate in the interview other than to ask the questions, request clarification and to ensure that the discussion remained on the agreed topic.

3.2.5 Development of the discussion outline

The discussion document, see Appendix 3, was developed with the object of directing the discussion into three main areas, namely:

Area 1: Reduction and prioritisation of the factors or drivers of adoption of a mobile telecommunications service from 50+ to the most important 5 to10.

For this two questions were asked as to what the expert saw as the main five drivers of adoption of mobile services and also asked to justify why they chose those particular drivers. Question 3 was designed to bring the interviewees back to the models and drivers identified in the literature survey and to ask them after looking at the models whether they would change any of their drivers and if so why.

Media reports (MyBroadband, 2015; MyBroadband, 2016) and institutional reports (Worldbank, 2017; Research ICT Africa 2015, 2016 and 2017; International Telecommunications Union, 2017) had indicated that the high cost of mobile data and smartphones were acting as an inhibitor to the adoption of mobile services. In light of this, and the rollout of free WiFi by municipalities and private individuals (Techcentral, 2016; Alfreds, 2016) Question 4 was devised to see if respondents thought that the price of mobile data was actually inhibiting adoption and if the constraints with regard to the unaffordability of data and devices were removed what they thought would be the effect on adoption.

Area 2: To suggest a possible segmentation of mobile subscribers.

Question 5 was designed to determine what were the key factors that could be used to segment the telecommunications market and how did each of them act on the market.

This information would be important in determining what the moderating factors on the adoption would be.

Area 3: To suggest how the adoption factors may vary according to the various segments.

Question 6 was an extension of Question 5 and was designed to determine how the drivers of adoption varied with possible moderating factors and which were more important.

In both Areas 2 and 3 the idea of dividing the population into segments was a method of determining what were the key differentiating factors that split the population and using these differentiating factors to identify possible moderating and mediating factors.

3.2.6 Interviews

Seven one-on-one interviews of which five were face to face and two were telephonic interviews with a visual feed were conducted. An eighth interview was a group interview with two members of the team from the organisation participating.

The research was concluded after the eighth interview as the last two interviews had not produced any new data, insights or new drivers for adoption and theoretical saturation had been reached (Glazer and Strauss, 1967; Strauss and Corbin, 1998; Morse, 1995; Lasch, Marquis, Vigneux, Abetz, Arnould, Bayliss, Crawford & Rosa, 2010).

Additionally, the quality of a concept did not depend on the number of times it was stated but the richness of how it described the concept and how important the concept was to the overall research question (Braun and Clarke, 2006) was a key understanding used in the interviews.

3.3 ANALYSIS OF QUALITATIVE RESEARCH

Literature shows that there are many methods available for performing a qualitative analysis on data acquired in interviews and they are incredibly diverse, complex and nuanced (Holloway and Todes, 2003). The following section will first explain what methods of analysis were chosen, how the data was prepared for analysis and then articulate the methods that were adopted for this study.

3.3.1 Choice of Analysis Methodology

As stated, this phase of the study made use of qualitative techniques of data analysis. Quantitative techniques according to Saunders, *et al*. (2009) are determined by the very data themselves. In essence qualitative data is words and the meanings behind them and the analysis involves turning such data into useable information.

For this analysis it was determined that thematic analysis would be the best technique. The reason for this choice was two-fold.

The first reason was that prior experience had indicated to the researcher that often the key factors of adoption are those small infrequent gems of information which are not widely known. A major choice in design of Phase 1 was to talk to the experts and try and determine those gems. Morse (1995), Braun and Clarke (2006), and Fereday and Muir-Cochrane (2006) all strongly emphasised that in thematic analysis often a single comment can be just as important as a theme or comment present in all the individual documents and it is that infrequent gem that ties a significant amount of the rest of the data to the theoretical framework. The approach of content analysis, where the ideas with the greatest occurrence are chosen, could result in those gems being ignored.

The second reason was that once the interviews commenced it became obvious that there were two distinct ways in which the experts looked at the problem of adoption. The majority viewed it from a socio-economic perspective and all the factors identified were issues such as income, education, urban or rural, etc. While, a minority viewed the problem from a behavioural perspective and identified factors such as usefulness of the service, social influence from friends and family, etc. Combining these two very different points of view by using content analysis would probably have meant that the behavioural point of view would have been lost, whereas thematic analysis allowed the combining of both points of view.

3.3.2 Preparation of data for analysis

According to Field (2009) exploring data is seen as the first step in any data analysis procedure. After the first interview the data was examined to determine if the interviews gave the required information and slight changes were made to the discussion document.

The audio records of the interviews and the interview notes were transcribed after each interview was concluded and were then fed into Atlas.ti, (http://atlasti.com/), a Qualitative Data Analysis software package, where they were available for coding.

3.3.3 Description of the Thematic Analysis process used

Thematic analysis involves searching across a set of data to find repeated patterns of meaning called themes which become the categories for analysis (Braun and Clarke, 2006; Fereday and Muir-Cochrane, 2006). It is the theoretical, flexible method that organises, describes and interprets qualitative data and it can be applied across a large range of theoretical and epistemological approaches (Boyatzis, 1998; Crowe, Inder & Porter, 2015). According to Braun and Clarke (2006) it should be seen as a foundation method for qualitative research.

There are two primary ways in which the patterns in the data can be identified. They are:

- An ***Inductive*** or 'bottoms up' approach (Boyatzis, 1998). In this data driven approach the way in which the themes emerge out of the data and are not fitted into a pre-existing coding frame. (Braun and Clarke 2006).
- A ***Deductive*** or ***Theoretical*** approach (Hayes, 1997; Crabtree and Miller, 1999). This is a 'top down' approach which uses an a priori template of codes into which the data is fitted. According to Braun and Clarke (2006) this type of analysis gives a more detailed analysis of the data, but a less rich description of it.

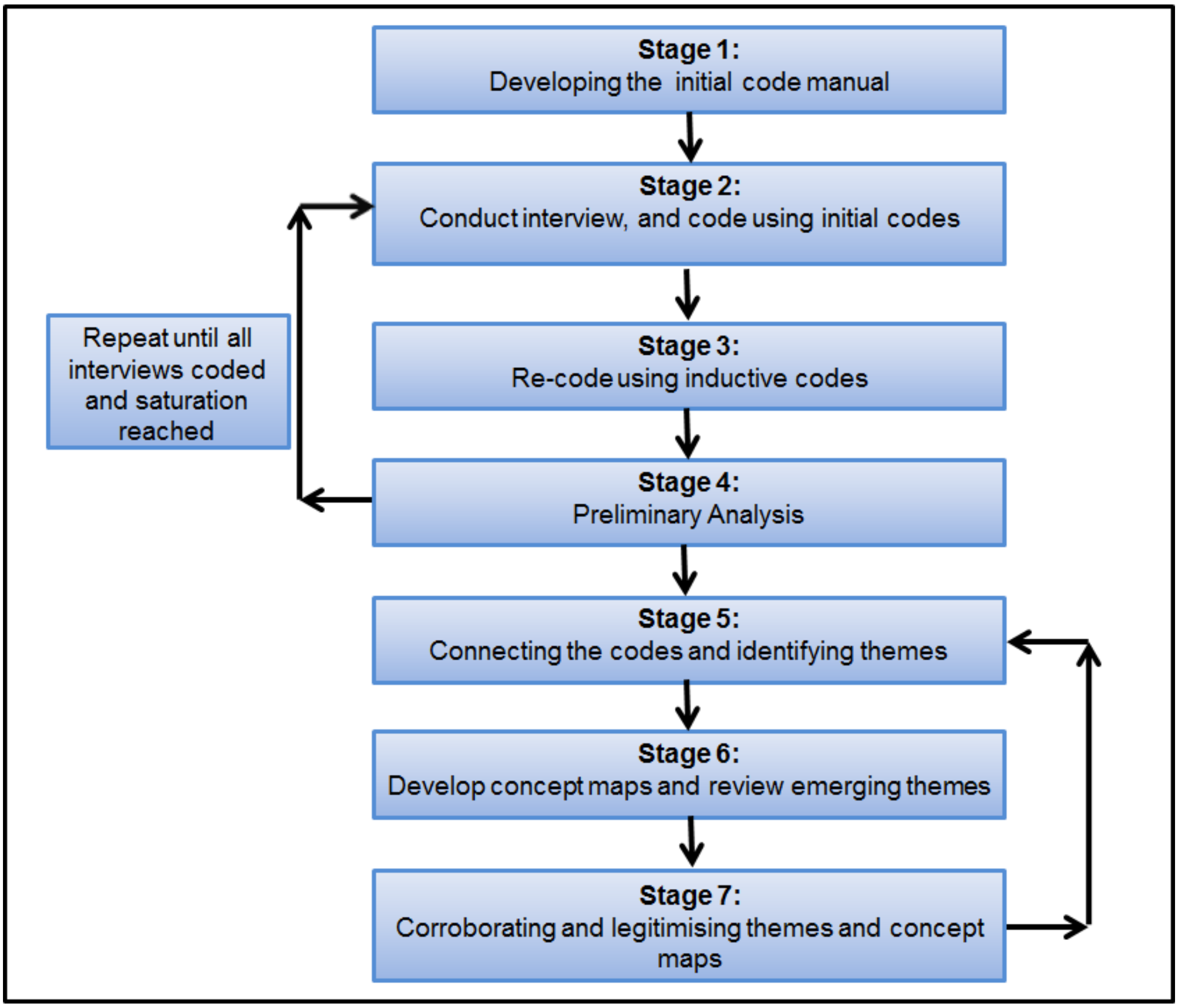
Fereday and Muir-Cochrane (2006) found that both methods were compatible and by using them in a hybrid approach demonstrated increased rigour.

Braun and Clarke (2006) developed a six stage process that can be used as a guideline to assist researchers with a thematic analysis using an inductive approach. Fereday and Muir-Cochrane (2006) also developed a six stage coding process adapted from Boyatzis (1998) and Crabtree and Miller (1999). However, this uses a deductive approach with a predefined template or code manual.

In this research it was found that the initial coding manual was inadequate, especially when the two distinct ways in which the experts approached the adoption of mobile services were identified (see section 3.3.1). Therefore, a method which incorporated both inductive and deductive methodologies and a coding process that incorporated elements from both Braun and Clarke's (2006) and Fereday and Muir-Cochrane's (2006) processes was devised. This method also incorporated the techniques for the identification of themes as articulated by Ryan and Bernard (2003) and incorporated the technique of concept mapping as postulated by Novak and Cañas (2008). These techniques are explained further in the following sections.

The final methodology to conduct the thematic analysis is articulated in Figure: 3-1 and described as follows:

Figure: 3-1: Diagrammatic representation of Final Thematic Analysis Methodology



(Source: Extracted from Braun and Clarke, 2006 and Fereday and Muir-Cochrane, 2006)

Table: 3-2: Detail of the Final Thematic Analysis Methodology

Stage	Description
1. Develop the coding manual	The code manual was developed based on the research question. The code manual served as data management tool (Crabtree and Miller, 1999).
2. Conduct an interview and code using initial codes	Interview was conducted, it and the researcher's notes were transcribed and an initial coding using the code manual was performed.
3. Re-code using an inductive coding methodology	The interview was re-coded, by adding additional inductive codes where the initial coding had failed to properly highlight the all the ideas and concepts articulated.
4. Preliminary Analysis	The data from the interview was summarised and added to the data from the previous interviews. The combined summarised data was now analysed to see what trends emerged and if there was anything which needed pursuing in more detail in the following interviews. The new data was also compared to the existing body to check if saturation was being reached. If saturation did not appear to be reached, then another interview was conducted until saturation was reached. Saturation was considered to have been reached when it could be said that no further concepts, sub-concepts or relationships between them could be obtained by further analysis or data collection (Glazer and Strauss, 1967; Strauss and Corbin, 1998; Morse, 1995; Lasch, *et al*., 2010).
5. Connecting the codes and identifying themes	The various codes were connected, clustered and the initial themes identified using the techniques as postulated by Ryan and Bernard (2003) and initial 'thematics' were constructed.
6. Develop concept maps and review emerging themes	The initial concept maps were developed to give a diagrammatic representation of the clusters and the emerging themes.
7. Corroborating and legitimising themes and concept maps	The initial themes were clustered into first order themes and then re-clustered until the 2nd level and highest order of themes were determined (Crabtree and Miller, 1999) and the corresponding concept maps were created. The resulting analysis was checked for completeness and if it was found to be problematic the process returned to Stage 5 and the cycle repeated until no problems were found.

3.3.4 Identification of Themes

According to Ryan and Bernard (2003) the identification of themes is at the heart of qualitative analysis, but is one of the most mysterious as it is seldom discussed in literature.

The first action in identifying themes is to define what a theme is. In this Ryan and Bernard (2003) follow the lead of Agar (1979, 1980) while remaining faithful to the terminology of Opler (1945) who describe themes and expressions as the fundamental concepts that need describing.

Ryan and Bertrand (2003) describe 12 methods for the determining of themes and classify them into two major classes, namely, ‘Scrutiny Techniques’ (things to look for) and ‘Processing Techniques’ (things to do). The techniques are the following:

Scrutiny Techniques:

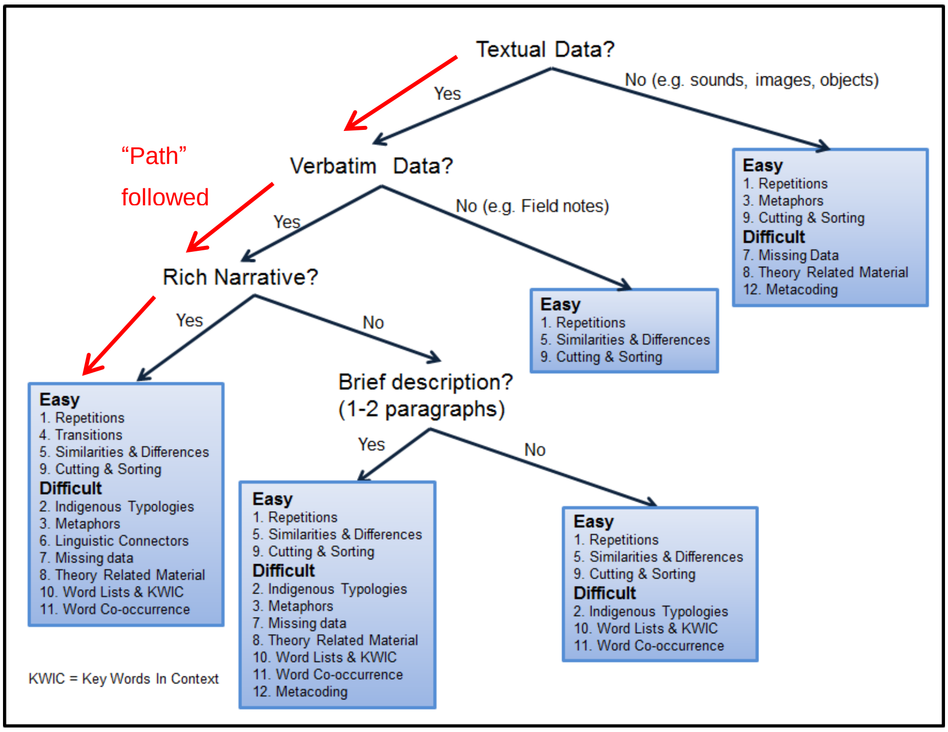
1. Repetitions: these are topics that occur and re-occur (Bogdan and Taylor 1975:83).
2. Indigenous Typologies or Catalogues: these are local terms that sound unfamiliar or are used in unusual ways. According to Patton (2015) these are indigenous categories in contrast to analysis constructed typologies.
3. Metaphors and Analogies: People often represent thoughts, behaviours and experiences with analogies and metaphors (Lakoff and Johnson, 1980).
4. Transitions: In text, transitions into new paragraphs indicate a change of an idea, where as in speech it is a pause, the occurrence of certain phrases or the changes in voice tone also can signify the transitions.
5. Similarities and differences: the constant search for similarities and differences by making systematic comparisons is what Glaser and Strauss (1967) call the constant comparison method.
6. Linguistic Connectors: specific words and phrases, such as because and as a result of often indicate casual relations. While conditional relationships are often shown by words such as if, then, and instead of.
7. Missing Data: often interviewees will deliberately avoid talking about specific topics and the avoidance of these subjects can be an indicator of things (Bogdan and Taylor, 1975).
8. Theory Related Material: the bringing in of prior studies and theory can aid identification of themes, but at the same time can hinder the identification of new ideas (Charmaz, 1990).

Processing Techniques,

1. Cutting and Sorting: this method involves marking quotations and expressions in the data, cutting them out and collecting them in combinations in order to highlight themes.
2. Word Lists and Key Words in Context (KWIC); This technique involves paying close attention to the words which people are using and using techniques such as counting the number of times the words are used.
3. Word Co-occurrence; this methodology is based on the principle that a word's meaning is related to the concepts to which it is connected. It comes from linguistics and semantic network analysis and is often called collocation and results in the formation of co-occurrence matrices.
4. Metacoding; "*Metacoding examines the relationship among a priori themes to discover potentially new themes and overarching metathemes*" (Ryan and Bernard 2003: 99).

Ryan and Bernard (2003: 102) also produced a flow chart which suggests which technique should be used in what situation. This chart is shown in Figure: 3-2.

Figure: 3-2: Selecting among Theme Identification Techniques



(Source: Ryan and Bernard 2003: 102)

The path which was followed in this analysis is the path in red on Figure: 3-2, namely: Textual Data→ Verbatim Data→ Rich Narrative→ Yes→ methods in most left block

3.3.5 Concept Maps

Miller (1956) found that an individual's working memory (short–term memory) can only process between five and nine psychological units at any particular moment. This limits a person's working memory so they can only process two to three concepts at a time (Novak and Cañas, 2008). Anderson (1992) indicated that in order to structure large bodies of knowledge there must be an orderly sequence of iterations between the working and long term memories to process new knowledge. Concept mapping is a technique that was developed by Novak to help children understand mathematics and science (Novak and Musonda, 1991). Novak and Cañas (2008) then extended the concept to qualitative research, where they are described as "*graphical tools for organizing and representing knowledge*", (Novak and Cañas, 2008: 1). They postulate that the concept map facilitates process several concepts and allows the orderly sequence of iterations between the working and long term memories and hence it serves as a template or scaffold to help organise and structure the knowledge.

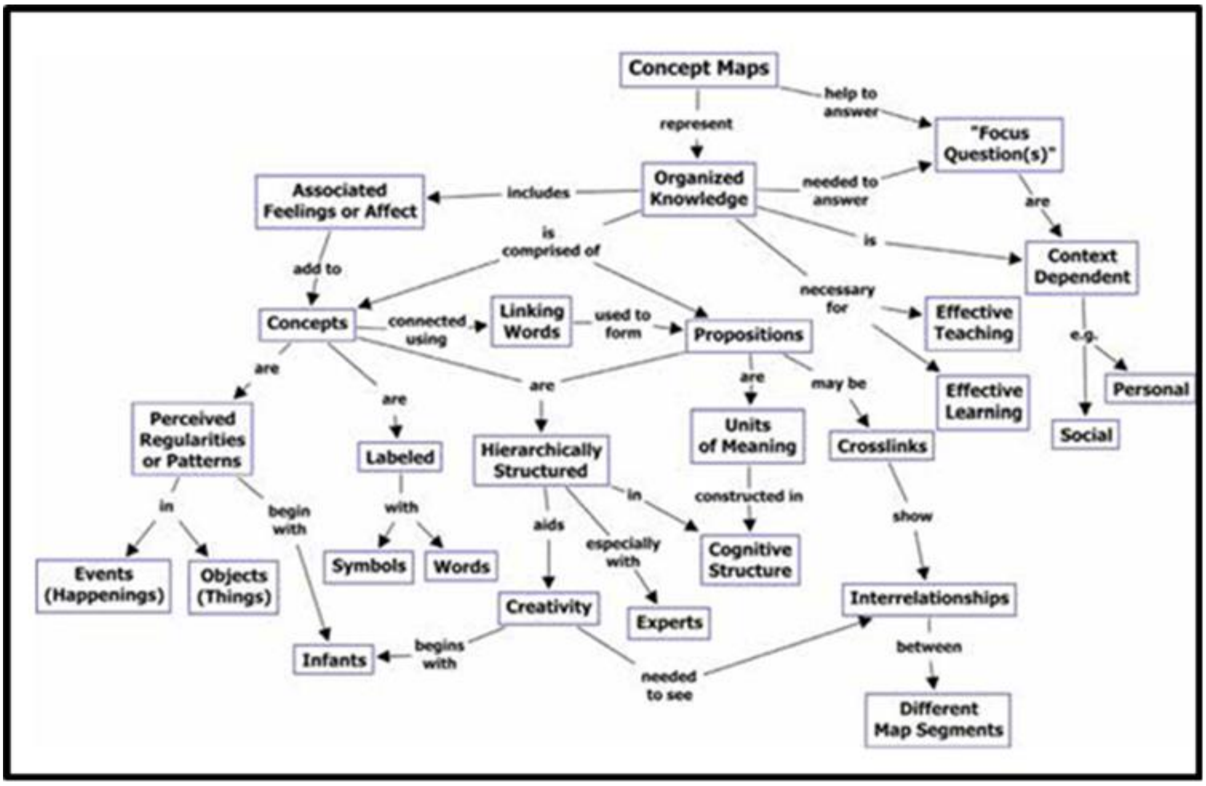
The methodology below, as described by Novak and Cañas (2008) was used to construct the concept maps:

- Start with a focus question. This is a question that clearly specifies the problem for which the concept map is being constructed.
- Identify the key concepts that apply to this focus question from the data source.
- Construct a preliminary map by attaching the concepts to the focus question in a hierarchical manner. If not all the concepts can be added initially keep them in a parking lot from where they can be added to the map at a later stage. Subject the preliminary concept to several iterations to optimise it.
- Start adding cross-links. Cross-links are links that exist between the different segments or domains of the concept map. This is important as "*in the creation of new knowledge, cross-links often represent creative leaps on the part of the knowledge producer*" (Novak and Cañas, 2008: 2). They also illustrate relationships between the sub-domains.

- The concept map is again taken through several iterations until the map cannot be improved by any further revisions.

Figure: 3-3 below shows the key features of concept mapping in the form of a concept map.

Figure: 3-3: A Concept Map showing the key features of concept maps



(Source: Novak and Cañas, 2008: 2)

3.4 ASSESSING AND DEMONSTRATING THE QUALITY AND RIGOUR OF THE PHASE 1 RESEARCH DESIGN

In this section the handling and storing of all the data utilised in Phase 1, from raw data to the final development of themes and concept maps, is explained.

3.4.1 Recording, storing and coding of the data gathered

All raw data, (recordings, field notes and observations) that were collected from each interview were correlated. A copy was made of all the raw information and the original documents and recordings were stored in a locked cabinet and only used for reference purposes. Only the copies of the documents and recordings were used for transcribing and analysis, thereby ensuring the integrity of the data. All copies of the recordings which were used in transcribing were controlled and a declaration signed indicating that no additional copies were made by the transcribing agency. All the information regarding the analysis, including code manuals, coded documents, analysis results and concept maps were stored in the qualitative software and electronic copies kept with the raw data. All raw data and analysis are to be kept for 5 years.

3.4.2 Reliability

In qualitative research, 'qualitative reliability' indicates that the researcher's approach is consistent across different researchers and different projects (Gibbs, 2007). In order to do this the reliability procedures as defined by Gibbs (2007) were used. Therefore, the transcripts were checked against the audio recordings to ensure that they accurately represented the audio record. In order to prevent a drifting in the definition of the codes, all codes, both a priori and deduced were defined before they were used in the analysis and were constantly checked to ensure that there was no shift in the meaning of codes.

3.4.3 Validity

In qualitative research, 'qualitative validity' means that the researcher checks for accuracy of the findings (Creswell, 2009). The following strategies recommended by Creswell (2009) were employed to ensure accuracy of the results.

Data from the research was triangulated with literature and other documents in the public domain, written by research houses other than those interviewed, to confirm the accuracy of the results.

The findings were also checked by discussing them with several of the participants from the interviews, this served as both a member review as well as a peer review.

Finally, the bias of the researcher was clarified.

3.4.4 Rigour

The rigour was tested for this study by using the correct sampling strategy when selecting the sample. By using a 'purposive sampling' method, the best sample was selected as the most knowledgeable persons in the field were interviewed. The other way the rigour in this study was demonstrated was the correct application of qualitative analysis.

3.4.5 Researcher bias

According to Leedy and Ormrod (2010: 208), "*bias can be defined as any influence, condition, or set of conditions that singly or together distort data*". The researcher clearly employed 'self-awareness' and a monitoring approach towards the data as the data could have been prone to manipulation by various influences. It was important to eliminate any bias within a research study, as without acknowledging these critical areas of research it may have given rise to questions on the quality of the research study and as a result may have put the study in dispute.

The researcher attempted to remove all forms of bias by deliberately not becoming actively involved in the discussions and steering the interview towards drivers and segmentations that he felt were valid. The researcher may also have added bias to the study by the choice of codes. However, constant checking with the researcher's supervisor was a method in used to try and mitigate researcher bias.

CHAPTER FOUR

PHASE 1: ANALYSIS OF DATA OBTAINED IN THE INTERVIEW PROCESS AND DEVELOPMENT OF A PRELIMINARY FRAMEWORK

This section will explain the analysis of the data obtained in the Phase 1 interviews using the methodology outlined in section 3.3

4.1 INTRODUCTION

The chapter is structured as follows; section 4.2 describes the analysis, while section 4.3 covers the development of the preliminary framework.

4.2 DETAILED DATA ANALYSIS

As highlighted earlier the method explained in section 3.3 was utilised to carry out the analysis of the qualitative data.

4.2.1 Stage 1: Developing the initial coding manual

The initial step in this process was to develop an a priori template of 80 codes, and their definitions based on the drivers for adoption and inhibitors highlighted in the various frameworks discussed in Chapter 2.

4.2.2 Stages 2-3: Coding

The initial stages of the analysis were an iterative process. After each interview was conducted the interview was transcribed using the audio transcript and it was coded first using the 80 codes in the initial coding manual. This was the ‘deductive’ approach (Hayes, 1997; Crabtree and Miller, 1999). The interview was then re-examined looking for any ideas or concepts that had not been captured in the initial coding step. Once a new idea or concept was identified it would be compared with the ‘inductive’ codes developed from previous interviews. If it was an existing concept it would be coded using the appropriate code and if it was not defined previously a code would be created and defined and added to the inductive coding manual (Boyatzis, 1998). Once all the concepts and ideas had been coded, a summary of the interview would be created highlighting key aspects uncovered and any new ideas which could be investigated in subsequent interviews. This process continued until two consecutive interviews were conducted where no additional concepts or ideas were discovered meaning theoretical saturation had been reached (Glazer and Strauss, 1967; Strauss and Corbin, 1998; Morse, 1995; Lasch, *et al*., 2010). Once all the interviews were complete and coded both deductively and inductively, the complete set of transcripts was examined several more times checking for any possible changes in codes. This was done because the interviews were initially coded over a period of time, and there was a possibility that the meaning of a code could have changed. Additionally, if there was a drift in the code, the original code may not be completely capturing the idea and then a second code became necessary (King, 2003).

4.2.3 Stage 4: Preliminary Analysis

From the preliminary analysis it became clear that there were two distinct viewpoints in relation to the factors of adoption and inhibition that were being identified.

The first and majority view, was focused on the practical factors such as affordability, educational standards, network coverage, age, utility and technological knowledge.

The second focus was on behavioural issues and highlighted areas such as usefulness, social pressures, and lifestyles. In fact, one of the participants indicated that their organisation actually organised their mobile user segmentation based on behavioural and lifestyle factors.

Table: 4-1: Top 20 Codes in numerical terms (level 1)

Code	Number of Times Used
Adoption	167
Apps	88
Usage	85
Affordability	82
Age	77
Driver	76
Behaviour driven	65
Ease of use	62
Benefits	58
Attitude	51
Utility	49
Device	47
Constraint	44
Education constraint	41
Technology competence	40
Technology	39
Cost/ Financial	36
Data	36
Voice	36
Social Interaction	35

The preliminary analysis indicated that the initial 80 codes had increased to 164 and there were 495 quotations linked to these codes. The number of times each code was also used was counted in order to obtain how often it was referred to in the interviews. Table: 4-1 above highlights the top 20 codes after the initial analysis.

4.2.4 Stage 5: Connecting the Codes and Identifying Possible Themes

The next step was to examine the various individual codes and start to collate them into groups according to functional code types and to colour code these groups. Then the next step was to re-examine the codes paying close attention to those codes which often occurred in close proximity to another code to try and tie different functional codes together. In this analysis individual codes were not exclusively used in a single group, but could be used in several groups and served as a link between the various potential themes. The 164 codes were reduced to 13 code groups and these are highlighted in Table: 4-2

Table: 4-2: Combined Codes and number of individual codes in each

Combined Codename	Description	Number of individual codes in combined code
Behaviour	Relate to the users behaviour with regard to mobile services	38
Demographic	Relating to demographic factors such as age, residence	17
Ease of Use	Relates to how easy or difficult to use mobile services	25
Intention to use	Relates to the factors that influence users intention to use the services	19
Lifestyle:	Relates to users lifestyles and complimentary factors such as income, free cash flow	28
Life Style Measure (LSM)	Life Style Measures refers to the persons life style and assets based on SAARF ratings	23
Operator Intent	What the operator is doing or intending to do in the market	25
Operator Issues	Issues with regard to the operators which affect usage, i.e. coverage, speed	45
Services	Relates to services (offerings) from operators and what is required by users	40
Social Issues	Social pressures and forces which act on users	29
Technical Knowledge	Refers to users technical knowledge and how it hampers or helps usage	15
Technology	This refers to technology directly and encompasses factors such as 2G vs 3G, handset types, feature vs smart phones	24
Usefulness / Utility	Refers to the values gained from mobile or its services	21

Figure: 4-1: Thematic Map of Behaviour

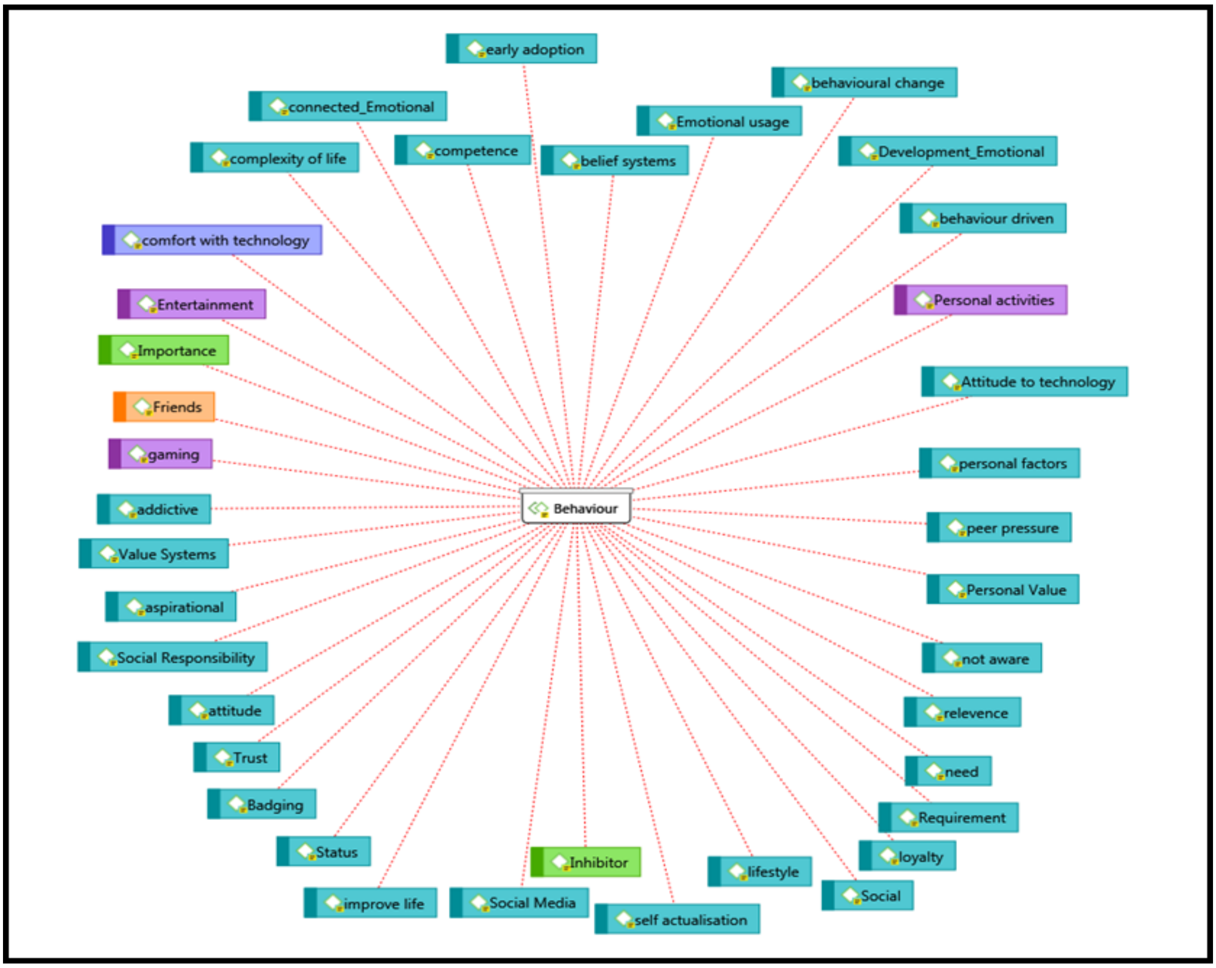


Figure: 4-2: Thematic Map of Ease of Use

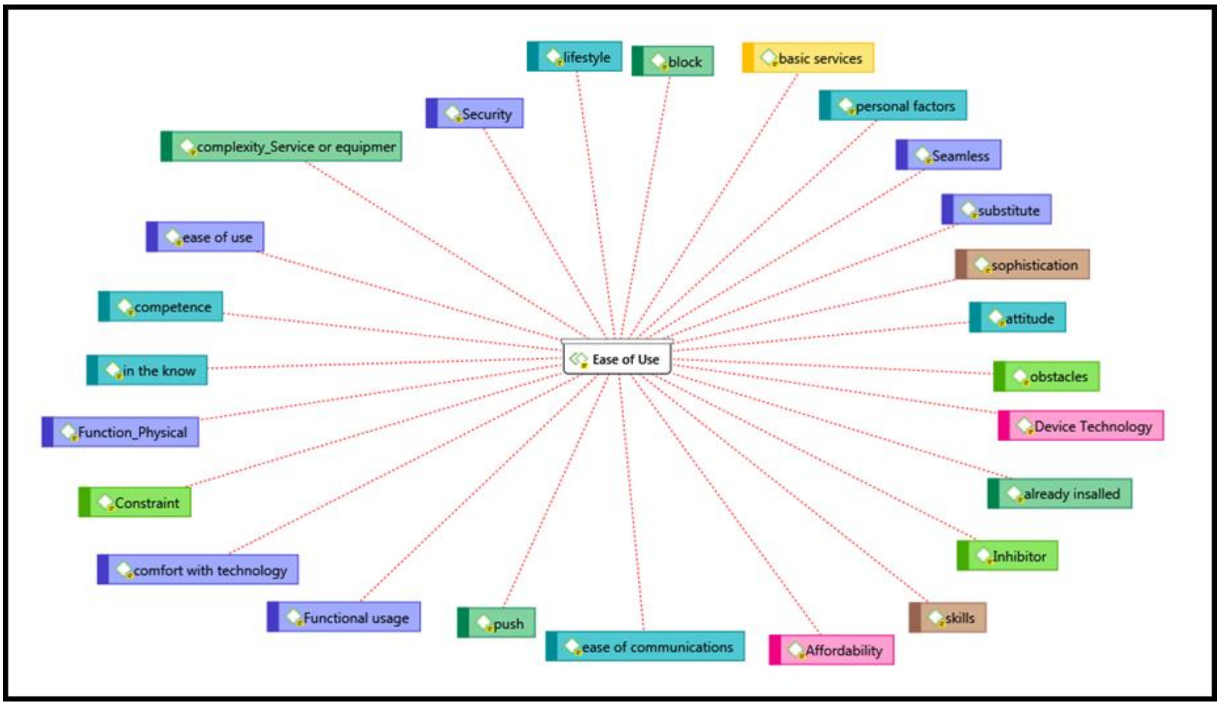
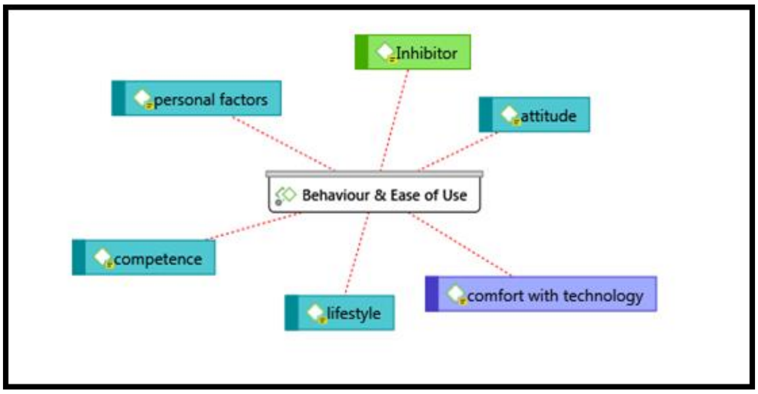


Figure: 4-3: Thematic Map of Behaviour and Ease of Use Combined



The next step was to start plotting these 13 combined code groups with each other and to see which codes were the same in both groups. This diagram of the related linked codes is called a 'thematic' (Braun and Clarke, 2006) or 'concept' map (Novak & Cañas, 2006). Figure: 4-1 and Figure: 4-2 shows examples of this first level thematic map.

If there were a lot of identical codes in two groups it would indicate that the two groups were similar and that they could be combined into a single unified group or theme. If there were very few identical codes in two groups as in Figure: 4-3 (Behaviour and Ease of Use), this would indicate that the groups were different and very unlikely could be combined into a single theme.

4.2.5 Stage 6: Develop Concept Maps and Review Emerging Themes

The development of the themes continued with the development of more complex thematic maps which included often three or more different code groups. These different maps would then be linked using similar codes. Figure: 4-4 shows a sample of one of these intermediate maps. These maps helped to condense the codes into four main themes and four sets of factors which interact upon the themes.

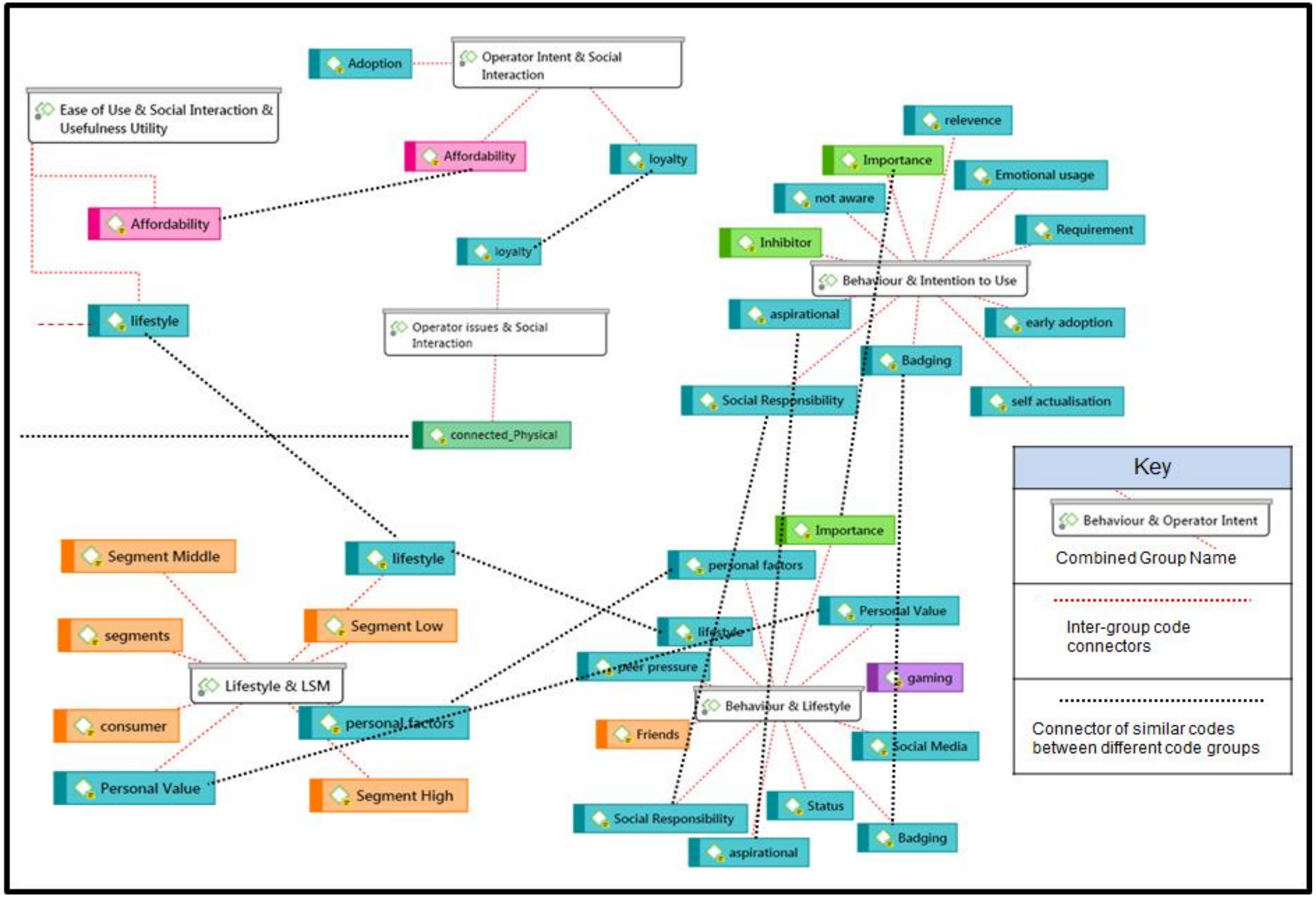
4.2.6 Stage 7: Corroborating and Legitimising the Themes

The themes were reviewed using a technique called axial coding, which is a method for re-coding the data into more distinct groups and searching for analytical concepts, (Babbie, 2008).

The analysis confirmed the results of four themes and sets of factors which interact on the themes called moderating factors.

These themes are described in greater detail in section 4.3.

Figure: 4-4 : Section of IntermediateThematic Map



4.3 DEFINING AND NAMING THE THEMES

The following sections define and name the themes using the information gathered in the interviews.

4.3.1 Explanation of identification used to identify the interviewees and their quotations

In the defining and naming of the final themes the researcher refers to direct quotations from the various participants. In order to maintain the promised confidentiality, they were randomly given a number and are referred to as Participant 1, Participant 2, to Participant 8 in the description and definition of the themes. Quotations are identified by the following method, *(5:64)*, where the first number refers to the participant and the second number is the quotation number from that particular interview. Thus *(5:64)* means quotation No. 64 from Participant No.5.

4.3.2 4 Major Themes

4.3.2.1 *Theme 1: Mobile Service Provider Marketing Tactics (MOSPMT*)

4.3.2.1.1 *Definition of Mobile Service Provider Marketing Tactics:*

Actions and behaviours of the mobile service provider to get the individual mobile users to act in a specific way in terms of products used and the when and where they use them.

They will use several different instruments to do this, and often the same instrument can be used in a positive way, i.e. the promotion of a service by lower prices and promotions, or in a negative way, i.e. preventing the use of Voice of Internet Protocol (VoIP)[16] by prohibitive pricing if mobile data is used for VoIP calls or by denying support for them from the Customer Care Centre.

4.3.2.1.2 Description

This theme is one of those that Morse (1995) refers to as an, ‘infrequent gem’ as it was brought up in one of the latter interviews and only confirmed by a participant when asked directly about the possibility of it occurring. The concept that mobile service

[16] Voice over Internet Protocol (VoIP) is an application that allows for voice to be carried over a Data network as a data string instead of a voice channel. Examples of this are Skype, Whatsapp Voice, Face Time, WeChat etc.).

providers will try and increase the use of a particular service is not directly addressed in literature as it is almost understood to be a high level assumption. If a service provider releases a product into the market it is assumed that it will push it so as to make it a success. However, Participant no 5 brought up the concept that service providers will try and inhibit the use of a service, in this case Voice over IP (VoIP), as its use will cannibalise an existing key and highly profitable service namely, mobile voice. Participant 5, said when asked why VoIP was not being used replied "*It's [an] overt service because it's not being pushed by the mobile operators" (5:3).* It was elaborated on further by indicating the following *"Remember what [Service provider name deleted] did is that they start blocking you if they find out that you are using VoIP" (5:34)*. Participant 8 confirmed it when discussing VoIP with the following statement *"There's a market power of our mobile operators they have had little desire, they want to keep the cash cow of the voice as long as they can and it's still a large part of their revenues" (8:15),* and also *"They certainly don't make it easy to use" (8:18).* Participant 8 also went further to indicate how a service provider will try to encourage the use of a service, *"But I just think at the moment that the thing is that voice, although it's still marketed heavily, I mean the [Service provider name deleted] adverts and things like that, there's still people talking to each other. At the moment it's still interesting there's a big push regarding call quality and that's an interesting angle that [Service provider name deleted] have taken, so basically now they've bundled voice in so many free offerings, that people have been distracted to try and find the better deals" (8:21).* Participant No 5 had a an interesting take on service provider intent and informing users regarding technology *"The mobile(s) [service providers] are not educating the people in the technologies" (5:60) and "So that they make sure that she doesn't know about these technology and services" (5:65).*

4.3.2.1.3 How Mobile Service Provider Marketing Tactics act to Strengthen or Inhibit the adoption of a service

The participants highlighted the following methods which are currently being used in this regard. They indicated that the service providers try and strengthen the adoption of a service by using Promotion. They promote a service by featuring it in advertisements, emphasising the quality of the service and by keeping that service at the top of the customer's mind. They will also use a discounted price or by bundling it with other services so it is seen to be free or severely discounted when bought as a single service

*(5:65).*They also indicated the ways in which the mobile service providers will try and inhibit the use of a particular service, this is especially true for services such as Voice over IP (VoIP) *(5:34*; *8:18)*, which are seen to be cannibalising the existing services and reducing revenues. The first is by keeping subscribers unaware that the service exists, by never mentioning it at all in any market communications *(5:3; 5:60*). They will reduce the ease of use by not offering any support for it on its support desk. It will even go so far as to block the use of it if they detect its use on the network *(5:34)*. They also can make it prohibitively expensive by applying special tariffs for use of that service.

4.3.2.2 Theme 2: Social Pressure and Aspirational Value (SPAV)

4.3.2.2.1 Definition of Social Pressure and Aspirational Value

Actions and/ or pressures that the social groups surrounding an individual mobile telecommunications user place on that person and the social status that can be achieved through the use of mobile telecommunications.

These actions can be conscious or overt, i.e. 'Badging' (a deliberate displaying of wealth or status by a specific action or physical object), or unconscious feeling of being pressurised to keep up with members of a social group. The fulfilment or lack of the product will increase or decrease the user's standing in the social group.

4.3.2.2.2 Description of Social Pressure and Aspirational Value

This theme is a combination of the 'image' factor from the Perceived Characteristics of Innovating (PCI) framework (Moore and Benbasat, 1991) and 'social factors' from the Model of Personal Computer Utilisation (MPCU) (Thompson, *et al*., 1991). 'Image' is defined in the PCI as, "*the degree to which use of an innovation is perceived to enhance one's image or status in one's social system*" (Moore and Benbasat, 1991: 195) while the PCI defines 'social factors' as, "*the individual's internalisation of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations"* (Thompson, *et al*., 1991: 126).

Another aspect of Social Pressure and Aspirational Value is tied into that of brand. It has been well established that brand plays an important role in African society in terms of designating status and telecommunications products and services are high on the list (Chikweche and Fletcher, 2014; Odoom, 2016; Morgan and Govender, 2017).

This theme was highlighted by just about all the participants in that they all saw that mobile telecommunications and its environment was a way to show a person's status.

Participant No 1 felt that mobile telecommunications and status were intrinsically linked in South Africa with the following statement, "*You can differentiate status in the South African market in two ways; the first way is that you do your status and you almost call it badging – you badge with the device, so you need to separate the device with the services and what the services gives you. One is badging in terms of the latest device – I can badge with something physical; the other is that I get the status through being what we call in the know. I am very much connected and I know what is going on, I have the latest and greatest whatever service. So that is why someone will be an early adopter because they want to be the first and it gives them a form of status in their community and they can access a lot of use for it. It is almost like a FOMO piece – a fear of missing out piece as well" (1:7)*. This idea was echoed by Participants No 5, *"Mobile in Africa is very aspirational" (5:63)* and No 7 *"We are already in the culture of appearance" (7:42)*. While Participants Nos 2, 3, 4 and 8 highlighted the major social aspects of mobile telecommunications with the following; *"Be driven by your social contribution activities" (2:4); "[Kenyan mobile service provider] network represents the social networks existing in society" (3:13); "[Use of mobile phones for entertainment] is a social dynamic" (4:25); "There's some big social trends here, every advert you see has the Facebook, Twitter and Instagram logo" (8:38).* Participant No 5 highlighted the importance of brand *"Brand plays an enormous role in the South African telecom" (5:1).*

The above quotes highlight the fact that mobile telephony is very important in South Africa as it is very closely linked with status and people's aspirations. People can display their status with it. Hence, Social Pressure and Aspirational Value is a major driver in the adoption of telecommunications.

4.3.2.2.3 How Social Pressure and Aspirational Value act to Strengthen or Inhibit the adoption of a service

Social Pressure and Aspirational Value can also act as a positive or as a negative inducer into the use of a telecommunications service. They act to strengthen by increasing a person's status within their social circle if they use a particular service. Also, the use of a particular service is a vital communication tool within a particular social circle. So as to be part of that circle one must use that service *(7:1).* However, the same thing works in reverse to inhibit adoption: if a particular service is seen to lower a person's status within the social circle it will not be used.

4.3.2.3 Theme 3: Perceived Ease of Use (PEU)

4.3.2.3.1 Definition of Perceived Ease of Use

The construct 'Perceived Ease of Use' is defined as, "*the degree to which a person believes that using a particular system would be free of effort*" (Davis, 1989: 320).

4.3.2.3.2 Descriptions of Perceived Ease of Use

This theme was highlighted by nearly all the participants, particularly those who discussed the behavioural issues (see section 4.2.3). These participants saw a user's ability to understand and use mobile telephony and internet technology as a major driver in the adoption of mobile services. However, most participants saw the lack of technical education and knowledge as an inhibitor that was preventing usage. This is highlighted in a quotation from Participant no 1, "[*For] poorer older people, it goes back to the level of education, then ease of use becomes the major issue" (1:42).*

However, others also had a more positive spin in that, *"I think the biggest driver is, of course, the ease of communications" (2:1)* as well as, *"It has been ease of use and what other benefits am I going to get from it" (2:61).*

Again participant No 2, when discussing adoption factors highlights the technical competency of the user, *"Technological confidence of the users or the perception of their competency", (2:63).*

While participant No 6, although not directly discussing behaviours, touched on an interesting point in that they related the take up of Uber, the transport application, as to its ease of use, *"Think of how Uber was adopted, it was easy to use" (6:39).*

4.3.2.3.3 How Perceived Ease of Use acts to Strengthen or Inhibit the adoption of a service.

In this case how easy or difficult a user perceives the service is to use is going to determine whether they use the service or not. This is also related to the user's technical competence and education. The higher the users technical competence, or their perception of their technical competence, the less this factor is going to play a part in the adoption of a service. Additionally, the higher this competency the higher the likelihood that a user will see usefulness in a service, so it is directly related to usefulness, while the more useful a user judges a service to be, the more likely they are to make the effort to use it. Thus, it is a two way relationship with Usefulness.

4.3.2.4 Theme 4: Perceived Usefulness / Utility (PU)

4.3.2.4.1 Definition of Perceived Usefulness / Utility

The definition of the construct ‘Perceived Usefulness/ Utility’ is based on that of Davis (1989), but expanded not just to cover job performance but also include everyday life. Therefore the construct ‘Perceived Usefulness/ Utility’ is defined as, *“The degree to which a person believes that using a particular system would have an intrinsic value for them*”. This value can be practical, it saves them time, (doing financial transactions from a phone instead of physically having to go into a bank to do it) and it can also be more ethereal in that it is adding richness to a users’ life by expanding their horizons with social networks.

4.3.2.4.2 Descriptions of Perceived Usefulness / Utility

Participant No 4 had some very enlightening ideas with regard to mobile communications. Participant No 4 started out by highlighting the fact that one of the fundamental needs of humans is to communicate, “*One of the fundamentals of the human condition is to communicate. People without communication have psychological issues, social issues. Mobile phone and feature phones are a major plus, they enable communication, they shrunk time and space. So you can communicate with anybody, anywhere, anytime instantly” (4:5).* The Participant then expanded on this idea by highlighting the Canadian author, philosopher and academic, Marshall McLuhan, and his ideas, and in so doing captured a very important idea regarding communication, namely; “*Marshall McLuhan – he did a lot of work in communication studies in the 1960’s at the University of British Columbia and he came up with a lot of theories on what is communication actually, and one of the things that he came up with is that communication can inform, educate or entertain. The Smartphone does all 3 so it became the de facto vehicle for self-actualization, ultimately on a consumer basis” (4:10).* To take this concept further, any service that can inform, educate or entertain is adding value or utility to a person. Participant No 3 put it simply in terms of the value of being connected in that they said, “*The mobile phone works because you are always connected” (3:18).*

Participant No 1 looked at mobile technology as utility and how it is enabling one's life, *"Look at utility in technology, how is that integrating into my life, how is that enabling my life" (1:13).*

Participant No 5 ties the value of mobile telephony to the economic concept of value, utility, "*The value, to me the key thing for services and stuff is using the economic word, utility*" *(5:20).*

Participant No 8 highlighted the fact that if there is no utility, or a need for something, it will not get used. They referred to The South African Statistical Services General Household Survey in stating that, *"I don't think it was the last general household survey but it was certainly the survey before, it was questions about why don't people use internet service. …..the biggest inhibitor was simply that there was no need for them to use the internet" (8:13).*

4.3.2.4.3 How Perceived Usefulness / Utility acts to Strengthen or Inhibit the adoption of a service.

Mohr, Fourie & Associates, (1995: 259), simply define utility of a good or a service as, "*the degree to which it satisfies human wants*". Then the greater it satisfies that desire, the greater it is desired. This desire can be mitigated by factors such as price, ease of use, to name a few, but ultimately the desire will drive the adoption.

4.3.3 Groups of Moderating Factors

The next group of themes that will be examined are a group of factors that act on the drivers of adoption (themes) discussed in section 4.3.2. These factors will have a moderating effect in that they influence the strength of the relationship between two of the main themes described above. For example, a user's educational level will have an influence on their ability to use more complex applications and hence their usage of said application.

The various factors were grouped into three separate groups for ease of analysis, but there is also considerable overlap between them and it could be argued that some could belong in another group. Take Income for example, it could be equally argued for it to be in the Demographics group instead of it being in its current Socio-economic group. However, this is not important as whatever group it is in, it will still have the same effect on the other variables.

4.3.4 Moderating Factor Group 1: Demographics

Demographics is defined as, "*the statistical data of a population, especially those showing average age, income, education, etc.*" (Dictionary.com, 2017). There were four demographic factors which had an influence on the drivers of adoption identified in the interviews. They are discussed in the following section:

4.3.4.1 Demographic Factor 1.1: Age

4.3.4.1.1 Definition

Age can influence a persons' adoption of a telecommunication service.

4.3.4.1.2 Description

It has long been held that individuals who are born around the same time share distinctive social or historical development periods and have common value systems or world views that are different from others who were born and grow up in different eras (Schaie, 1965; Twenge, Cambell, Hoffman & Lance, 2010). These 'Generational Cohorts' are influenced by the broad forces such as parents, peers, media and popular culture that surround them when they grow up. These forces are strongest during childhood and adolescence (Twenge, *et al.*, 2010), and according to Scott (2000: 356) this system of values, "*stays with the individual throughout their lives*". Various participants highlighted the differences in ages as influencing the adoption of services and what services were adopted.

Participant No1 said, *"Youth adopt sooner"* (1:39), while Participant No 4 endorsed that idea with, *"You are going to have to look at the demographic, …., the age demographic because it is going to change by age"* (4:47).

Participants No 6 and 8 went further and linked age to the type of services that people use, indicating that the youth do not like making voice calls but communicate with texts or pictures with the following statements: *"Well unfortunately that generation [Youth] doesn't communicate [by voice] they text, take videos and pictures and that's it"* (6:50) and, *"The current generation (16 – 20) would rather send a text, it's cheaper as well, than make a voice call"* (8:38).

4.3.4.2 Demographic Factor 1.2: Gender

4.3.4.2.1 Definition

The rate at which an individual will adopt a telecommunication service and the type of service adopted is influenced by a person's gender.

4.3.4.2.2 Description

In various behavioural frameworks such as The Decomposed Theory of Planned Behaviour (Taylor and Todd, 1995), Theory of Planned Behaviour (Ajzen, 1991) researchers have found that Gender is a moderator (section 2.4.1).

Participant No 2 indicated that females would be more willing to communicate saying, *"[In the] social context females would historically be more prone to communicating'' (2:107)* while several other of the participants held similar views, but as with age they associated them with other moderators. Participant No 7 highlights this very succinctly in this statement, *"An ICT gap between male and female, so it depends on the market, obviously in rural areas or in a less developed or privileged area whereby the girl's education is neglected compared to the boy, lack of literacy will make naturally the girl or the women less inclined to use the services" (7:49).*

4.3.4.3 Demographic Factor 1.3: Location

4.3.4.3.1 Definition

The adoption of a telecommunication service will be moderated by where the individual resides.

4.3.4.3.2 Description

An individual's location can be influenced by where they reside. This is generally a split between rural and metropolitan areas and is influenced greatly by other factors such as education and income. Again statements from Participants Nos 4 and 7 highlight this factor, *"You are going to have to look at the demographic" (4:47)* and, *"In a less developed or privileged area whereby the girl's education is neglected compared to the boy" (7:49).*

However, in this study all the research was carried out in three metropolitan areas so the location factor was whether there was a variation in those three different metropolitan areas[17].

Additionally, the effect of limited coverage or lower data speeds in some areas will not be covered in this factor as it has a more direct effect and is thus evaluated under section 4.4.3.6.

4.3.4.4 Demographic Factor 1.4: Education

4.3.4.4.1 Definition

The ability of an individual to adopt or use a telecommunications service will be moderated by their education level.

4.3.4.4.2 Description

The lower the education level the less likely an individual will have the required skills to do anything other than the basic functions on a mobile device and hence the ease of use becomes a barrier. Again education is linked with other demographic factors such as age and income. The following are some of the statements the participants made regarding this factor: Participant No 1, *"Poorer older people, it goes back to the level of education" (1:57),* Participant No 2 ties education to Living Standards Measures, *"[The] lower you get in the LSMs then I think the more difficult it becomes from an educational perspective" (2:70)* and Participant No 8 ties education to race and income, *"Segmenting by race and education, income, house-hold income is an important thing*" (8:35).

4.3.4.5 Demographic Factor 1.5: Ethnicity / Culture

4.3.4.5.1 Definition:

Individuals with different cultural and ethnic backgrounds will have different drivers and rates of adoption of telecommunications.

4.3.4.5.2 Description

Cultures and ethnicity play significant roles in the adoption of ICT services (Hofstede, 1991; Bagchi, *et al*., 2004; Geissler, 2006). This aspect is discussed in more detail in

---

[17] Note, although four metropolitan areas were used two, Johannesburg and Tshwane are so intertwined that they were analysed as a single area called Gauteng.

section 2.4.2. The concept of separate development that was prevalent in South Africa until 1994 (Hoogeveen and Özler, 2005), has meant that South Africa has developed very strongly along ethnic lines as opposed to cultural differences, therefore ethnicity is probably a better factor to measure than culture. This demographic factor was noted by some of the participants but again in combination with other factors. Participant No 4 states, *"Behaviours, attitudes, value systems, cultural, belief systems that drive the adoption of technology per se" (4:4),* while Participant No 8 tied it to education and income, *"Segmenting by ethnicity and education, income, house-hold income is an important thing" (8:35).*

4.3.5 Moderating Factor Group 2: Socio-economic Factors

The second set of moderating factors is with regard to the affordability of mobile telecommunications. There are two moderating factors discussed here namely, Living Standards Measures (LSM) and Income.

4.3.5.1 Moderating Factor 2.1: Living Standards Measures (LSM)

4.3.5.1.1 Definition

The LSM group to which an individual belongs will give a good indication of the individual's ability to use a mobile telecommunications service. The higher the LSM group the more likely the individual is to use a telecommunications service.

4.3.5.1.2 Description

The Living Standards Measurement (LSM) is a measurement of an individual's social class or living standard that does not take into account ethnicity or income as differencing variables. It was developed by the South African Advertising Research Foundation (SAARF) to give a composite measure of social class using wealth, access and geography and without using income (Cant, Brink & Brijball, 2006; Truter, 2007; Haupt, 2017). It is used broadly across all media products and is the segmentation tool used by the All Media Products Survey (AMPS) (Truter, 2007).

It was the differentiation tool highlighted by the many of the participants. Participant No 2 indicated the following, *"LSM is one analysis, it mostly focuses on finance or LSM translates to a large extent to disposable income level" (2:103)* and, *"Driving factors being in the different LSMs" (2:106).* Participant No 5 said, *"There I would actually look* *at the LSM brackets" (5:53),* while Participant No 6 indicated, *"You need to be able to afford those things that are mentioned in that particular LSM" (6:43).*

4.3.5.2 Moderating Factor 2.2: Income

4.3.5.2.1 Definition

The level of income of an individual will determine the amount of disposable income they have to spend on telecommunication services. The lower an individual's income the less disposable income there is to spend on telecommunication services. This factor is directly related to affordability.

4.3.5.2.2 Description

Affordability of telecommunication services, especially data services is understood to be a major inhibitor to the take-up of telecommunications services, see section 2.4.1.4. Affordability combined with income, was a moderating factor as seen by nearly all participants. The following are a few of the statements made by the various participants: Participant No 2 said, *"[The] main driver would be financial, are you able to afford a device" (2:8)*; Participant No 4 expanded on it with, *"They will afford it to the maximum of what the disposable income allocated" (4:42)*; Participant No 6 tied price to a particular service by saying, *"That's why people adopt WhatsApp because it's a cheaper service, so price is a consideration" (6:6)* and *"Affordability is a major factor" (6:40).*

4.3.6 Moderating Factor Group 3: Personal Factors

There are two factors in this moderating factor group, and they refer to an individual's technology knowledge and their attitude towards technology.

4.3.6.1 Moderating Factor 3.1: Technical Knowledge, Ability and Skills

4.3.6.1.1 Definition

The ability of an individual to interact with technology is related to their technical knowledge, and as such technical knowledge is a moderator for the adoption of mobile telecommunications services.

4.3.6.1.2 Description

The ability of a person to interact with technology is loosely related to the individual's education level but also their attitude towards technology. An individual can have a low educational level but a high level of technical knowledge or vice versa. According to the Participants No's 2, 3 and 5 this lack of technical knowledge is more relevant across the poorer and less educated people with the following statements indicating this. Participant No 2 stated, *"So across the LSM groups you also don't have technical capabilities or competencies with the individuals"* (*2:104)* and, *"How important is the technological competence? It's obviously more important [in] the lower LSM levels" (2:77).* Participant No 3 said, *"There might be lack or relevant skills" (3:2),* while Participant No 5 said, *"It goes back to education, people…a significant proportion of our population [are] technologically illiterate" (5:11)* and on the fact that subscribers will use multiple service providers for cost or quality reasons, *"That means that they are savvy about how they will use their technology" (5:57).*

Participant No 1 ties technology knowledge to attitude to technology by saying *"When you start looking at comfort in the technology, it has actually now gone into an attitudinal space now as well; so the comfort is more or less about how tech savvy are you, are you wanting the latest services just because it is something important to you and you integrate that into your life" (1:7).*

It is also related to age, especially the youth segment, "*These kids are more technologically savvy*" (2:92). Participant No 8 has the following answer when asked about technical skills, *"Do you see that people's lack of knowledge and technical expertise in SA being an inhabitant to the take-off of services? Yes I do" (8:12).*

4.3.6.2 Moderating Factor 3.2: Attitude to Technology

4.3.6.2.1 Definition

An individual's attitude towards technology is a moderating factor in their adoption of a telecommunication service.

4.3.6.2.2 Description

One of the moderating factors in the adoption of a telecommunication service or all of ICT as whole is the individual's attitude towards technology. The behavioural frameworks discussed in section 2.3.5 all try and explain this. However, for the purpose of this study we will not attempt to quantify it, but instead try to show it is a moderating factor highlighted by the participants in Phase 1.

Participant 1 highlights the difference between the individual's attitude to technology, *"Level of comfort with technology, …. and that is people who are just using technology, it must be easy to use, use it in my life, it is just helping me to connect, I am not looking* *at taking it and pushing the envelope, it helps me make sense of my life and I am not doing anything really fancy with my phone, I am just doing the basics."(1:5)* over against, *"Then you have the super users who are incredibly comfortable with technology, they are your technology junkies, who want the next best greatest thing and they almost use the latest services, the latest technology – it links almost to their status in their community and status in life" (1:6).*

Again as with most of the moderating factors they cannot be used in isolation, *"Behaviours, attitudes, value systems, cultural, belief systems that drive the adoption of technology per se" (4:4).*

4.3.7 Direct Effect Moderating Factor

These moderating factors are a group of factors which have a direct influence on the adoption of a service in that if they are not present, the subscriber cannot use the service.

4.3.7.1 Direct Moderating Factor D.1: Coverage

4.3.7.1.1 Definition

Coverage refers to whether there is availability of mobile wireless communication in the area in which the individual resides and works.

Participant Nos 4 and 6 highlighted this factor as follows, *"The issue is about network connectivity" (4:52)* and, *"an area in Limpopo whereby our network just disappears, it comes and goes, you can use WhatsApp, you can't use Facebook, you can't use any news service" (6:37).*

4.3.7.2 Direct Moderating Factor D.2: Technology

4.3.7.2.1 Definition

This relates to the generation of mobile technology which is available in the area in which the individual resides and works. As explained in section 2.2.3, the generation of mobile technology which is available in the area will determine which services can and cannot be used.

Participant No 2 explains the problem well with the following statement, *"[Mobile Service provider 1] and [Mobile Service provider 2] may claim to have over 90% coverage on 3G[WCDMA] but their coverage is very variable. Sometimes it's not* *broadband it more like narrowband, you may get 56 kbps if you're lucky but it's not broadband…so yeah, you can access the internet but you may not really be able to access the websites effectively for educational or social purposes or work purposes*" *(2:14).* The information regarding coverage supplied by ICASA (2016), see section 2.2.4.8.1 supports this.

4.3.7.3 Direct Moderating Factor D.3: Quality of Service (QoS)

This refers to the quality of the network which an individual can connect to. It is measured in terms of dropped call rate[18], call set up rate[19] and data throughput rate[20] (ICASA, 2016). Quality of service is very closely related to the direct moderating factors of 'Coverage' and 'Technology' as all the quotations used to highlight these factors contain an element of quality of service. Participant No 3 builds on to the statements made by Participants 2, 4 and 6, above with, *"The drivers of adoption, there a few drivers of course…the increasing of speed, hopefully the improvement of quality" (3:1).*

4.3.7.4 Direct Moderating Factor D.4: Device

Definition: The generation and type of device which a subscriber uses will determine what mobile services they can utilise. This is explained in section 2.2.3.1, and a subscriber can only expect to use mobile data services if they have a modern 3G, 4G or smartphone. Participant No 2 states, "*If you have coverage you might be able to do a little bit of browser depending on what sort of handset you're using and what kind of compression software it runs with" (2:25).*

4.4 DEVELOPMENT OF PRELIMINARY FRAMEWORK

4.4.1 Behaviour Driven

One of the areas of focus was that the adoption of telecommunications was driven by behavioural issues. In a more detailed analysis of the interviews it was discovered that nearly all the participants felt that behavioural issues were a major driver in the adoption and use of mobile telecommunication services. Significant quotations from Participant No 1 regarding this subject were, *"So there is something around utility of technology to*

---

[18] Dropped call rate is a percentage of telephone calls that are terminated by a fault in the service provider's network rather than by one of the participants in the call

[19] Call set up rate is a percentage based on the number of times subscribers try to make a call and cannot connect to the other party due to network related issues

[20] Data throughput rate refers to the connection speed between the subscriber and the website they are communicating with. Data rates are generally asymmetric in that the rate from the user to the network (uplink) is different than from the network to the user (downlink)

look at, there is also something around functional vs. the emotional aspect of why I am engaging with technology" (1:36) and, *"Yes, behavioural elements have become so much important because of the complexity of life. The more complex life becomes the more behavioural becomes the driver" (1:59).* Participant No 2 said, *"It could be driven [adoption] by your social contribution activities"* (2:4) while Participant No 3 equated the behaviour of telecommunications networks to real life, *"Flow of phone calls replicate the flow of real networks in the population, real behaviour in the population" (3:14).* Participants 4, 6 and 7 had similar understandings, *"Behaviours, attitudes, value systems, cultural, belief systems that drive the adoption of technology per se" (4:4),* Participant 6, *"I think [it is] behavioural issues that drives adoption" (6:52)* and Participant 7, *"It's very important to observe behaviour, it is very difficult to predict what people are going to do but you observe behaviour so that you can tell what services based on such behaviour" (7:69).* Participant No 5 indicated that mobile telecommunications was something to be strived for, *"Mobile in Africa is very aspirational" (5:63).*

4.4.2 Preliminary Theoretical Framework

Olivier (2009) outlined the following three essential elements that are needed to build a framework.

4.4.2.1 Concepts

Concepts are abstract ideas that are relevant to the questions that the research is endeavouring to answer. Abstract ideas are often expressed as operational definitions which are built up with a 'valid piece of data' which can be recorded or observed. What is meant by a 'valid piece of data' is that it is a concept or part of a concept which the research is striving to quantify (Olivier, 2009).

4.4.2.2 Data

Data are the measurements and records of the activities which have taken place in trying to answer the research questions. Data must be valid, and reliable (Olivier, 2009). Reliability basically means the results of research must be consistent, dependable and repeatable by another researcher (Saunders, *et al*., 2009; Zohrabi, 2013).

4.4.2.3 Hypothesis

Hypotheses are the suppositions that are made to explain the relationships between the concepts (Olivier, 2009).

4.4.2.4 Guidelines

Additionally, Olivier (2009) defined several guidelines with regard to developing and evaluating a framework. These guidelines are: Clarity; Comprehensive; Exactness; Generality; and Simplicity. These guidelines are explained as follows:

Clarity:

Clarity dictates that the purpose and intentions of the components and interactions in the framework must be clear and easily understandable (Olivier, 2009).

Comprehensive:

The guideline of Comprehensive mandates that the framework must deal with all aspects of the problem.

Exactness:

Exactness means that the framework must be as accurate as possible in explaining the problem (Olivier, 2009).

Generality:

Generality means that it must explain as many variations of the problem as is practical (Olivier, 2009).

Simplicity:

Simplicity requires that the framework must be kept as simple as possible yet it must still define all the elements of the major concepts being investigated (Olivier, 2009).

In light of the information given, the practical advice of Olivier, and the researcher's analysis of the interviews and the themes identified in section 4.3, it was decided that the theoretical framework would be based on behavioural theory (Olivier, 2009).

4.4.3 Components of the framework

The framework was constructed using some components, or constructs from other behavioural models and with the introduction of two new constructs.

4.4.3.1 Existing Constructs: *Perceived Ease of Use, Perceived Usefulness and Behavioural Intention to Use*

These first three constructs, 'Perceived Ease of Use (PEU)', 'Perceived Usefulness (PU)' and 'Behaviour Intention to Use (IU)' were taken from the Technology Acceptance Model 1 (TAM 1), the model where the component 'Attitude toward Use (A)' had been removed (Venkatesh and Davies, 1996). In this framework the PEU acts upon the PU and the IU while the PU just acts upon to the IU. The IU will lead to actual system usage (Nysveen, *et al*., 2005). The definitions of these constructs are the following:

Perceived Ease of Use (PEU): is "*The degree to which a person believes that using a particular system would be free of effort*" (Davis, 1989: 320).

Perceived Usefulness (PU): *"The degree to which a person believes that using a particular system would have an intrinsic value for them*".

Behavioural Intention to Use (IU): "*The degree to which a person actually intends to use the system".*

4.4.3.2 New Constructs

The two new constructs for the model are the 'Mobile Service Provider Marketing Tactics (MOSPMT)' and the 'Social Pressure and Aspirational Value (SPAV)'. These new constructs are explained in more detail in the following.

4.4.3.3 Mobile Service Provider Marketing Tactics (MOSPMT)

4.4.3.3.1 Definition of Mobile Service Provider Marketing Tactics

Definition of Mobile Service Provider Marketing Tactics: "*Actions and behaviours of the mobile service provider to get the individual mobile users to act in a specific way in terms of products used and the when and where they use them*."

The 'Mobile Service Provider Marketing Tactics (MOSPMT)' will act positively upon 'Perceived Usefulness (PU)' by offering promotions, advertising particular services and competitive pricing. It can also negatively act upon a service by not promoting it at all or with tariffing that makes the product uneconomical.

It will act upon 'Perceived Ease of Use (PEU)' by making a service as automated as possible, with technical support from the support centre and by detailed instructions for use in advertising or on initiating the service. It will also act negatively on a service by denying any Support Centre service for those who use that service at all or even voiding warranties if the service is used.

Additionally, it will also act upon the 'Social Pressure and Aspirational Value (SPAV)' by advertising that is based on displaying increased sophistication or status when the service is used. It will also focus on improving the brand and making it a premium brand compared to the other service providers. Examples of this would be advertising showing Service provider X has the best network in terms of Quality of Service or Service provider Y has a the fastest download speeds.

4.4.3.4 Social Pressure and Aspirational Value (SPAV)

4.4.3.4.1 Definition of Social Pressure and Aspirational Value

Social Pressure and Aspirational Value is defined as: "*Actions and / or pressures that the social groups surrounding an individual mobile telecommunications user place on that person and the social status that can be achieved through the use of mobile telecommunications".*

'Social Pressure and Aspirational Value' will act upon 'Perceived Usefulness (PU)' as the increasing social status associated with using the service will increase its utility. It will also act on 'Perceived Ease of Use (PEU)' as the incentive of the increased status will make the subscriber more determined to use the service thereby making any difficulties with using the service seem less.

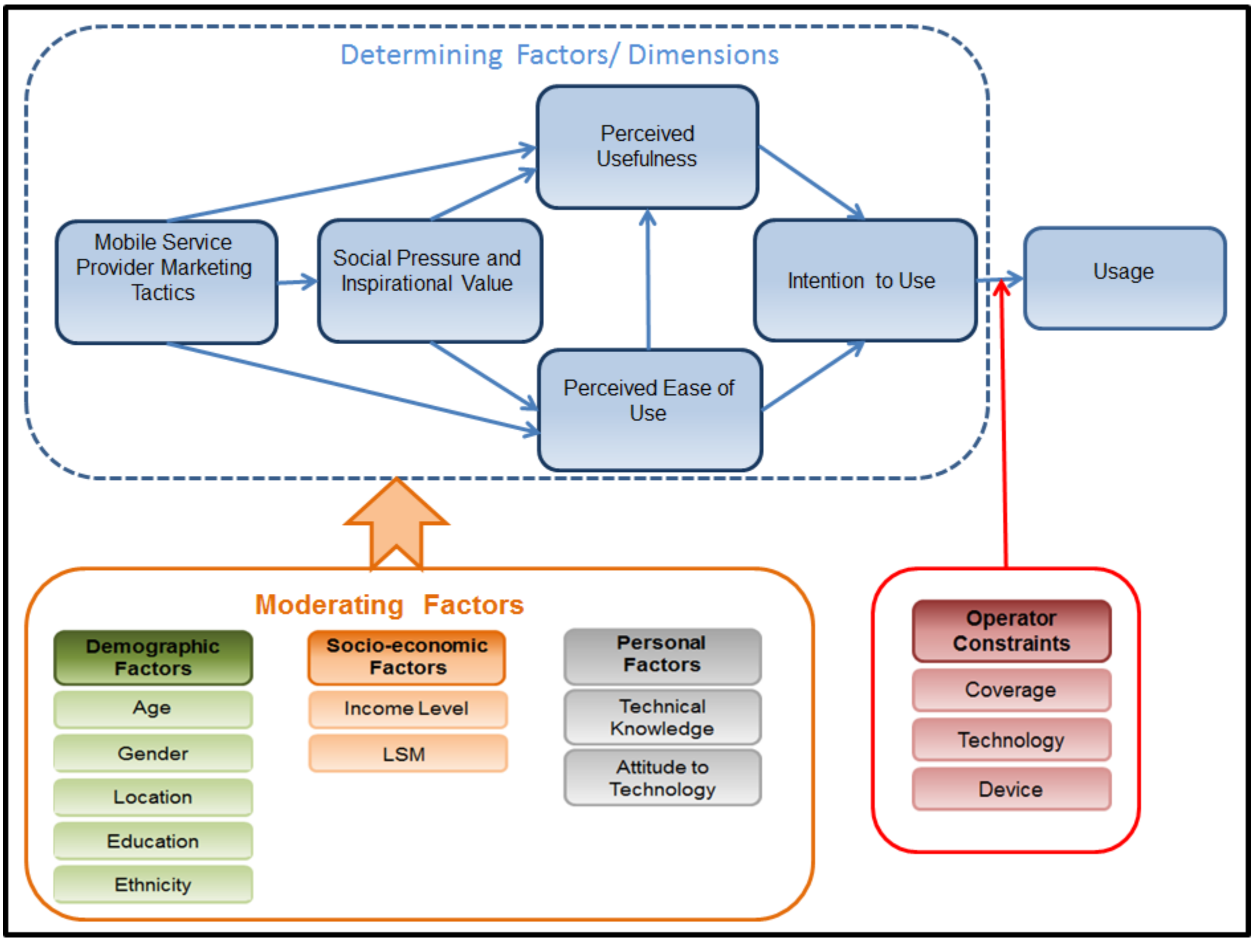
4.4.3.5 Moderating Factors

Literature and the interviews have shown that the moderating factors act on all of the behavioural factors. Therefore, the moderating factors are shown to act on the behavioural framework as indicated in the Mobile Phone Technology Acceptance Model of Van Biljon (2006).

4.4.3.6 Direct Moderating Factors

As discussed in section 4.3.7 these factors do not influence the behavioural constructs of the framework but act on the framework between the 'Behavioural Intention to Use' and the actual 'Usage'.

Figure: 4-5: Preliminary Theoretical Model For Testing



CHAPTER FIVE

OVERALL METHODOLOGY AND EXECUTION OF PHASE 2

This section describes the second and final phase of the research. It begins by examining the basic strategy of inquiry and then leads to the sampling methodology, including the research approach and the methods and instruments used to collect the data. It then describes the data analysis techniques and methodologies before finalising with a demonstration of the quality and rigour of this phase of the overall research design. This phase of the research took place between July and December 2017.

5.1 DESCRIPTION OF STRATEGY OF INQUIRY OF PHASE 2

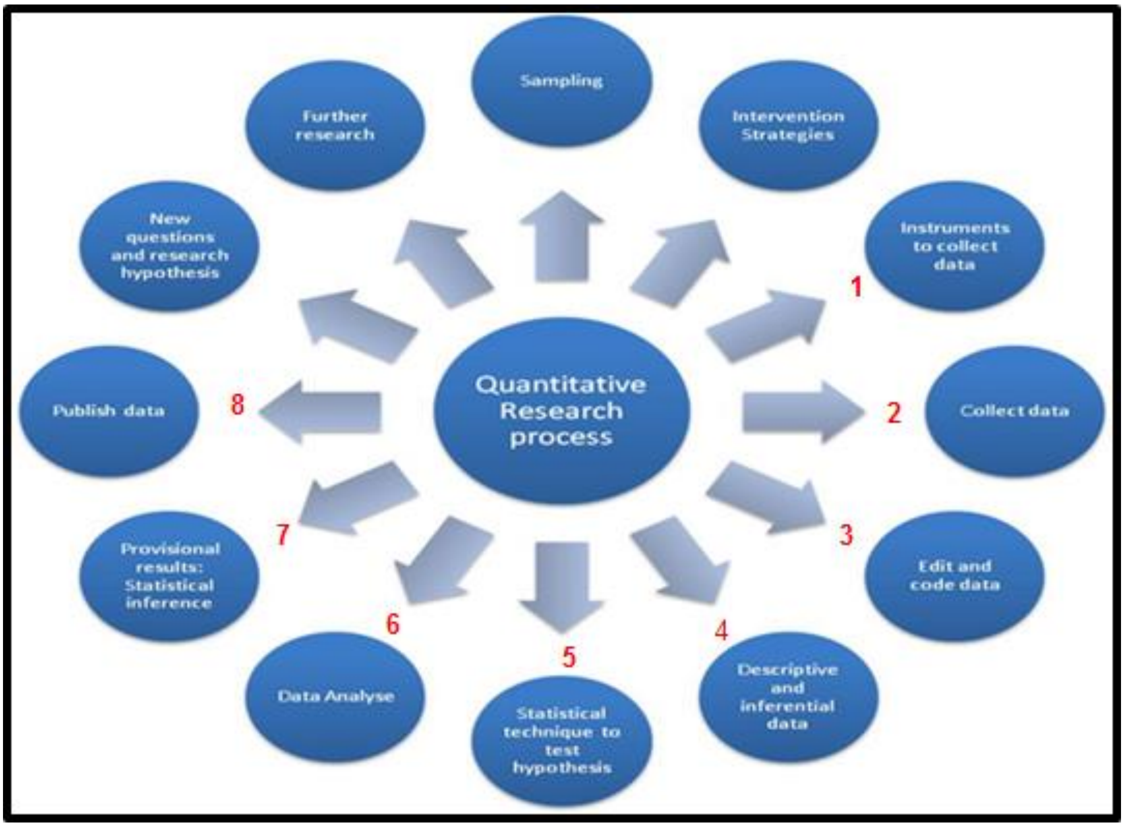
Phase 2 of this research was intended to help the service providers by developing a framework which indicates the major factors which service providers need to take cognisance of before launching a mobile data product. It did this by evaluating the preliminary framework; see section 4.4.3 and Figure: 4-5, which was developed from the literature review and the input of experts in the telecommunications field, Phase 1 of the research. Phase 2 of the research was to test and confirm the preliminary framework by the use of a questionnaire that was put to a large number of subscribers of mobile data services in four metropolitan areas of South Africa.

The design of Phase 2 required the development of a cross sectional, non-experimental research design that would be able to give quantitative, a numerical description, of attitudes, opinions or trends of a population by studying a sample of the population

5.1.1 Characteristics of Quantitative Research

Quantitative research was used as a means for testing objective theories by the method of statistically analysing relationships amongst variables (Creswell, 2007). Quantitative research was carried out from a deductive approach which involved the testing of theoretical propositions by the employment of a research strategy that was specifically designed for the testing (Saunders, *et al*., 2009). The research in Phase 1 indicated the concept that the intentions and marketing tactics of the Mobile Telecommunications Service providers played a role in the adoption process. This concept was not found in literature; hence it was a new concept that had to be tested. However, as it acted in a similar way to the other adoption and moderating factors it was tested in the same way as these factors.

Figure: 5-1: Overview of Quantitative Research Process



(Source: Maree, 2010: 146)

Maree, (2010: 146) gives an overview of the quantitative research process which is shown in Figure: 5-1. This process was used as a template to ensure that all the essential steps of the quantitative research were completed. The numbers 1 to 8 indicate the order in which each item was executed.

5.1.2 A classification of Phase 2 of the Research Design

Phase 2 was classified the same as the overall research design, namely a cross-sectional, non-experimental, empirical, evaluative research design using primary quantitative data.

5.2 THE SURVEY INSTRUMENT

The survey instrument was developed out of the constructs and factors that were identified in Phase 1 of the research, and the survey was designed to test the preliminary framework developed in section 4.4.2.

5.2.1 Development of the survey instrument

An in depth study did not yield a suitable survey instrument for capturing the factors which determine the adoption of mobile data services in a developing economy such as exists in South Africa. Research such as ‘Consumer acceptance of wireless mobile finance’ (Kleinjan, *et al*., 2004), ‘Adoption of smart government’ (Saif Almuraqab and Jasimuddin, 2017), ‘Internet banking adoption’ (Fawzy and Esawai, 2017), ‘Mobile Commerce Adoption’ (Moorthy, *et al*., 2017) and ‘App adoption and switching behaviour’ (Roy, 2017) supplied concepts to test but could not supply individual questions. Bradburn, Sudman & Wansink (2004) was used for the general principles of questionnaire design.

The research of Van Biljon (2006) regarding motivational and cultural factors that influence mobile phone usage supplied several questions which were used in sections 3 and 4 of the questionnaire.

Question 5, which was used to determine the users Living Standards Measures (LSM) band, was taken directly from the South African Advertising Research Foundation (SAARF) 2017 SAARF/ Amps LSM questionnaire. (This question was used with permission by the SAARF). The LSM measure is a methodology of determining the user’s lifestyle without relating it to income. Somebody with a LSM rating of 10 will have access a greater number of consumer items than somebody in LSM 7 (Question 5 in Appendix 4 displays the types of household items which are used to calculate a LSM level). This question was a backup method of indicating a user’s level in social circles if the user was reluctant to give their income level.

Questions 26 and 28, which were used to determine attitudes regarding ‘Perceived Ease of Use’ and ‘Perceived Usefulness’ were sourced directly from Davis (1986) just with the type of application being changed from, Electronic Mail in Davis (1986), to any new application that the individual would like to download from the internet and use. In order not to add any variability in the use of these questions, the Likert-type scale response was kept at a seven point scale while the rest of questions using a Likert-type scale were carried out using a 5 point scale. This concept was investigated at the pre and pilot testing stages and found not to cause any significant problems.

As explained above the scales were developed using the research of Vagias (2006) and Barry, Chaney, Stellefson & Chaney (2011) as references.

The survey instrument or questionnaire was built up of 5 sections. Section 1 had two major purposes. The first was to explain the purpose of the research and gain formal consent from the participant to take part in the research. The second purpose was to ensure that the participants were 18 years or older and they used mobile data services for their personal use.

Section 2 was to gather demographic data with regard to the participant's gender, age, location, ethnicity, highest academic level, monthly income in segments corresponding to the LSM bands and a series of questions to determine the participants LSM band.

Section 3 was seven questions which were designed to determine what technology an individual had access to and how they and where they accessed the internet. It then determined their level of skill and attitudes towards communication technology and their level of skill with it.

Section 4 was to gather information regarding the individual's mobile usage behaviour, what applications they used and whether the price of telecommunications was influencing the user's usage behaviour.

Section 5 was directed at the participant's use of and attitude towards data based voice applications and free WiFi Hotspots, both of which are used as substitutes to existing services.

5.2.2 Pre- / Pilot Testing

To ensure that the survey was readily understandable and would give the required outputs, the survey instrument was given to several knowledgeable people in designing and using such surveys and asked for input. These knowledgeable people included the statistician who would assist with the analysis and the head of the research company which would do the field research. Once the experts' inputs were added, the questionnaire was given to a focus group of 5 people to complete and discuss any difficulties and misunderstandings in the wording of the questions. After the group, minor changes were made to the questionnaire and 5 surveys were then given to the senior field worker of the external research company. This senior worker carried out 5 surveys in the field and indicated where problems were experienced and again minor changes were made. A pilot field trial of 30 questionnaires was conducted in the metropolitan areas and the results were tested to again check if a) all the metropolitan areas were producing the required information and b) that the statistician was satisfied that the questionnaire was producing statistical acceptable results. Only after this test was the questionnaire released to the field workers to conduct the remaining 370 interviews. The final questionnaire is to be found in Appendix 4.

5.2.3 Allocation of Questions to various constructs being tested

From the preliminary framework in sections 4.3 and 4.4, there were five constructs, six factors in demographic moderating factor group, two factors in the socio-economic factor group and two factors in the personal factor group. There were also 6 factors to determine the actual usage information, see Table: 5-1 for the question allocations.

Table: 5-1: Allocating questions to various constructs being tested

Construct or Moderating Factor Group	Factor	Question Number
Moderating Factor: **Demographics**	Gender	Question 1
	Age	Question 2
	Location	Question 3a & b
	Highest Academic Level	Question 4a
	Ethnicity	Question 4b
Moderating Factor: **Socio-economic**	Maximum Income Level	Question 5a
	LSM Bands	Question 5b
Moderating Factor: **Personal**	Technical Knowledge, Skills and Ability	Questions 8, 9 & 10
	Attitude towards Technology	Question 11
Construct: **Service Provider Marketing Tactics**		Question 12 a-g Question 23 e, h,
Construct: **Social Pressure and Inspirational Value**		Question 23 d, j, k Question 26 d, j, k
Construct: **Perceived Ease of Use**		Question 23 b, c, f Question 26 b, c, f, h Question 28 b, d, f, I, j, l, m
Construct **Perceived Usefulness**		Question 23 g, i, l, m Question 26 g, i, l, m, a Question 28 c, e, g, h, k, n
Construct: **Intention to Use**		Question 24 Question 27
Actual Usage	Access	Questions 6 & 7
	Description of Connection	Question 13
	Usage parameters	Questions 14, 17, 18, 19 & 20
	Price Sensitivity	Question 15
	Applications Used	Questions 16, 22 & 25
	Importance of Attributes	Question 29

It must be noted that the Direct Moderating Factors, as given in section 4.3.7.1, were not tested as they are totally dependent on the mobile service provider's network and were not measureable in the survey.

5.3 METHODOLOGY FOR PHASE 2

The following sections describe the methodology which was used to collect and analyse the data used in the confirming and modifying the preliminary framework determined in Phase 1.

5.3.1 Sampling

This section defines the units of analysis, the target population and the sampling procedure.

5.3.1.1 Units of Analysis

The units of analysis were the same as those defined in the overall research design, namely individuals who use a mobile data telecommunications service.

5.3.1.2 Sampling Units

The sampling units in this phase were the individuals who use mobile data telecommunication services in the metropolitan areas of the provinces of Gauteng (Johannesburg and Tshwane), Western Cape (Cape Town) and Kwa-Zulu Natal (eThekwini), South Africa.

The reasons that individuals, who use mobile data services, were chosen as sampling unit instead of mobile data subscriptions were the following. Firstly, by its very nature a mobile data service does not have to have a voice component so it is impossible to contact them telephonically to request them to complete a questionnaire. Additionally, as there are no directories of mobile numbers it is impossible to identify the owner of that number and contact them by another method. Secondly, there are significantly more mobile data subscriptions than people in South Africa. In 2017 there were an estimated 61.8 million mobile data subscriptions (ICASA, 2018) in South Africa on a total population of 56.52 million (Statistics South Africa, 2017), so obviously many individuals have more than one subscription. Additionally, a significant number of these data subscriptions are machine to machine (M2M) connections and point of sale machines (Vodacom, 2017) and not owned by a single individual.

These locations were chosen for two reasons. The first reason was due to the fact that the rollout of the latest 4G and to an extent the 3G networks are mainly restricted to the metropolitan areas, see Figure: 2-17 in section 2.2.4.7, meaning the majority of mobile data users are in the metropolitan areas

The second reason for choosing three provinces and 4 metropolitan municipalities was to get as large a geographical spread as possible in order to try and eliminate any bias that might be introduced by sampling only in a single province. These four locations had a population of 15.9 million, which is about 80% of the total population who reside in metropolitan municipalities (Municipalities of South Africa, 2018). The World Bank estimates that 66% of the South African population is urbanised (World Bank, 2017) meaning approximately 37.3 million people are urbanised. Thus, approximately 40% of all urbanised South Africans reside in these four metropolitan municipalities.

The numbers of participants per province and metropolitan area are given in Table: 5-2.

Table: 5-2: Places and Numbers of Survey Participants September 2017

Province	City	Number of Interviews
Gauteng	Johannesburg	100
	Tshwane	100
Western Cape	Cape Town	100
Kwa Zulu Natal	eThekwini	100

5.3.1.3 Sample Size

The total population of individuals who reside in these locations was 15.9 million. The sample size was estimated using the following equation (University of California, 2010) with the margin of error being set at 5%.

$$ME = z\sqrt{\frac{\rho(1-\rho)}{n}}$$

Where:

$ME = margin\ of\ error,\ in\ our\ case\ 5\%\ or\ 0.05$

$z = z\ score, in\ our\ case\ 1.96,$

$p = population\ portion\ in\ ourcase\ the\ maximum\ of\ 0.5$

$n = sample\ number\ required$

Using a 95% confidence level and a margin of error (confidence interval) of 5% meant that the required sample size was 384. In the end 400 completed questionnaires were analysed.

5.3.1.4 Sampling Method

As opposed to the fixed line telecommunications where legislation requires operators to produce a directory of all users and numbers (Republic of South Africa, 1996 and 2005) there is no official directory of mobile data service users available in South Africa and due to privacy issues the mobile network operators were not willing to give the researcher access to their databases of subscribers. Additionally, as explained in section 5.3.1.2 only the individuals who own the mobile data service can complete a questionnaire not the service itself. Therefore, a totally random sampling based on SIM card numbers was not possible.

Therefore, a convenience sampling methodology was employed where individuals would be approached at random and asked if they were willing to participate. The face-to-face methodology was chosen as telephone respondents were more likely to give socially desirable responses and that the advantages of trust built up in the face-to-face interview outweighed any disadvantages due to the lack of anonymity (Jäckle, Roberts & Lynn, 2006).

The method used was that the field workers would choose a place where there was a high volume of foot traffic and ask people at random to participate in the survey. The field workers would move locations regularly in order to sample different parts of the population. For example, they would go to a taxi rank or bus station to get users who use public transport or a high end shopping centre for more affluent users. However, before proceeding to start interviewing people the field workers were requested to try and make sure that the sample was as varied as possible in terms of gender, ethnicity and age. The field workers would approach people at random and ask them to participate in the survey. If they agreed and met the criteria in terms of age and being a mobile data services user, the interview would commence. The interviewees would be asked to sign the interview questionnaire as a sign of their consent. All interviews were conducted in English.

5.3.2 Data collection

The method of data collection in this phase was the use of a survey. The design of the survey was based on the key adoption drivers highlighted in Phase 1. The survey was also designed to test the weightings and interactions of the adoption factors.

5.3.2.1 Data collection method

The data was collected with a face-to-face methodology.

5.3.2.2 Who is involved with the collection of the data?

The data for the quantitative phase was collected by an external research company which specialises in the collection of data. The questionnaires were put to the field using several field research field workers in each of the four metropolitan municipalities. The field workers would be briefed by the head researcher. The head researcher company was responsible for the final quality control check on the completed file for completeness and accuracy.

5.3.2.3 Length of the data collection period

The data was collected over a period of two weeks in September 2017. In order to control the process most efficiently, feedback was given by the research company on a regular basis.

5.3.2.4 Process for the Collection of the data

The research company collected interviews in four cities on a face to face basis. The sampling method used to choose the participants is described in section 5.3.1.4. The researcher went to places where there were crowds such as shopping centres, taxi ranks. The field workers would make the demographics of the people they approached to be as varied as possible in terms of gender, ethnicity and age. The field workers would approach a possible participant and ask if they were willing to complete the survey and if they were would check if they met the criteria of being over 18 years old and being a subscriber to a mobile data service. The field worker would use a clean paper copy of the questionnaire for each new participant. After confirming that the participant was eligible the field worker would ask the participant to sign the copy of the survey to give consent. The field worker would then conduct the interview filling in the blank spaces on the questionnaire with the participant’s answers. The field workers would move locations regularly to gain as much diversity as possible.

The completed questionnaires were returned to a central collection area in each province where they would be checked for completeness and accuracy by the senior field worker in that province. The completed questionnaires would then be couriered to the central office where the data coded and put into an electronic format that was compatible with the IBM SPSS Statistics software. Once all the data was entered on in the electronic format, it was checked for completeness and accuracy by the head researcher in the company and only they were satisfied was the data sent to the researcher in the electronic format.

5.3.2.5 Recording, storing and coding of the data gathered

The coded data was received from the external research company in an electronic (SPSS) format. Two copies of the original database were made, and the original database was stored electronically on a portable hard-drive in a locked cabinet.

Of the two copies that were made, one was kept as a control sample and the other became the working copy.

5.3.3 Data Analysis

This section describes the data analysis process, starting at the nature of the analysis of the data gathered. The statistical data analyses were performed using the IBM SPSS, version 24, software.

5.3.3.1 Preparation of data for analysis

According to Field, (2009), data exploration is the first step in data analysis. SPSS provides numerous techniques for this step. The data was fed and analysed to determine if there were any problems with the data that could lead to distorted statistics or statistical errors. This analysis investigated for errors such as missing data, incorrect data entered, irregular distributions and outliers, which are scores with extreme values (Luthans and Avolio, 2009). If any errors such as incorrect values, i.e. a value of 7 when there were only 6 possible values were experienced in the analysis the incorrect values were removed and not included in the analysis. This would explain why in certain analysis there were less than 400 samples.

5.3.3.2 Predictive vs. Explanatory Modelling

There has long been a debate in the philosophy of science whether predicting and explaining are distinct but the same. This debate was strongly influenced by the hypothetic-deductive model of Hempel and Oppenheim (1948) which equates prediction and explanation. However, later it became clear that the uncertainty associated with explanation is of a different nature than that associated with prediction (Helmer and Rescher, 1959). This difference between the two models has been elaborated on in more detail by Shmueli, (2010) and many others including Dowe, Gardiner & Oppy (2007); Foster and Sober (1994); and Foster (2002). Simon (2001) explains the difference in terms of basic science and applied science with explanatory models equating to basic science where the focus is on knowing and predictive models being more like applied science where the emphasis is on using and inferring (Shmueli, 2010).

5.3.3.2.1 Causal Explanatory Modelling

Shmueli (2010: 2) defines Causal Explanatory Modelling as "*statistical models being applied to data in order to test causal hypotheses"*. These types of models are extensively used in the social sciences field to test causal hypotheses and are association based models applied to observational data, with regression models being the most common. In these models the role of theory is very strong and the theory is the lens through which the data and statistical modelling are applied. Causal explanatory models can be best expressed with the following example:

***"Y=F(x)**, where construct **X** causes construct **Y** via the function **F**, with F being represented by a path model or a set of qualitative statements. The measurable variables **X** and **Y** are operationalisations of **X** and **Y** respectively. The operationalization of **F** into a statistical model **f**, such as E(Y) = f(X), is carried out by considering **F** in light of the study design. The goal in explanatory modelling is to match **f** and **F** as closely as possible for statistical inference to apply to the theoretical hypothesis. Thus, the data, **X** and **Y** are tools for estimating f, which is in turn used for testing the causal hypothesis"* (Shmueli, 2010: 6-7).

5.3.3.2.2 Predictive Modelling

Shmueli, (2010: 4), describes predictive modelling as "*the process of applying a statistical or data mining algorithm to data for the purpose of predicting new or future observations*". The Delphi Method (Dalkey and Helmer, 1963) is a typical example of a predictive model. Extrapolation methods such as Auto Regressive Integrated Moving Average (ARIMA) type models and exponential smoothing models are used for prediction and description purposes, but they are not useable for causal explanation purposes (Shmueli, 2010). The difference of predictive modelling to causal explanatory modelling is best explained by going back to the example in section 5.3.3.2.1 which explains Causal Explanatory Modelling. In this example for causal explanatory modelling it was stated that "*the data, **X, Y** are tools for estimating **f**, which is in turn used for testing the causal hypothesis"*, while in predictive modelling "*the entities of **X** and **Y** are of interest, but the function **f** is used as a tool for generating good predictions of new Y values",* (Shmueli, 2010: 6-7). So in causal explanatory **X** and **Y** are used to estimate **f** while in predictive modelling **f** is used to estimate **Y** for new values of **X**.

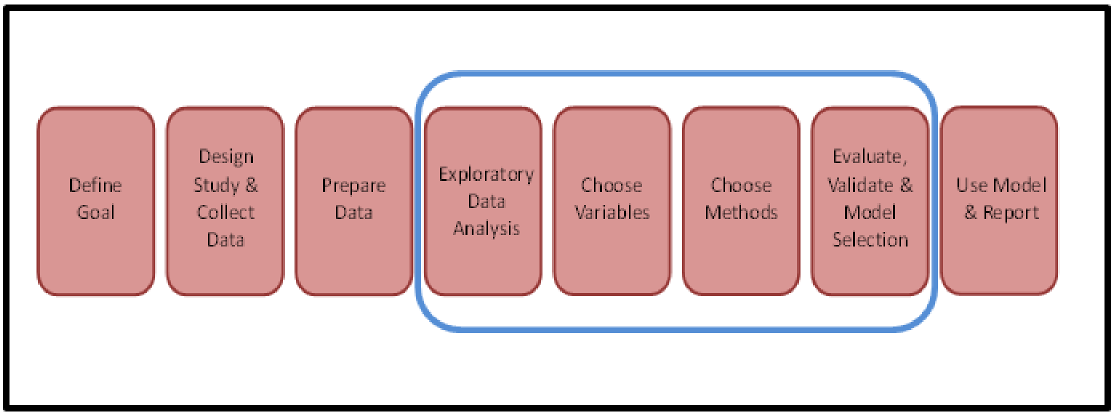
5.3.3.2.3 Choice of Modelling Type

It is important at this stage for the researcher to indicate the type of framework that is being developed as the two different types of frameworks use different statistical methodologies which are explained in the previous two sections. As this framework is an association based framework testing causal hypotheses with the application of observational data, it is a Causal Explanatory framework.

5.3.4 Modelling Framework

However, according to Shmueli, (2010) the process of statistical modelling for both explanatory and predictive modelling follow the same steps, but the choice of methods, criteria, data and information used will vary. Figure: 5-2 illustrates the generic statistical modelling process of Shmueli that was used in this research. The four steps which are of concern for this analysis are those that are enclosed within the blue rectangle. Each of the four steps is discussed in more detail in the following sections.

Figure: 5-2: Generic Statistical Modelling Process



(Source: Shmueli, 2010)

5.3.4.1 *Exploratory data analysis*

The first step in the analysis was to perform descriptive statistics on the demographic and socio-economic factors which were questions 1 to 5 in the questionnaire. For this analysis the variable of age which had been collected as individual ages was divided into four age groups which were chosen to be aligned as much as possible with key events in the mobile timeline and the generational cohorts. All subsequent analysis was conducted with age in these four groups.

The first step in the analysis was to construct tables which compared the data for an individual question against the demographic and socio-economic factors, Figure: 5-3 is an example of part of the table for Question 23.13.

Figure: 5-3 Part of the Table of Question 23.13 against the Demographic, Socio-economic and Personal factors

			Total sample	[v1] Gender		[v2] Grouped age			
			n	Male	Female	18-24	25-34	35-44	45+
[v23.13] Data based voice or video calling applications: they allow me to video conference when face to face meetings not possible	Strongly disagree	n	42	22	20	10	14	6	12
		%	10.5%	11.0%	10.0%	12.8%	9.4%	5.6%	18.5%
	Disagree	n	35	19	16	11	12	8	4
		%	8.8%	9.5%	8.0%	14.1%	8.1%	7.4%	6.2%
	Neither agree nor disagree	n	66	27	39	8	25	16	17
		%	16.5%	13.5%	19.5%	10.3%	16.8%	14.8%	26.2%
	Agree	n	152	75	77	33	57	39	23
		%	38.0%	37.5%	38.5%	42.3%	38.3%	36.1%	35.4%
	Strongly agree	n	105	57	48	16	41	39	9
		%	26.3%	28.5%	24.0%	20.5%	27.5%	36.1%	13.8%
	Total	n	400	200	200	78	149	108	65
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The next set of analyses was to compare analysis was to compare the various demographic, socio-economic and personal factors against each other and against each of the individual questions to test for independence. In these analyses the factor would be the independent variable and the question as the dependent variable. The test for independence was carried out with the Pearson's Chi-squared (X^2) using an Asymptotic Significance (2-sided) with a value of $p<0.05$ being considered as significant (Field, 2009: 697). The symmetric was then measured on an 'interval by interval' basis using a Pearson's R and on an 'ordinal by ordinal' basis using the Spearman's correlation, again with a significance of <0.05. The hypothesis that was tested was the following:

- Null hypothesis: - there is no association between the two variables
- Alternative Hypothesis: - there is an association between the two variables.

Table: 5-3: Tests for Independence for Demographic factor 'Location' Against Question 23.13

[v23.13] Data based voice or video calling applications: * [v3.2] Location

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	54.992[a]	8	**0.000**
Likelihood Ratio	62.701	8	**0.000**
Linear-by-Linear Association	20.110	1	**0.000**
N of Valid Cases	400		

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 8,75.

Then the following analyses would be carried out by all the demographic and socio-economic factors on each of the individual questions. First would be descriptive statistics of mean, standard deviation and standard error of the mean. The second set of analysis would be the Pearson's Chi-squared test for independence using an Asymptotic Significance (2-sided) with a value of $p<0.05$ being considered as significant (Field, 2009:697). The next analysis was a T-test for the Equality of Means, with equal variances assumed and again with equal variances not assumed. Again it was a two sided test at the <0.05 level. The Levene Statistic, which is designed to test the null hypothesis that the variances of the groups are the same, was then evaluated and again it was considered significant at a <0.05 (Field, 2009).

The final series of analyses was to determine if there was any variance between the groups in a single demographic or socio-economic factor. This was achieved by performing a one-way Analysis of Variance (ANOVA) test with a significance event achieved at a 0.05 level. The Welch–*F* test was then carried out if the Levene Statistic was significant to account for the fact that the variances were unequal and this violated one of the assumptions of the ANOVA (Field, 2009).

If the ANOVA analysis showed that there was a variance between the groups at a 0.05 level two further analyses that were performed, namely the Bonferroni and Games-Howell post-hoc tests. The ANOVA test indicates if there is a variance between the groups whereas the Bonferroni Correction and the Games-Howell (which assumes unequal variances and unequal group sizes) tests indicate between which groups the differences lie (Field, 2009). The Bonferroni and Games-Howell tests were considered significant at the 0.05 level as with all the analyses performed in this exploratory data phase.

5.3.4.2 Choice of Variables

The choice of the variables was predetermined by the results of the Phase 1 qualitative analysis. Through that phase all the variables and possible moderating factors were determined and the theoretical framework was used as a basis.

5.3.4.3 Choice of Methods

Explanatory modelling requires interpretable statistical models f that are easily linked to the underlying theoretical model Ƒ, (Shmueli, 2010*).* For frameworks there is a large range of plausible models ranging from statistical models, both interpretable and un-interpretable, to data mining algorithms.

The first step in this analysis was to decrease the large number of correlated variables or questions into a smaller number of latent constructs or explanatory concepts but which explain the maximum amount of common variance in a correlation matrix (Tinsley and Tinsley, 1987). This was carried out using Factor Analysis. However, before factor analysis is carried out the data was first tested to see if it was suitable for factor analysis. This was done by carrying out the Kaiser-Meyer-Olkin Measure of Sampling Adequacy where a value greater than 0.7 was considered good, however a value greater than 0.5 was not good but useable (Kaiser, 1974). The second test was the Bartlett's Test of Sphericity which tests if the variables are related and suitable for structure detection. A value of less than 0.05 of the significance level indicates that a factor analysis is suitable (Field, 2009).

According to Tinsley and Tinsley (1987) once it is decided to use factor analysis, four decisions had be made. The first was to determine the communality estimate to use. As the analysis was an exploratory type the ‘squared multiple correlation (SMC)’ technique was used. The second question was which method of extraction was to be used. For an exploratory-descriptive analysis the primary technique of 'Principal Axis Factoring (PAF)' was used as this assumes the populations of subjects and variables provide purely descriptive solutions and most importantly analyses only the estimated common variance (Tinsley and Tinsley, 1987). Additionally, the maximum number of iterations allowed before the analysis was terminated was 25 and provided the Convergence was <0.01 (Warner, 2008). The third question was how many factors to rotate. For this the recommended standard value for rejection was used in that all factors with a communality, after extraction, lower than 0.3 were rejected (Tinsley and Tinsley, 1987; Warner, 2008; Field 2009; Pallant, 2011). The last question was what rotation procedure to use. As it was the intention to rotate the factors whilst keeping them independent, or unrelated, 'Orthogonal Rotation' (Varimax with Kaiser Normalization) was the method of choice (Tinsley and Tinsley, 1987; Warner, 2008; Field 2009).

If any factors were removed from the matrix for having a communality of below 0.3, the process would be repeated with that factor removed. If more than one construct[21] was determined from the factor analysis, all the constructs would be carried forward into the next part of the analysis.

The last step in the factor analysis was to confirm the internal consistency or reliability of the factor analysis. This was carried out using the Cronbach's Alpha Coefficient and generally with this test the value should be above 0.7 (Pallant, 2011). However, this test is very sensitive in constructs which consist of only a small number of factors and in such cases an acceptable Cronbach's alpha value may be as low as 0.5 (Pallant, 2011). In such circumstances it is recommended that the inter-item correlation for the items be used instead, with the optimal range for acceptance of the inter-item correlation being between 0.2 and 0.4 (Briggs and Cheek, 1986; Pallant, 2011).

The strength of the interactions was determined using regression techniques. The determining, power and actions of moderating and mediating factors was carried out using a regression based technique and using a sub-routine developed by Hayes (2013a).

The next step in the construction of the framework was to create a table of correlations where all the constructs determined in the factor analysis were correlated against each

[21] In order to prevent confusion a group of factors which were identified as being together were called a construct, and these constructs are the nodes of the framework

other using the Pearson's Correlation (*r*). All the correlations which were significant at the 0.05 and 0.01 levels were identified and these were the factors that were used to build the framework.

The final stage of the analysis was to test various combinations of the framework which were suggested by the regression analysis. The frameworks were tested in two ways, first by a multiple regression analysis technique and the secondly by using AMOS (Analysis Of Moment Structures), version 22, a module that is added to SPSS in order to conduct Structural Equation Modeling, path analysis, and confirmatory factor analysis.

5.3.4.4 Evaluation, Validation and Model Selection

As there were often more than one set of factors that could be used as a construct they all had to be tested until the optimum set of constructs were found. The optimum model was found using the following three steps.

Evaluation:

In this step the framework was constructed using one set of constructs and the overall explanatory power which measures the strength of relationship was calculated. Here the correlation coefficients or R^2 values and statistical significance of overall *F*-type statistics were used to explain the explanatory power (Shumeli, 2010).

Validation:

The particular iteration of the model was then validated in two ways, the first 'Model validation' was to confirm that the model was valid by ensuring that f adequately represents Ƒ and the second was **'**Model fit' which was to ensure that ḟ fits the data {*X,Y*}, (Shumeli, 2010).

Framework Selection:

In the final steps models were constructed with all the possible variations and the model having the highest explanatory power was selected.

5.3.5 Determination of Moderating and Mediating Factors

According to Hayes (2013) the final step in the overall analysis was to conduct a 'Conditional process analysis' which is a modelling strategy undertaken with the goal of describing the conditional or contingent nature of the mechanism(s) by which a variable transmits its effect on another, and testing hypotheses about such contingent effects. This process was used to determine which of the factors identified in section 4.3.3 were actually having a moderating effect and on the relationships between the constructs and to determine which of the constructs had a mediating effect on the constructs.

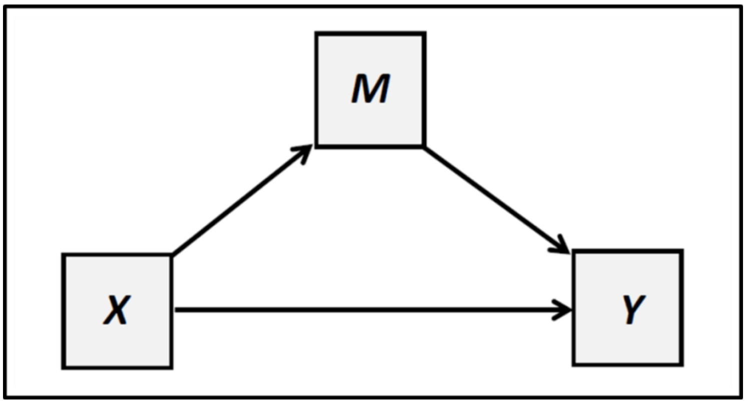
The first step was to clearly define the difference between a 'moderating' and 'mediating' variable. The difference is very clearly elucidated by Baron and Kenny (1986) and Hayes (2013).

5.3.5.1 Mediating Factor

Baron and Kenney, (1986) define a 'mediator' in the following way, "*a variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion*" (Baron and Kenny, 1986:1176). Hayes (2013) explains a mediating model Figure: 5-4 as follows: $X \rightarrow M \rightarrow Y$ is a causal chain of events. The mediator variable *M* is the 'mechanism' variable through which X exerts an effect on Y. The mediator variable *M* is one that helps explain the relationship between two other variables *X* and *Y*.

The mediator and moderator variables were tested and their impact determined using the Process Macro Version 2.16.3 (Hayes, 2013a).

Figure: 5-4: The Mediator Model



(Source: Hayes, 2013)

5.3.5.2 Determining mediating factors

To determine if a variable is a mediating variable the process software uses Model 4 with the following variables (Variables *X, Y* and *M* as the mediating variable, see Figure:

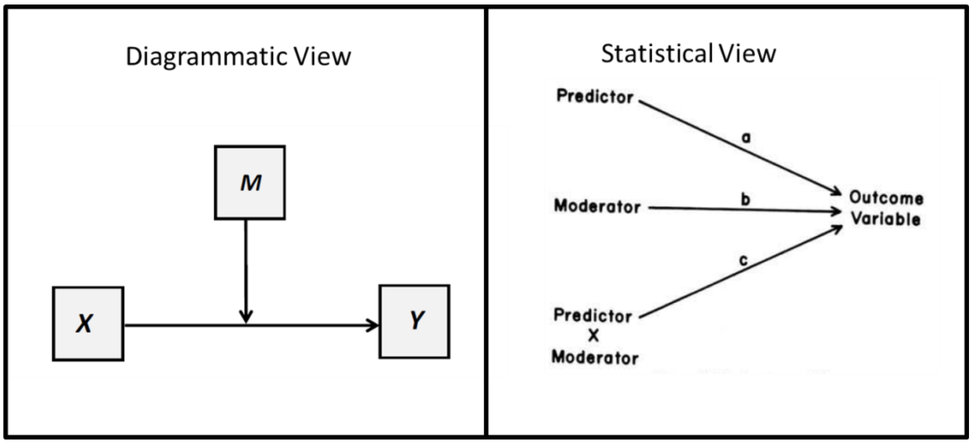
5-4) and the software calculates using multiple linear regression with R^2 deviation from zero.

1. First the software tested to see if the path between *X* and *M* was significant. Logic tells us that if *X* is not a predictor of *M* then mediation is unlikely.
2. Next it checked for overall fit for both *X* and *M* on *Y*.
3. Next the relationship between *M* and *Y* was tested.
4. The possible relationship was then tested in two ways, the first using the Bootstrap Test for Mediation.
    a. This method determined the 'total effect' of *X* on *Y*
    b. It the determined the 'direct effect' of *X* on *Y*
    c. The difference between these two values was the 'indirect effect' of *X* on *Y*
    d. If the calculated effect was between the Upper and Lower Bootstrap Confidence Intervals then M was a mediating variable
5. The second method was the Sobel Test, and in this test if $p<0.05$, then M was a mediating variable.

5.3.5.3 Moderating Factor

A 'moderator', is defined as "*a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable*" (Baron and Kenny, 1986: 1174). A way of understanding moderator variables is that the effect of *X* on *Y* can be said to be 'moderated' if its size or direction is dependent on *M*, Figure: 5-5 (Hayes, 2013). Also, moderating factors always act as independent variables.

Figure: 5-5: The Moderator M acting on X Y



(Source: Hayes, 2013)

5.3.5.4 Determining Moderating Variables

The same software was used but in this case Model 1, using linear multiple regression. First, it tested for the existence of a statistically significant interaction between the predictor variable (a) and moderator variable (b) with regard to the outcome variable, using a multiple linear regression. A statistically significant interaction was considered to be achieved if the regression coefficient for the interaction term was statistically significant at a <0.05 level. Second, if there was evidence that such a statistically significant interaction was present, ‘post hoc probing’ of the interaction was completed using a ‘pick-a-point’ approach (Ragosa, 1980). The regression coefficients were then calculated and the effect of the different groups in the variables was calculated.

5.4 ASSESSING AND DEMONSTRATING THE QUALITY AND RIGOUR OF THE PROPOSED RESEARCH DESIGN

5.4.1 Reliability

Reliability refers to the accuracy of an instrument and to be interpretable, a test must be reliable (Cohen, 1988). Cronbach’s correlation coefficient was used to test the reliability. The result of the reliability analysis was a reliability coefficient (*r*) where 0 indicated a completely unreliable test and 1 indicated a completely reliable test with a value above 0.7 being acceptable (Briggs and Cheek, 1986; Field, 2009; Pallant, 2011). Cronbach's alpha measures how well a set of items (or variables) measures a single unit-dimensional latent construct (Field, 2009). Where there were only a few variables, three or less items, it was not possible to have an accurate Cronbach’s alpha then the inter-item correlation for the items was used instead, with the optimal range for acceptance of the inter-item correlation being between 0.2 and 0.4 (Briggs and Cheek, 1986; Pallant, 2011).

5.4.2 Rigour

Rigour was introduced into this research design by using data sampling methods that gave the best possible opportunity for the whole population to be represented in the sample used. Rigour was also maintained as several different analytical and statistical techniques were used in order determine which of the various frameworks proposed gave the best explanatory power when assessed.

5.4.3 Validity and Bias

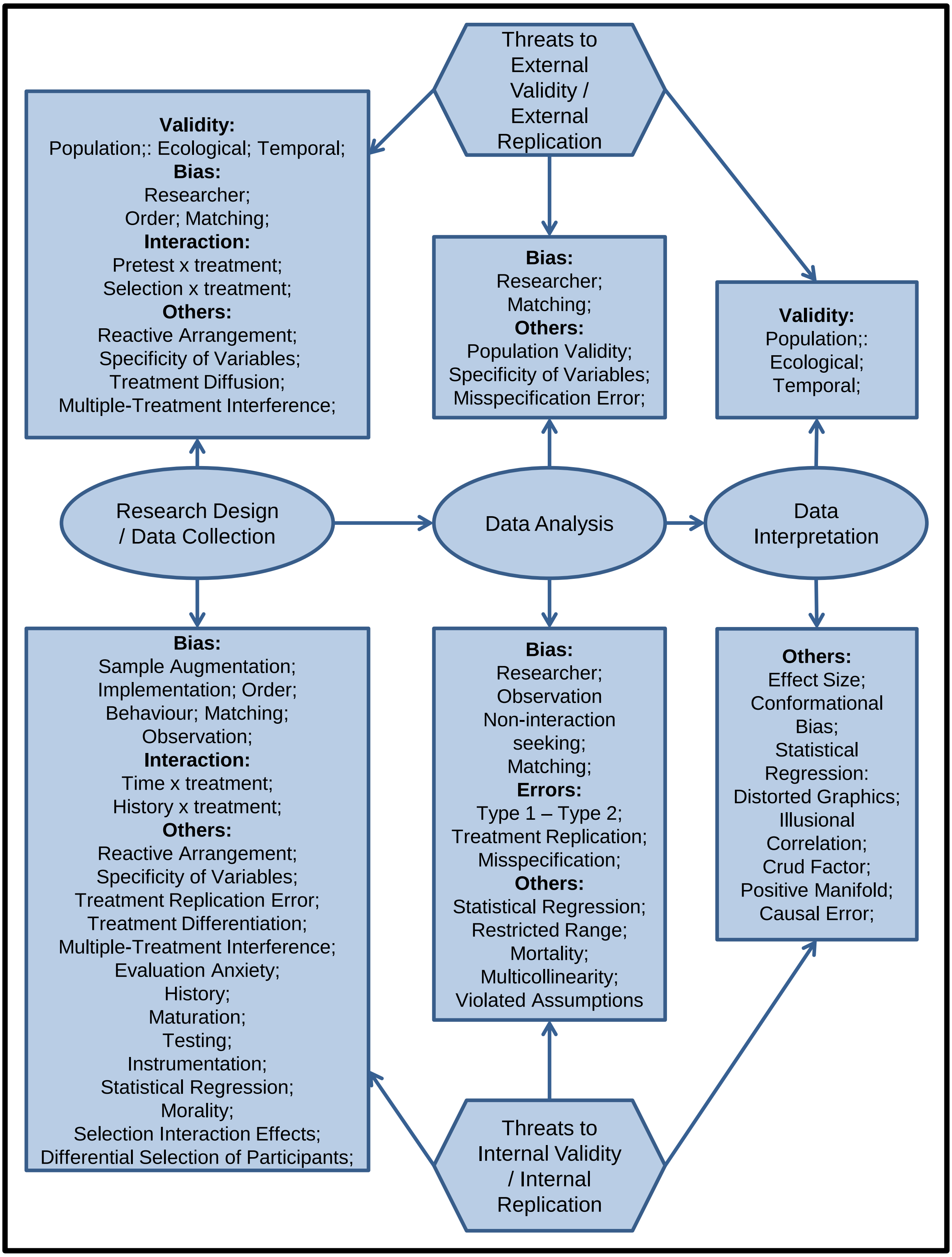
The validity with regard to the overall research is covered in section 1.6.7.2 and will not be repeated here. However there are specific factors which can affect the validity of the quantitative phase of the research. Campbell and Stanley (1963) split the threats to validity into two areas, 'internal validity' which is defined as "[the] *extent to which findings can be attributed to interventions rather than flaws in your research design*", (Saunders, *et al*., 2009: 593) and 'external validity' which is defined as "*the extent to which the research results from a particular study are generalizable to all relevant contexts*" (Saunders, *et al*., 2009: 592). In 2000, Onwuegbuzie, with regard to quantitative research, further split them into 3 separate time periods to which the specific time period in the research that they can occur, see Figure: 5-6 (Onwuegbuzie and Johnson, 2006).

Although the threats are split across the three time periods a significant amount are consistent across all three periods such as population validity which is an external validity threat across all three time periods or statistical regression which is an internal threat at all three time periods. Additionally, a large number of the threats, such as mortality or multi-treatment interference, were not of importance as there was only a single interaction with all the interviewees used in Phase 2.

It can be noted that bias is seen as a major component of the validity threats. Smith and Noble (2014) describe 5 types of bias of which 4 that can be equated with the various biases indicated by Onwuegbuzie (2000), the exception being 'Publication bias' which is not valid at this stage. The 4 biases which are of importance are: 'Design bias' which refers to a poor study design and incongruence between aims and methods; 'Selection or Participant bias' which refers to both the process of recruiting participants and study inclusion criteria; 'Data Collection and Measurement bias' which refers to bias that can occur when a researcher's personal beliefs influence the way information or data is collected or where the tool or instrument used for the collection has not be assessed for its validity or reliability; and 'Analysis bias' where the researcher concentrates on data that supports the hypothesis and ignores contradictory data (Smith and Noble, 2014).

An important bias that must be mitigated for at the design of the research is the 'Design bias' which is often called 'Common method bias' or 'Systematic method bias' (Podsakoff, MacKenzie & Podsakoff, 2012). The design of the questionnaire must aim

Figure: 5-6: Breakdown of threats to validity in various time periods of Quantitaive Research



(Source: Adapted from Onwuegbuzie & Johnson, 2006)

to limit the respondents ability to respond inaccurately by not asking complex or abstract questions (Doty and Glick 1998; Krosnick, 1991), using clear and concise language (Krosnick, 1991; Podsakoff, *et al*., 2003), not using double barrelled questions (Bradburn, *et al*., 2004; Krosnick, 1991), not using questions that rely on retrospective recall (Krosnick, 1991) and by using face-to-face interviewing instead of telephonic interviewing (MacKenzie and Podsakoff, 2012). It must also be designed to allow the respondents the ability to answer the questions as truthfully as possible (MacKenzie and Podsakoff, 2012). The Harman one factor analysis was conducted to measure the amount of common bias in the results (Harman, 1976; MacKenzie and Podsakoff, 2012)

The researcher mitigated the threats and bias indicated above by ensuring that all steps in the research were tested with external experts before proceeding to the next step in the process. Additionally, where practical the researcher used external experts to conduct parts of the research where it would be advantageous. An example of this was using an external research component to do the data collection as they employ professional field agents and have external protocols that ensure the samples were collected as randomly as possible but still maintain the diversity in the sample with regard to the demographic and socio-economic requirements.

5.5 SUMMARY OF CHAPTER 5

Chapter 5 has covered all the methodologies as well as the levels of significance and rejection/acceptance levels that were used in collecting and analysing all the data obtained. It also explains all the processes and controls which the researcher put into place to ensure the rigour of this research as well as repeatability and removal of threats to validity and possible bias from the research

CHAPTER SIX

EVALUATION OF FRAMEWORK AND FACTORS

6.1 INTRODUCTION

In this chapter the data which was acquired in the market survey was evaluated using the methodology outlined in Chapter 5. This chapter consists of six sections, the first being an analysis of the demographic profile of the survey participants. In the second the overall framework and its constructs were evaluated using the methodology described in section 5.3.4. The third section was where the moderating factors and their impact on the constructs of the Framework were evaluated. The fourth section investigated the mediating factors found and the impact of this finding on the mobile telecommunications market. The fifth and penultimate concentrated on the current usage of ICT services, what services people used and how much do they used them. It also examined if there are any demographic differences with regard to usage. The sixth and last section covered additional analyses carried out on the collected data.

6.2 DEMOGRAPHIC PROFILE OF THE PARTICIPANTS

Phase 1 and the literature survey had indicated that gender, age, location, education levels, income levels, LSM bands and ethnicity could affect the adoption of a new mobile telecommunication service. Some of these factors are well covered in literature, for example, Gender (Pedersen 2005; Lee & Lee, 2010; Riquelme and Rios, 2010; Khedhaouria, *et al*., 2013), age (May, 2012; Oluwatayo 2014), education (Schumpeter, 2002; Kapurubandara and Lawson, 2008; Worku, 2010 Freeman and Mubichi, 2017) and ethnicity (Lee and Lee, 2007; Horrigan, 2008; Lee and Lee, 2010; Hudson, 2010; Prieger, 2015) but the literature was divided showing them having an effect in some cases but in others no effect was detected.

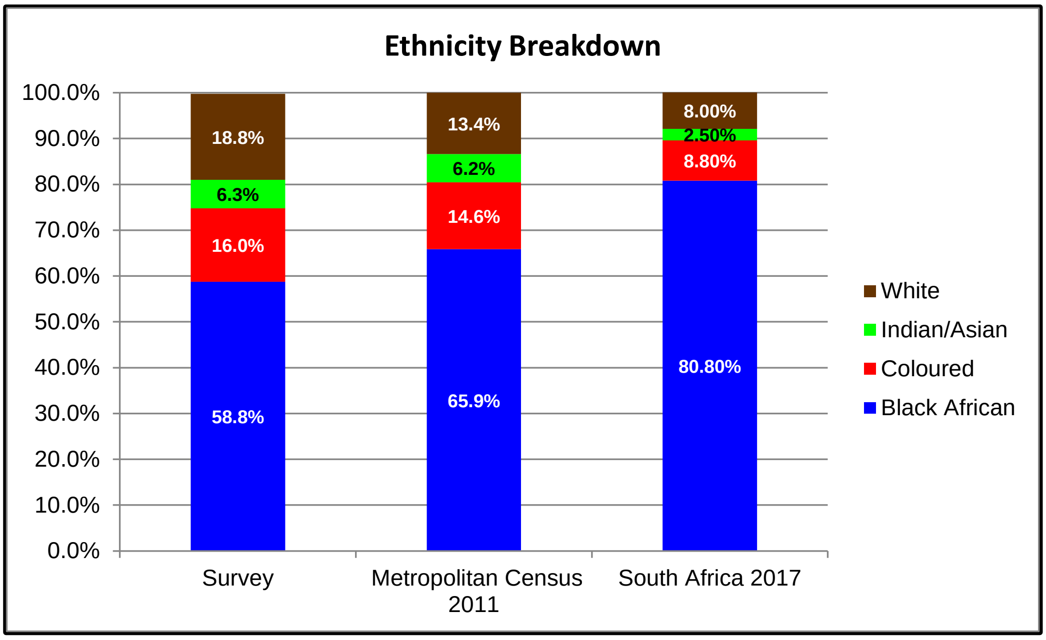
6.2.1 Overview of Demographic Profile

As this survey was voluntary it was not possible to control the exact breakdown of all the demographic factors to be similar to the demographics of South Africa. Therefore, the field workers were given rough breakdowns in terms of age, gender and ethnicity of the individuals that were required for the survey. The only control the survey had on the constructs of Income and Living Standards Measures (LSM) were the areas in four metropoles where the interviews were conducted. For example participants in the lower level income and LSM bands were more likely to be found at public transport hubs, such as taxi ranks and train stations, while those in the higher bands were at top-end suburban shopping centres. Therefore, the sampling and interviews were conducted in different locations around the metropoles to ensure as diverse a sample as possible for these characteristics.

A similar problem was the split of participants in terms of ethnicity. The only available statistics for ethnicity in the four metropolitan areas were from the Census of 2011 (Statistics South Africa, 2012). However, these were outdated, in that for example the total population of Cape Town at the 2011 Census was given as 3.74 million (Statistics South Africa, 2012) while it was estimated to have risen to 4.01 million in 2016 (Municipalities of South Africa, 2018) an increase of 7%. Additionally, there were no statistical breakdowns of LSM bands 6 to 10 on an ethnic or metropolitan basis. Therefore, the 2011 statistics were used as a rough guide for ethnicity targets for participant splits in the survey.

The ethnic breakdown of the survey sample, the mid-year estimates for the whole of South Africa for July 2017 (Statistics South Africa, 2017) and estimates of the four metropolitan areas according to the Census of 2011 (Statistics South Africa, 2012) are shown in Figure: 6-1. Details with regard to the groupings in the statistics are discussed in the following section.

Figure: 6-1: Breakdown of Ethnicity in the Sample versus the Current South African figure and the 4 Metropolitan areas in 2011



6.2.2 Analysis of Demographic Profiles and possible relationships between the different variables tested.

The following gives the analysis on the demographic profiles of the participants in the survey. The first test was to check how the demographic factors were distributed across the survey.

Next was to test if there was a relationship among variables (e.g. Gender) against all the questions in the survey, with the demographic, socio-economic or personal factor as the independent variable and the question as the dependent variable using the methodology outlined in section 5.3.4. This analysis was carried out by using the Pearson Chi-squared Test for Independence and confirmation was obtained by using the Linear-by-Linear Association and Likelihood Ratios tests. The level of Asymptotic Significance (2-sided) was set at the <0.05 level. The hypothesis that was tested was the following:

- Null hypothesis: - there is no association between the two variables
- Alternative Hypothesis: - there is an association between the two variables.

The next test determined if there was any variation between the groups in the independent variable. This was carried out using the one-way analysis of variance test (ANOVA). If there were three or more groups in the variable, i.e. income level with four groups, then Post-hoc tests were performed to determine which groups varied with each other. The Post-hoc tests used to conduct pairwise comparisons for the factors were the Bonferroni test which assumes equal variance and the Games-Howell which assumes unequal variance. In all tests the level for significance was set at the <0.05 level, and strong significant at <0.01 level.

6.2.2.1 Gender

According to the Phase 1 interviews gender was possibly a factor which influences the adoption of mobile services. However, the literature survey in section 2.4.1.1 has shown that in certain circumstances gender does play an influencing role on the adoption of ICT services (Cheong and Park, 2005; Hong and Tam, 2006; Lee, *et al.*, 2007; Hong, *et al.*, 2008; Kuo, *et al*., 2009; Kuo and Yen, 2009), while at the same time there is a body of research where gender is found not to be an influence (Gerpott, 2010; Nysveen, Pedersen & Thorbjornsen, 2005; Cheong and Park, 2005; Hong and Tam, 2006). In light of this, gender was tested in this research to see if it played an influencing role in the adoption of mobile data services in South Africa.

Table: 6-1: Demographic breakdown of survey participants

Demographic Factor	Groups	Number in the Sample (Percentage)
Location	Gauteng (Johannesburg and Tshwane)	200 (50%)
	Cape Town	100 (25%)
	eThekwini	100 (25%)
Gender	Female	200 (50%)
	Male	200 (50%)
Ages	18-24 Years	78 (19.5%)
	25-34 Years	149 (37.3%)
	35-44 Years	108 (27.0%)
	45+ Years	65 (16.3%)
Ethnicity*	White	75 (18.8%)
	Indian	25 (6.3%)
	Coloured	64 (16.0%)
	Black	235 (58.9%)
Highest Academic Level* Achieved	Secondary Schooling (SS)	20 (5.0%)
	Matric (M)	170 (42.6%)
	Post Matric Diploma (PMD)	120 (30.1%)
	Undergraduate Degree (UG)	52 (13.0%)
	Post Graduate Degree (PG)	37 (9.3%)
Average Monthly Income Level (ZAR)*	Nothing	35 (8.8%)
	1–5 000	54 (13.6%)
	5 001-10 000	135 (33.9%)
	10 001–20 000	116 (29.2%)
	>20 000	97 (14.6%)
Life Style (LSM Group)	7	79 (19.8%)
	8	105 (26.3%)
	9	119 (29.8%)
	10	97 (24.3%)

*Note some of of the totals do not add up to 400, this is due to respondents not willing to give this information.

As seen from Table: 6-1 the number of males and females interviewed was controlled to some extent at a location level and at an ethnic level so that there would approximately be similar numbers of female and male participants. This means that in all of the three locations there were similar numbers of males and females surveyed with eThekwini being the largest variation with 51 males and only 49 females. It is the same with ethnicity with the biggest variation in gender being in Coloured people with 36 males interviewed and only 28 females.

Gender was tested against the other 47 questions which were used in the development of the Framework and there were only three instances where the significance level on the Pearson's Chi-squared test was below 0.05 and the alternative hypothesis was accepted. In most cases the value of Chi-squared was greater than 0.5 indicating there was no significant association between Gender and the other variables. The three incidences where there was a significant association are shown in Table: 6-2.

Table: 6-2: Questions where there is a significant association with Gender

Question	Allocated to Construct	Pearson Chi-Squared			Linear-by-Linear Association		
[Q12.1] Operators keep mobile prices higher to maximise their profits	Mobile Service Provider Marketing Tactics	12.724	4	0.013	3.460	1	0.063
[Q12.2] Operators can influence the how and when you use your mobile device by manipulating prices	Mobile Service Provider Marketing Tactics	9.783	4	0.044	1.076	1	0.300
[Q26.10] Using free WiFi hotspots is good for my image as it shows that I am technically literate	Social Pressure and Aspirational Value	21.138	6	0.002	6.779	1	0.009

The Student-t test to determine the equality of means (Snedecor and Cochrane, 1989) was performed on gender as the independent variable and the other questions as the dependant variable. Out of the 47 tests only one showed a significant variation at the 0.05 significance level in the means at both assumptions, (equal variance assumed and equal variance not assumed), see Table: 6-3. It is worth noting that it was the same question, Question 26.10, which showed the significant association in both the Pearson Chi-squared test and the Linear-by-linear association test.

Table: 6-3: Test of independence of Gender vs. Question 26.10

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
[v26.10] Free wifi hotspots: using them is good for my general image as it shows am technically literate	Equal variances assumed	7.169	0.008	-2.623	398	0.009	-0.510	0.194	-0.892	-0.128
	Equal variances not assumed			-2.623	394.24	0.009	-0.510	0.194	-0.892	-0.128

Only Question 26.10 shows a significant variation in both distributions and means, but as Question 26.10 was one of the factors used in the final Framework, Gender was carried forward into the Final Framework for testing as a moderating factor.

6.2.2.2 Age

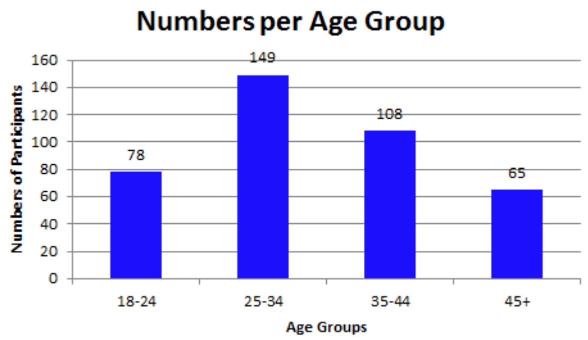
The interview participants had indicated that age was a possible differentiating factor in the adoption of mobile data services with the younger people more likely to adopt mobile data services than the older generations. However, as with Gender, the literature survey had shown that there was no definitive answer whether Age was a moderating factor on the adoption of mobile services. Prior research had shown inconclusive results, in that in some research Age did in fact affect the adoption of mobile services (Morris and Venkatesh, 2000; Dholakia and Uusitalo, 2002; Pagani, 2004; Khare, Khare & Singh, 2012) while in other research the opposite was in fact true and that it did not affect adoption (Sobhanifard, *et al*., 2017); see section 2.4.1.2 for details.

In the survey, Age was collected as a continuous variable in that actual ages were collected. However, for analysis purposes, Age was broken down into four groups: 18 to 24 years; 25 to 34 years; 35 to 44 years; and 45 years and older. The age breakdown was carried out using the following three criteria: the groups were reasonably sized to give good statistical data; the generational cohorts as defined in section 2.4.1.2; and finally key dates in the ICT timelines, i.e. the arrival of mobile services in South Africa in 1993.

Figure: 6-2 gives the details of the original continuous Age data and its subsequent groupings.

Figure: 6-2: Ages of participants in the survey, first as a continuous variable then in groups

	Years
No of Samples	400
Youngest	18
Oldest	64
Average Age	33.9
Standard Deviation of Age	10.02



The table on the left of Figure: 6-2 shows the data collected for respondents age, with the youngest being 18 and the oldest 64 years, with an average age of 33.9 years. The graph on the right shows the variable age where the ages have been grouped into four bands or age groups with the age group 25-34 having the greatest number respondents at one hundred and forty nine.

The Grouped Age (the data in the four discrete bands) was tested against all 47 questions at a <0.05 significance level and a <0.01 significance level for the Pearson's Chi-squared test and the Linear-by-linear Association tests for independence.

The ANOVA was used to test whether there was any variation between the groups in the independent variable, and the Post-hoc Bonferroni and Games-Howell tests were performed to determine which groups varied in the independent variable.

Table: 6-4 summarises the results of the analysis, the full results can be found in Annexure 5.

Table: 6-4: Summary of Tests of Variance with Grouped Age

Dimension	Total Questions	Number questions significant at 0.05 Level			Number questions significant at 0.01 Level			Post-hoc tests (Number questions with Variations)	
		Pearson Chi Squared	Linear-by-linear	Anova	Pearson Chi Squared	Linear-by-linear	Anova	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	10	1	0	1	2	0	1	2	2
Social Pressure and Aspirational Value (SPAV)	6	1	0	0	2	2	2	2	2
Perceived Ease of Use (PEU)	14	1	0	1	2	1	1	2	2
Perceived Usefulness (PU)	15	3	1	3	5	6	5	8	8
Intention to Use (IU)	2	1	0	0	1	1	2	2	2

The 47 questions which were used to build the final framework were divided into five groups with each question in a group being used to build one of the constructs of the final framework. The results show that there is a statistically significant variance with at least two questions in every group of questions when the responses of the four age groups were tested against each other. Additionally of the questions where statistical variance was observed there were more questions where the variation was at the highly significant <0.01 significance level than at the lower <0.05 significance level.

The Bonferroni and Games-Howell Post-hoc tests were used to analyse the responses from the respondents in the four different age levels for a particular question and tested to see if there was a significant variation in the responses between the groups. The Post-hoc test then indicates which groups show a statistically significant difference in the responses to the question. The analysis of the Grouped age responses against all 47 questions showed that the responses of the group aged 45+ were most often different from the other groups. The group to with which the responses of the 45+age group were most often different were the 18-24 year olds group followed by the 25-34 year olds group.

It was deduced that Grouped Age does have an association with the questions which are used to create the constructs of the preliminary framework and thus would be tested again as a moderating factor in the Final Framework.

6.2.2.3 Location

The Phase 1 interviews highlighted location as a possible factor that would affect the adoption of mobile services. The experts suggested a split on rural versus urban lines, but this was not practical for reasons highlighted earlier. Therefore in order to ensure the sample was as diverse as practical the survey was conducted in four metropolitan areas. The metropolitan areas were Tshwane and Johannesburg, in the province of Gauteng, eThekwini in Kwa-Zulu Natal and Cape Town in the Western Cape. 80% of the total metropolitan population of South Africa reside in these four metropolitan areas (Municipalities of South Africa, 2018). 100 surveys were completed in each metropolitan, but with Johannesburg and Tshwane being combined into a single entity named Gauteng.

The independence of the three locations was tested using the Pearson Chi-squared and Linear-by-linear tests. The ANOVA was used to test whether there was any variation between the groups in the independent variable and the Post-hoc Bonferroni and Games-Howell tests were performed to determine which groups varied in the independent variable.

Table: 6-5: Summarised Tests of Variation between the three locations

Dimension	Total Questions	Number questions significant at 0.05 Level			Number questions significant at 0.01 Level			Post-hoc tests (Number questions with Variations)	
		Pearson Chi Squared	Linear By linear	Anova	Pearson Chi Squared	Linear By linear	Anova	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	10	3	2	0	4	4	4	4	4
Social Pressure and Aspirational Value (SPAV)	6	0	0	0	6	4	5	5	6
Perceived Ease of Use (PEU)	14	0	1	2	12	11	11	13	13
Perceived Usefulness (PU)	15	3	5	2	12	5	8	11	11
Intention to Use (IU)	2	0	0	0	1	1	1	1	1

It was found that there was a statistically significant variation in the responses to the 47 questions from the responses from the three locations. In fact, at least 80% of the questions showed variations between the three locations which were the highest number of questions showing variations for any of the other possible moderating factors. Additionally, the majority of the questions (35 of the 43 questions which showed variations) showed them at the highly significant <0.01 level versus the 8 questions at the <0.05 significance level.

An analysis of the findings from the Benferroni and Games-Howell Post-hoc tests to show the responses from which groups were statistically different indicated that the responses from Gauteng were most often different from eThekwini and Cape Town, respectively.

The Post-hoc tests also indicated that there was a variation in responses to all six questions which comprise the SPAV construct. 13 of the 14 questions (93%) which comprise the PEU construct showed a variation in responses while for the Perceived Usefulness construct it was 11 of the 15 questions (73%).

The results show that the three different locations have an effect on the adoption of mobile data services and were tested further in the Final Framework.

6.2.2.4 Maximum Educational Level

The Phase 1 interviews had indicated that education most likely played a role in the adoption of mobile services in that a low level of general education would negatively impact on a subscriber's technical knowledge and lower the subscriber's ability to interact with the more technically advanced functions of ICT services. The literature survey was again inconclusive with some research indicating it was a factor that affects the adoption of ICT services and some indicating that it did not; see section 2.4.1.3 for more detail.

The survey collected data on the maximum educational level achieved by the interviewee. The data was collected at six levels but reported at five levels as the level Completed Primary Schooling was combined with Completed Secondary Schooling to form a new level Secondary Schooling in order to have sufficient data for analysis purposes as there was only one response at completed primary school. The others were Achieved Matric, Completed a Post Matric Diploma, Undergraduate Degree and the last group Post Graduate Degree.

Of the sample nearly 48% had only matric or less and only 22.3% had a university degree, see Figure: 6-3. As would be expected the largest group were those with Matric.

Figure: 6-3: Breakdown of Maximum Educational Level

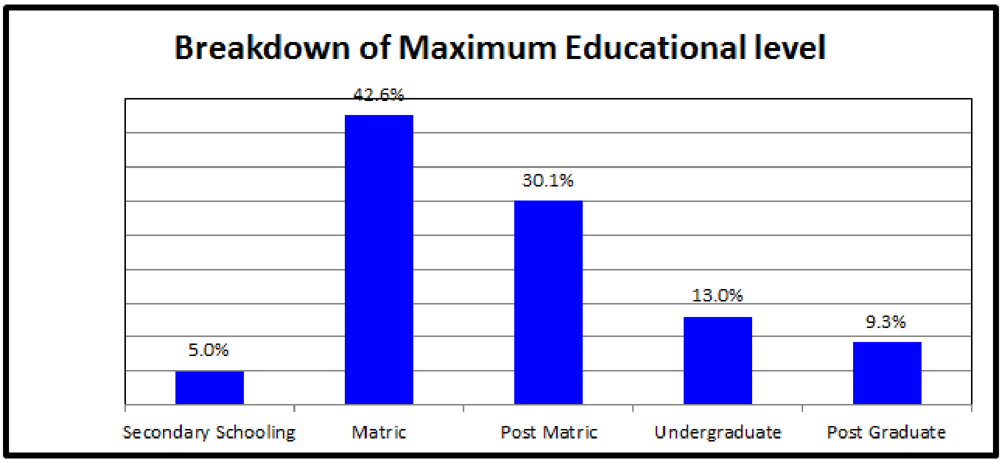


Table: 6-6: Summary of Tests of Variance on Maximum Educational Level

Dimension	Total Questions	Number questions significant at 0.05 Level			Number questions significant at 0.01 Level			Post-hoc tests (Number questions with Variations)	
		Pearson Chi Squared	Linear-by-linear	Anova	Pearson Chi Squared	Linear-by-linear	Anova	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	10	0	0	2	1	3	2	3	3
Social Pressure and Aspirational Value (SPAV)	6	1	1	1	1	2	4	5	5
Perceived Ease of Use (PEU)	14	2	2	3	3	9	7	7	8
Perceived Usefulness (PU)	15	1	1	1	6	7	6	7	7
Intention to Use (IU)	2	0	0	1	2	2	1	1	1

The analysis of variance which is summarised in Table: 6-6 indicates that there was a considerable amount of variation in the responses to the 47 questions between the respondents in the various educational levels in this study.

Again, as with the Location factor the majority of the questions show that the variations in responses between the different educational levels are at the highly significant <0.01 level (4 questions show variance at the <0.05 level with the Pearson's Chi-squared test versus 13 at the <0.01 level). These results would indicate that this factor should be investigated further with regard to its effect on the final framework.

The Bonferroni and Games-Howell Post-hoc tests analysed the responses from the respondents in the five different maximum educational levels for a particular question and tests to see if there is a significant variation in the responses between the groups. The Post-hoc tests showed that the responses of the group with a Post graduate degree were the group whose responses were different to the other groups most often and especially between this group and with the Achieved Matric group.

It was found that of the 5 of the 6 questions (83%) which comprise the SPAV construct had variations between the different groups while for the PEU construct it was 8 of the 14 questions (57%).

6.2.2.5 Ethnicity

As explained in section 2.4.1.5 it is not possible in research which is limited to metropolitan areas to use culture as a possible moderating factor in the absorption of mobile data services in South Africa. However, as a result of apartheid the concept of race or ethnicity is a very important factor in the South African society where for decades that society was divided along ethnic lines. Therefore, it is too large an unknown in any research such as this to ignore a factor such as this. According to previous studies, culture is a major differentiator in ICT adoption and ethnicity is sometimes used as a proxy (Hudson, 2010; Lee and Lee, 2010).

Therefore, ethnicity was used for this study instead of culture, with the four ethnic groups Black, Coloured, Indian / Asiatic and White being used.

As explained in section 6.2.1 there was no definitive, up to date breakdown for the population of South Africa in terms of ethnicity for mobile data, so only rough guidelines were laid down to the field workers. The final breakdown into ethnic groups in the sample and the reference breakdowns are given in Table: 6-1.

As with the other demographic factors the variances within the four ethnic groups with regard to the 47 questions was investigated using the same tests as the other factors. Table: 6-7 summarises the variances found.

Table: 6-7: Summary of Tests for Variance on the Four Ethnic Groups

Dimension	Total Questions	Number questions significant at 0.05 Level			Number questions significant at 0.01 Level			Post-hoc tests (Number questions with Variations)	
		Pearson Chi Squared	Linear-by-linear	Anova	Pearson Chi Squared	Linear-by-linear	Anova	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	10	2	3	3	4	3	1	2	3
Social Pressure and Aspirational Value (SPAV)	6	0	1	1	1	1	0	0	2
Perceived Ease of Use (PEU)	14	1	1	4	6	5	7	9	12
Perceived Usefulness (PU)	15	2	0	2	8	2	6	8	8
Intention to Use (IU)	2	1	1	1	0	1	0	1	0

Apart from the SPAV construct, at least 50 % of all the questions in the other constructs show a statistically significant variance between the different ethnic groups. As with the previous Education and Location constructs the number of questions with a variance at the highly significant value of <0.01 level was around twice those of those whose variance were at the less significant <0.05 significance level.

The analysis, using the Benferroni and Games-Howell Post-hoc tests, showed surprisingly that the groups with number of greatest variations in responses was between the Asian and Black Ethnic groups, followed by the variations between the Asian and the White Ethnic groups. Therefore, the responses of the Asian Ethnic group showed differences on more questions than the other ethnic groups. With South Africa’s past racial history it would have been expected that the most variations would have been between the White and Black ethnic groups.

The constructs with the most questions where a variation was found between the different ethnic groups were the PEU construct, followed by the PU construct.

The detailed breakdowns of all the above analyses are to be found in Annexure 5.

6.2.3 Socio-economic

The second group of possible factors which can affect the adoption of mobile data services is the socio-economic factors. The intention of testing this group of factors was to determine if the adoption of mobile services differs with various income levels and Living Standard Measures (LSM).

6.2.3.1 Income Levels

The first socio-economic factor that was tested was that of income levels. The income levels were chosen to roughly correspond with income of the different LSM bands. Originally, the income levels were set at an annual figure for the ease of collecting data. However, after the pilot testing phase it was determined that measuring income at a monthly level was more reliable and more closely aligned with usage and mobile services spends. The annual data bands in the questionnaire were then converted to monthly incomes. The survey had 9 separate bands but it was found that for analysis purposes nine bands was too many as some of the groups had less than 5 responses. Therefore these nine bands were reduced to the 5 bands using the LSM income groupings of December 2015 (SAARF AMPS Dec 15, 2016) as a basis.

Group 1: 'Nothing (ZAR0)': The first group was those who had no monthly income, but still could afford mobile data services. This combined with the fact that they had to be over 18 years of age to participate meant that this group was mostly students and those furthering their education but had the financial backing of a family or some form of educational loan. This group constituted 35 respondents, or 8.8% of the sample, while according to South African Advertising Research Foundation (SAARF) (SAARF AMPS Dec 15, 2016) households earning less than ZAR799 per month consisted of 1.7% of the population.

Group 2: 'R1-R5000': The second group was a combination of the following groups in the sample, R1-R1000, R1001-R2501 and R2501-R5000. This group consisted of 54 respondents or 13.6% of the sample. The SAARF (SAARF AMPS Dec 15, 2016) data had the segment earning between ZAR800 to ZAR 4999 estimated to be 35% of households.

Group 3: 'R5001-R10000': This was the largest group in the sample and contained 135 respondents or 33.9% of the sample. The SAARF (SAARF AMPS Dec 15, 2016) data was slightly different in that it covered from ZAR5000 to ZAR10999, and estimated that 30.2% of households were in this band.

Group 4: 'R10001-R20000': This group consisted of the two groups in the sample, one group earning R10001-R15000 per month and the second earning R15001-R20000. This group contained 116 or 29.1% of the respondents. The SAARF (SAARF AMPS Dec 15, 2016) data estimated the households earning from ZAR11000 to ZAR19999 to be 30.2%.

Group 5: 'More than ZAR20000': This group consisted of 58 respondents or 14.6% of the sample. The SAARF (SAARF AMPS Dec 15, 2016) data estimated this group at 18.7% of Households.

The comparison of the incomes of the groups in the research shows that Groups 3, 4 and 5 were relatively similar to the figures for households given in the SAARF document (SAARF AMPS Dec 15, 2016). While in the sample the numbers of participants in Group 1 were over represented (13.6% in the sample versus the 1.7% in the SAARF data) and the numbers of Group 2 were significantly under represented (13.6% versus the 35% estimated by the SAARF). However, the sample for the research was aimed at the strata of the population which uses mobile data services and as explained earlier this will exclude a significant amount of the population which are the lower income earners as they will not be able to afford these services.

The variance between the different income bands on the 47 questions was analysed using the methodology outlined in section 6.2.2.2.

As with most of the possible moderating factors discussed there was a significant amount of prior research that indicated that income did affect the adoption of mobile services, while there was also a large body of prior research that indicated that income levels did not affect the adoption (See section 2.4.1.4 for more detail).

The result of the analysis regarding the tests of variance on the various income bands areare summarised in Table: 6-8.

Table: 6-8: Summary of Tests of Variance on the Income Levels

Dimension	Total Questions	Number of Questions significant at 0.05 Level			Number of Questions significant at 0.01 Level			Post-hoc tests (Number questions with Variations)	
		Pearson Chi Squared	Linear-by-linear	Anova	Pearson Chi Squared	Linear-by-linear	Anova	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	10	1	1	2	1	2	1	2	2
Social Pressure And Aspirational Value (SPAV)	6	1	1	3	2	3	2	4	4
Perceived Ease of Use (PEU)	14	6	3	5	3	2	3	6	7
Perceived Usefulness (PU)	15	3	2	4	3	7	5	8	8
Intention to Use	2	0	0	0	1	1	1	1	1

The results show that there was a variation between the different income groups of all the constructs of the preliminary framework. This indicates that income levels influence the adoption of mobile data services and thus should be tested as a possible moderating or mediating factor in the final Framework. It is interesting to note that with this factor there are more variations at the lower <0.05 significance level as opposed to other factors such as Province and Ethnicity where the majority of the variations are in the highly significant <0.01 significance level. The SPAV construct showed the most variation when tested against income levels.

The analysis, using the Benferroni and Games-Howell Post-hoc test, showed that the greatest variation was between the responses of those respondents in income group 2 (R1-R5000) and those in income group 5 (R20000+ per month).

6.2.3.2 LSM levels

The Living Standards Measurement (LSM) is a measurement of an individual's social class or living standard that does not take into account ethnicity nor uses income as a variable. It must be noted that although income levels are recorded for each LSM band it is not a determining factor. Question 5b in the final questionnaire (Appendix 4) shows the factors which determine the LSM level and it can be seen that they are related to amenities and various luxury goods being available at the primary residence The LSM band concept was developed by the South African Advertising Research Foundation (SAARF) to give a composite measure of social class using wealth, access and geography (Cant, *et al*., 2006: Truter, 2007; Haupt, 2017). The LSM system separates the population of South Africa into 10 separate groups, with a sub-sectioning into Low and High for groups 7 to 10. The system starts with LSM 1 as the lowest level with minimal durable goods through to living standard 10 which is the highest (SAARF, 2017).

Although it was the intention to survey respondents in all the LSM bands, it was found that the pre-condition of having to be a mobile data user excluded the possible respondents from LSM groups 1 to 6, so only respondents in groups 7 to 10 were included in the survey. This causes a problem regarding the validity of the Framework towards those groups.

The LSM system was developed in South Africa and although the World Bank has tried to spread its use internationally, it is still predominantly a South African system and little or no international research has been conducted on its affect regarding the adoption of mobile services. Therefore, no prior research with regard to this factor and ICT adoption could be located.

As with the other demographic and socio-economic factors the LSM was tested against the 47 questions to determine the variation among the different LSM groups using the same methodology as all the others. The results are summarised in Table: 6-9.

Table: 6-9: Summarised Tests for Variance on LSM Groups

Dimension	Total Questions	Number of Questions significant at 0.05 Level			Number of Questions significant at 0.01 Level			Post-hoc tests (Number questions with Variations)	
		Pearson Chi Squared	Linear-by-linear	Anova	Pearson Chi Squared	Linear-by-linear	Anova	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	10	1	1	0	1	2	2	2	2
Social Pressure And Aspirational Value (SPAV)	6	1	3	1	1	1	1	2	2
Perceived Ease of Use (PEU)	14	0	2	2	4	6	3	7	7
Perceived Usefulness (PU)	15	3	1	3	5	6	5	8	8
Intention to Use	2	0	0	0	1	1	1	1	1

The results show that there was a variation between the responses of the various LSM groups in the sample. The results showed fewer variations between the groups than other factors but where there were differences, these were mainly at the highly significant <0.01 significance level. The construct which had greatest number of questions with a variation (as a percentage) between LSM bands was the construct of Perceived Usefulness.

The analysis, using the Benferroni and Games-Howell Post-hoc tests, showed that the greatest number of variations was between LSM levels 7 and 10, while LSM 10 had the highest number of questions where there was a variation between the LSM bands.

The detailed analysis can be found in Annexure 5.

6.2.4 Personal Factors

The third group of factors which were tested to see if they affected the adoption of mobile data services were personal factors. By personal factors is meant that these are factors in the individual's own background. The two personal factors that were tested were directly related to their ability to interact with ICT technology and were Technical Knowledge, Ability and Skills and the users Attitude towards Technology.

6.2.4.1 Technical Knowledge, Ability and Skills

Technical knowledge was seen by the experts to be a major inhibitor in the adoption of mobile data services, as they saw that the efficient use of mobile data services required a higher technical knowledge than required for the more basic services such as mobile voice. Additionally, technical knowledge and ability is different from the highest educational level reached, in that a user can have a high educational level but low technical knowledge, ability and skills.

Therefore, six questions were used to determine the user's technical knowledge. The questions were regarding the user's perception of their own knowledge, ability and skill in using a computer, the internet and their current mobile phone (Questions 8, 9 and 10). The other three questions were regarding the downloading and usage of data applications on the user's mobile handset, (Questions 21, 23.1 and 26.1). The key point with these questions was that they were measuring the user's own perception of their knowledge, ability and skills and not measuring against some external standard.

The methodology used was the same as for all the other factors, namely the Pearson's Chi-squared test and the Linear-by-linear Association tests for independence. This was followed by an ANOVA, which was used to test whether there was any variation between the groups in the independent variable. The Post-hoc Bonferroni and Games-Howell tests were performed to determine which groups varied between each other for a question. The results of these analyses are given in Table: 6-10.

The results indicate that Technical Knowledge, Ability and Skills have an effect on the adoption of mobile data services. The results show that although the number of questions with variances was less than with some of the other factors such as Location or Ethnicity, the majority of the variation was at the <0.01 significance level. The Post-hoc Bonferroni and Games-Howell tests showed that there were variations between all the knowledge groups with a slight predominance in the difference between the groups on the two extremes, namely Strongly Disagree and Disagree with the Agree and Strongly Agree.

Table: 6-10: Summarised Tests for Variance on Technical Knowledge, Ability and Skills

Dimension	Total Questions	Number of Questions significant at 0.05 Level			Number of Questions significant at 0.01 Level			Post-hoc tests (Number questions with Variations)	
		Pearson Chi Squared	Linear-by-linear	Anova	Pearson Chi Squared	Linear-by-linear	Anova	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	60	11	6	7	15	11	11	16	13
Social Pressure And Aspirational Value (SPAV)	36	2	0	2	14	14	13	15	11
Perceived Ease of Use (PEU)	84	11	11	15	33	25	30	37	39
Perceived Usefulness (PU)	90	9	3	9	25	16	20	25	26
Intention to Use	12	4	2	2	6	6	6	8	6

6.2.4.2 Attitude towards Technology

The last factor which was tested was the user's Attitude towards Technology. As with the previous factor it was the user's own perception that was being measured and not a standard test.

The methodology used was the same as for all the previous dependent and independent variables with more than two groups. The tests were Pearson's Chi-squared test and the Linear-by-linear Association tests for independence, followed by an ANOVA to test whether there was any variation between the groups in the independent variable and the Post-hoc Bonferroni and Games-Howell tests to determine which groups varied. The results are summarised in Table: 6-11.

Table: 6-11: Summary of Tests of Variance for the User's Attitude towards Technology

Dimension	Total Questions	Number of Questions significant at 0.05 Level			Number of Questions significant at 0.01 Level			Post-hoc tests (Number questions with Variations)	
		Pearson Chi Squared	Linear-by-linear	Anova	Pearson Chi Squared	Linear-by-linear	Anova	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	10	4	1	4	3	2	1	4	4
Social Pressure And Aspirational Value (SPAV)	6	0	0	1	5	1	3	4	4
Perceived Ease of Use (PEU)	14	2	4	2	7	2	4	5	4
Perceived Usefulness (PU)	15	3	2	3	4	3	2	4	4
Intention to Use	2	0	0	0	2	1	2	2	2

As with many of the other factors examined, nearly 50% of the questions showed a variance with the numbers at the <0.01 highly significance level which was considerably more than those at the <0.05 significance level. The Post-hoc Bonferroni and Games-

Howell tests showed the greatest variation between the groups on the two extremes; *"I am happy with existing technology"* with *"I actively keep myself up to date with technology*".

6.2.5 Summary of the Analysis of Demographic profiles and tests for relationships among variables

All the variables which were identified as having an indirect effect in the preliminary framework were tested to ascertain if there were any relationships among variables (e.g. Gender) against all the questions in the survey, with the demographic factor as the independent variable and the question as the dependent variable. This was carried out by using the Pearson Chi-squared Test for Independence and confirmation was obtained by using the Linear-by-Linear Association and Likelihood Ratios tests. The level of Asymptotic Significance (2-sided) was set at the <0.05 level. They were then tested to determine if there was any variation in between the groups in the independent variable. This was carried out using the one-way analysis of variance test (ANOVA) followed by the Post-hoc Bonferroni test and the Games-Howell test, which conducted pairwise comparisons for the factors.

6.2.5.1 Demographic Factors

The five demographic factors Gender, Grouped Age, Location, Ethnicity and Maximum Educational Levels were individually tested against all the questions which were used to determine the constructs for the framework. The factor Location was the factor showing the greatest variation with a variance being seen in 43 of the 47 questions for which it was tested against, and of those 43 showing variances, 35 showed the variance at the <0.01 significance level. The factors Grouped Age, Ethnicity and Maximum Educational Levels showed similar results to Location but with a smaller number of questions showing a variance. However, like Location the majority of variance was at the <0.01 highly significant level.

The factor Gender only showed a variance in three of the 47 questions, but it was retained to be tested as a moderating or mediating factor in the final Framework, as the questions which showed variation were included in the final Framework.

6.2.5.2 Socio-economic Factors

The two socio-economic factors which were tested were Monthly Income and Living Standards Measurement (LSM). Both these factors showed a variation with at least

35% of questions. This was less than with the demographic factors and with fewer variances at the 0.01 significance level and more at the 0.05 level, but the numbers were significant enough to take both factors through for further testing.

6.2.5.3 Personal Factors

Two factors were measured in this group, the Technical Knowledge, Ability and Skills were measured using six questions (Questions 8, 9, 10, 21, 23.1 and 26.1) while the User's Attitude towards Technology was measured with one question (Question 11). For these factors it was the user's perception of their own abilities and attitudes as opposed to a distinct standard measurement criteria as used for the other factors. Although there was less variance indicated with the Socio-economic factors and considerably less than demographic factors, the majority of variance that was found was at the <0.01 highly significance level. Hence both personal factors were adopted and tested for their effect on the final Framework.

6.2.6 Correlations between the Various Constructs of the Framework

The second last step in the preliminary data analysis was to determine if there was any relationship between the questions that were used in the constructs for the final framework, (see Table: 5-1 for the distribution of the questions to the Framework constructs). The Pearson product-moment correlation coefficient or Pearson correlation coefficient, which is a standardized measure of the size of relationship between two questions, was used to test the relevant questions against each other. The greater the value of the Pearson correlation coefficient, the stronger the relationship between the questions being tested (Field, 2009). This analysis again measures the relationships at the <0.05 and <0.01 significance levels.

Table: 6-12 is an example of the questions used for the Mobile Service Provider Marketing Tactics (MOSPMT) construct versus those used for Social Pressure and Aspirational Value (SPAV) construct. From the ten questions allocated to the MOSPMT construct seven have relationships with the SPAV construct, while all six of the questions allocated to the SPAV construct have a significant relationship with at least one question from the MOSPMT construct. In fact Question 23.4 in the SPAV construct was significantly related to five questions in the MOSPMT construct of which four are at the highly significant <0.01 level. The summary of all the constructs is given in Table: 6-13 and the full analysis in Annexure 6.

Table: 6-12: Pearson's Correlation Coefficient Mobile Service Provider Marketing Tactics (MOSPMT) vs Social Pressure and Aspirational Value (SPAV)

			Social Pressure and Aspirational Value (SPAV)					
			[Q23.4] Data based voice or video calling applications: don't know anybody who uses them, can't use them myself	**[Q23.10]** Data based voice or video calling applications: not good to use for my image as they make me appear poor	**[Q23.11]** Data based voice or video calling applications: use them as all my friends use them	**[Q26.4]** Free wifi hotspots: don't know anybody who uses them, so don't use them myself	**[Q26.10]** Free wifi hotspots: using them is good for my general image as it shows am technically literate	**[Q26.11]** Free wifi hotspots: use them as all my friends use them
Mobile Service Provider Marketing Tactics (MOSPMT)	**[Q12.1]** Operators keep mobile prices higher to maximise their profits	Pearson Correlation	-.131**	-0.041	0.023	-0.040	-.113*	-0.050
		Sig. (2-tailed)	0.009	0.410	0.644	0.420	0.024	0.315
	[Q12.2] Operators can influence how and when you use mobile device by manipulating prices	Pearson Correlation	-.104*	-0.079	0.026	-0.025	-0.017	-0.005
		Sig. (2-tailed)	0.038	0.116	0.598	0.624	0.741	0.923
	[Q12.4] Operators want you to use specific product or service they do it with promotions	Pearson Correlation	-0.080	-.111*	.102*	-0.053	-0.021	0.033
		Sig. (2-tailed)	0.109	0.026	0.041	0.288	0.673	0.510
	[Q12.7] Operators can control what you use on your phone by controlling download speed and	Pearson Correlation	-0.063	-0.017	0.053	0.030	-.145**	-0.074
		Sig. (2-tailed)	0.207	0.739	0.292	0.553	0.004	0.140
	[Q23.5] Data based voice or video calling applications: network operators discourage	Pearson Correlation	.507**	.396**	0.017	.353**	.113*	.122*
		Sig. (2-tailed)	0.000	0.000	0.730	0.000	0.024	0.014
	[Q23.8] Data based voice or video calling applications: no support for them if you have problems	Pearson Correlation	.150**	.165**	-0.025	.165**	0.054	0.014
		Sig. (2-tailed)	0.003	0.001	0.620	0.001	0.286	0.775
	[Q26.5] Free wifi hotspots: network operators discourage people using them	Pearson Correlation	.304**	.287**	0.030	.587**	0.025	-0.027
		Sig. (2-tailed)	0.000	0.000	0.548	0.000	0.616	0.596

Key: X (Yellow shading) is significant at the 0.05 level*

*X** (Red shading) is significant at the 0.01 level*.

Table: 6-13: Pearson's Correlation Coefficient Summary

	Social Pressure and Aspirational Value (SPAV)			Perceived Ease of Use			Perceived Usefulness			Intention To Use		
	Number Interactions	# Significant at 0.05 Level	# Significant at 0.01 Level	Number Interactions	# Significant at 0.05 Level	# Significant at 0.01 Level	Number Interactions	# Significant at 0.05 Level	# Significant at 0.01 Level	Number Interactions	# Significant at 0.05 Level	# Significant at 0.01 Level
Mobile Service Provider Marketing Tactics (MOSPMT)	60	5	11	140	17	39	150	31	34	20	2	0
Social Pressure and Aspirational Value (SPAV)				84	6	28	90	8	36	12	2	6
Perceived Ease of Use							210	13	95	28	7	10
Perceived Usefulness										30	3	9

The Pearson's Correlation coefficient shows that there is a significant amount of correlation between questions in the various different constructs. Additionally, the majority of the correlations (268 out of 362 or nearly 75%), are at the highly significant <0.01 level.

This indicates that there is sufficient variation between the various moderating factors and correlations between the questions in the various constructs to proceed to the more detailed analysis.

6.2.7 Harman Test for Common Method Bias

The final step in the exploratory analysis was to test for the presence of common method bias. The Harman one factor test using confirmatory factor analysis, where all the factors were loaded on a single factor was used and for the common method bias to be at an acceptable level the single factor must have a variance below 50% (Harman, 1976). The analysis showed the variation from that factor was 13.9%, showing that there was very little common method bias.

6.3 STATISTICAL EQUATIONAL MODELLING TO DETERMINE THE FINAL FRAMEWORK

In this next section an analysis was carried out to determine the factors and loadings that comprise the constructs of the framework. Once the factors and loadings have been determined for each construct, a correlation analysis was conducted amongst them to determine the relationship between them. The final part of the analysis was to choose a path for the Framework that maximises how much of the final Intention to Use (IU) is explained by the various components and what affect a construct has in explaining the results of the subsequent construct. The process is explained in detail in section 5.3.4.

6.3.1 Determining Factors of the Mobile Service Provider Marketing Tactics (MOSPMT) Construct

As described in section 5.3.4 the data for the Mobile Service Provider Marketing Tactic (MOSPMT) construct was tested with the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and the Bartlett's Test of Sphericity to test if the construct was suitable for factor analysis. With a KMO of 0.752 and a significance of 0.000 on the Bartlett's Test, the data was considered suitable for factor analysis and the analysis proceeded to the next step.

The data was then subjected to Principal Axis Factoring (PAF) to assess the factor structure and it was found that Question 23.8 had communality, after extraction, of only 0.099 below the minimum of 0.3 and was therefore removed from further analysis.

The analysis was repeated with a KMO of 0.747 and a significance of 0.000 on the Bartlett's Test and the PAF extraction on the reduced factors resulted in all communalities being above the minimum value of 0.3 and the total variance increasing from 45.5 to 45.9.

The Factor Matrix was then developed using PAF extraction where a two factor solution was produced. The extraction attempted to extract a third factor, but this was terminated after 25 iterations as convergence had not been reached. The Factor Matrix was then subject to orthogonal rotation (Varimax with Kaiser Normalization). See Table: 6-14 for the results of the rotated Factor Matrix.

Table: 6-14: Rotated Factor Matrix for the Mobile Service Provider Marketing Tactics (MOSPMT) Construct

	Factor			Final Factor Choice
	1	2	3	
[Q12.2] Operators can influence the how and when you use your mobile device by manipulating prices	0.742			MOSPMT_A
[Q12.4] If the Operators want you to use a specific product or service they do it with promotions and pricing	0.611			MOSPMT_A
[Q12.3] Operators can influence the how and when you use your mobile device with promotions	0.603			MOSPMT_A
[Q12.1] Operators keep mobile prices higher than necessary to maximise their profits	0.541			MOSPMT_A
[Q12.6] Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product		0.823		MOSPMT_A
[Q12.5] The Operators can prevent you using a specific product or service by refusing to give you help with it		0.664		MOSPMT_A
[Q12.7] Operators can control what you use on your phone by controlling download speeds and managing the traffic through the network	0.434	0.531		MOSPMT_A
[Q26.5] Free WiFi hotspots: network operators discourage people using them			0.795	MOSPMT_B
[Q23.5] Data based voice or video calling applications Network Operators discourage people using them			0.575	MOSPMT_B
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization				
a. Rotation converged in 5 iterations.				

The Rotated Factor Matrix appeared to give three factors, while the original Factor Matrix only gave two factors as it was unable to converge after 25 iterations in attempting to extract a third factor. A two factor solution where factors 1 and 2 were combined, as in the original Non-rotated Factor Matrix, and the three factor solution, as above, was tested and it was found that the two factor solution gave superior reliability results and was then retained.

The two potential constructs which were extracted, Mobile Service Provider Marketing Tactics Construct A (MOSPMT_A) and Mobile Service Provider Marketing Tactics Construct B (MOSPMT_B), were then individually tested for reliability and then the item and the scale statistics were calculated. The following sections examine each of the constructs separately to see if they were valid and could be used as constructs of the framework.

6.3.1.1 Mobile Service Provider Marketing Tactics (MOSPMT) Construct A (MOSPMT_A)

Potential construct Mobile Service Provider Marketing Tactics Construct A (MOSPMT_A) was built up from seven questions, namely Questions 12.1 to 12.7 inclusive.

The reliability was measured using the Cronbach's Alpha, as well as the Inter-Item Correlation Matrix and Inter-Item Statistics, see Table: 6-4

Figure: 6-4: Reliability and Inter-Item Correlation Matrix and Total Statistics for Construct MOSPMT_A

Initial Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.642	0.673	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
[Q23.4] Data based voice or video calling applications: don't know anybody who uses them, can't use them myself	4.40	6.376	0.512	0.299	**0.487**
[Q23.10] Data based voice or video calling applications: not good to use for my image as they make me appear poor	4.30	6.532	0.494	0.286	**0.511**
[Q26.4] Free wifi hotspots: don't know anybody who uses them, so don't use them myself	3.87	4.611	0.412	0.171	**0.672**

Final Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.672	0.672	2

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.934	1.885	1.983	0.097	1.052	0.005	2
Inter-Item Correlations	**0.506**	0.506	0.506	0.000	1.000	0.000	2

Nunnally (1978) recommends a value of 0.7 as the minimum acceptable Cronbach's Alpha and with the initial Cronbach's Alpha of 0.820 it meant that the MOSPMT_A was a valid construct. The next analysis was to check if the reliability of the construct could be improved by eliminating one of the factors/ questions which constitute this construct. The initial Cronbach's Alpha was higher than any Cronbach's Alpha in the Item-Total Statistics table where a single question or item is deleted consecutively and the Cronbach's Alpha was then re-calculated. This meant that the initial seven questions gave the highest reliability and the construct could not be improved by deleting any of the questions meaning that the initial solution was the optimal solution (Field, 2009; Pallant, 2011).

Therefore the Mobile Service Provider Marketing Tactics Construct A (MOSPMT_A) construct comprising seven questions (Questions 12.1 to 12.7 inclusive) was a valid construct for the framework.

6.3.1.2 Mobile Service Provider Marketing Tactics (MOSPMT) Construct B (MOSPMT_B)

Mobile Service Provider Marketing Tactics Construct B (MOSPMT_B) was built up of two questions, Question 23.5 and Question 26.5. The initial Cronbach's Alpha based on Standardized Items was only 0.605 which is below the normal minimum value of 0.7. However, when there are fewer than ten items, then the Cronbach's Alpha can be quite low and in such cases the better measure is the mean inter-item correlation which would optimally be between 0.2 and 0.4 (Briggs and Cheek, 1986: Pallant, 2011). The inter-item correlation at 0.464 was within this optimal region, see Figure: 6-5 below.

Figure: 6-5: Reliability and Inter-Item Correlation Matrix and Total Statistics for Construct MOSPMT_B

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.605	0.634	2

Inter-Item Correlation Matrix		
	[Q23.5] Data based voice or video calling applications: network operators discourage people using them	**[Q26.5]** Free wifi hotspots: network operators discourage people using them
[Q23.5] Data based voice or video calling applications: network operators discourage people using them	1.000	**0.464**
[Q26.5] Free wifi hotspots: network operators discourage people using them	**0.464**	1.000

As there are only two questions in this factor test to see if the reliability would be improved if an item was deleted, this was not possible.

Therefore the Mobile Service Provider Marketing Tactics Construct B (MOSPMT_B) construct comprising of two questions (Questions 23.5 and 26.5) was a valid construct for the framework.

6.3.2 Determining Factors of the Social Pressure and Aspirational Value (SPAV) Construct

The initial iteration of the factor analysis using Principal Axis Factoring to assess the factor structure gave Question 23.11 a communality of 0.129, well below the cut off communality of 0.3, and therefore this question was discarded and the analysis repeated with five questions.

The second iteration of the analysis commenced with the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and the Bartlett's Test of Sphericity to test if the construct was suitable for factor analysis. The result of the KMO was 0.611 which was not good but adequate for factor analysis (Kaiser, 1970 and 1974; Pallant, 2011), while the Bartlett's test result was 0.000 and therefore acceptable.

After the Factor Matrix was extracted using PAF and orthogonal rotation (Varimax with Kaiser Normalization) conducted, a two factor solution was proposed for this construct. Table: 6-15 shows the final Rotated Factor Matrix for the Social Pressure and Aspirational Value construct.

Table: 6-15: Rotated Factor Matrix for Social Pressure and Aspirational Value

Rotated Factor Matrix[a]			
	Factor		Final Factor Choice
	1	2	
[Q26.11] Free wifi hotspots: use them as all my friends use them	0.907		SPAV_B
[Q26.10] Free wifi hotspots: using them is good for my general image as it shows am technically literate	0.620		SPAV_B
[Q23.4] Data based voice or video calling applications: don't know anybody who uses them, can't use them myself		0.707	SPAV_A
[Q23.10] Data based voice or video calling applications: not good to use for my image as they make me appear poor		0.659	SPAV_A
[Q26.4] Free wifi hotspots: don't know anybody who uses them, so don't use them myself		0.555	Removed
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 3 iterations.			

As per the previous construct the two Factors which were extracted were then tested separately for reliability and the item and scale statistics were calculated in order to see if they were viable constructs for the framework

6.3.2.1 Social Pressure and Aspirational Value Construct A (SPAV_A)

This factor consisted of three questions, Question 23.4, Question 23.10 and Question 26.4. The initial Cronbach's Alpha was 0.642, which again was below the recommended 0.7, but as there were only three questions and the inter-item correlation was at 0.407 within the optimal region range so therefore it was considered acceptable (Briggs and Cheek, 1986: Pallant, 2011).

Figure: 6-6: Reliability and Inter-Item Statistics for Construct SPAV_A

Initial Reliability Statistics

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.642	0.673	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
[Q23.4] Data based voice or video calling applications: don't know anybody who uses them, can't use them myself	4.40	6.376	0.512	0.299	**0.487**
[Q23.10] Data based voice or video calling applications: not good to use for my image as they make me appear poor	4.30	6.532	0.494	0.286	**0.511**
[Q26.4] Free wifi hotspots: don't know anybody who uses them, so don't use them myself	3.87	4.611	0.412	0.171	**0.672**

Final Reliability Statistics

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.672	0.672	2

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.934	1.885	1.983	0.097	1.052	0.005	2
Inter-Item Correlations	**0.506**	0.506	0.506	0.000	1.000	0.000	2

The Item-Total statistics indicated that a superior reliability could be obtained by eliminating Question 26.4 as the Cronbach Alpha's with this item deleted was 0.672 higher than the initial Cronbach's Alpha. This item was then eliminated and the construct reduced to two questions, Questions 23.4 and 23.10. However, now the Inter-Item Correlation had risen from 0.407 to 0.506 which is slightly above the recommended level. The higher Cronbach's Alpha for the two question solution was accepted. The reliability and inter-item statistics for the final potential Construct SPAV_A are shown in Figure: 6-6.

Therefore, the Social Pressure and Aspirational Value Construct A (SPAV_A) comprising of two questions (Questions 23.4 and 23.10) is a valid construct for the final framework.

6.3.2.2 Social Pressure and Aspirational Value Construct B (SPAV_B)

Construct Social Pressure and Aspirational Value Construct B (SPAV_B) consisted of two questions, Question 26.10 and Question 26.11. For these two questions the reliability or Cronbach's Alpha was 0.727 and above the minimum. With only two questions or factors the Cronbach's Alpha with an item removed could not be tested. The results for Construct SPAV_B are shown in Figure: 6-7.

The Social Pressure and Aspirational Value Construct B (SPAV_B) comprising of two questions (Questions 26.10 and 26.11) is a valid construct for the final framework.

Figure: 6-7: Reliability and Inter-Item Statistics for Construct SPAV_B

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.727	0.727	2

Inter-Item Correlation Matrix

	[Q26.10] Free wifi hotspots: using them is good for my general image as it shows am technically literate	**[Q26.11]** Free wifi hotspots: use them as all my friends use them
[Q26.10] Free wifi hotspots: using them is good for my general image as it shows am technically literate	1.000	**0.571**
[Q26.11] Free wifi hotspots: use them as all my friends use them	**0.571**	1.000

6.3.3 Determining Factors of Perceived Ease of Use (PEU) Construct

The methodology outlined in section 5.3.4 was used for this analysis. After conducting the initial exploratory factor analysis using Principal Axis Factoring it was found that the Communalities of Question 23.6, Question 26.8 and Question 23.2 were below 0.3 and these questions were discarded for the second iteration.

The analysis was re-run and it gave an acceptable value for KMO of 0.809, the Bartlett's test gave a value of 0.000 and now all Communalities were above 0.3. The factor analysis using PAF extracted two factors after 9 iterations. The matrix was rotated using the Orthogonal Rotation method (Varimax with Kaiser Normalization) and again two factors were extracted and the matrix converged after 3 rotations. The final Rotated Factor Matrix is given in Table: 6-16.

As with most of the other constructs two factors emerged after the factor analysis. The further analysis of these factors is described in more detail below.

Table: 6-16: Rotated Factor Matrix for the Perceived Ease of Use (PEU) Construct

Rotated Factor Matrix[a]			
	Factor		Final Factor Choice
	1	2	
[Q28.12] Download and use a new application agreement: must not act in unexpected ways	0.712		PEU_B
[Q28.4] Download and use a new application agreement: easy to understand	0.681		PEU_B
[Q28.2] Download and use a new application agreement: must be easy to download and install	0.663		PEU_B
[Q28.6] Download and use a new application agreement: easy to learn	0.663		PEU_B
[Q28.13] Download and use a new application agreement: must make it easy for me to correct any errors I make	0.654		PEU_B
[Q28.10] Download and use a new application agreement: easy and quick to navigate around	0.641		PEU_B
[Q28.9] Download and use a new application agreement: must be flexible enough for me to do my specific task	0.559		PEU_B
[Q26.3] Free wifi hotspots: difficult to set up		0.843	PEU_A
[Q26.2] Free wifi hotspots: know about them but do not know how to use them		0.757	PEU_A
[Q26.6] Free wifi hotspots: more difficult to use then normal data services		0.707	PEU_A
[Q23.3] Data based voice or video calling applications: difficult to set up		0.555	PEU_A
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 3 iterations.			

6.3.3.1 Perceived Ease of Use Construct A (PEU_A)

This factor consisted of four questions, namely Questions 23.3, 26.2, 26.3 and 26.6. The initial Cronbach's Alpha produced a reliability of 0.806, however, the inter-item statistics analysis indicated that removing Question 23.3 resulted in a new Cronbach's Alpha of 0.812, higher than the initial value. Therefore, Question 23.3 was removed from the factor, leaving three items, Questions 26.2, 26.3 and 26.6.

The reliability and inter-item correlations scores are given in Figure: 6-8. The final Cronbach's Alpha with the three questions was 0.812 and it could not be increased by removing any one of the three questions and as the Cronbach's alpha was above the minimum of 0.7 the Perceived Ease of Use Construct A (PEU_A) comprising three questions (Questions 26.2, 26.3 and 26.6.) was a valid construct for the framework.

Figure: 6-8: Reliability and Inter-Item Statistics for Construct PEU_A

Initial Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.806	0.806	4

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
[Q23.3] Data based voice or video calling applications: difficult to set up	7.90	20.900	0.503	0.254	**0.812**
[Q26.2] Free wifi hotspots: know about them but do not know how to use them	7.57	15.689	0.668	0.470	0.733
[Q26.3] Free wifi hotspots: difficult to set up	7.22	14.771	0.724	0.535	0.703
[Q26.6] Free wifi hotspots: more difficult to use then normal data services	7.24	15.564	0.625	0.402	0.757

Final Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on	N of Items
0.812	0.812	3

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
[Q26.2] Free wifi hotspots: know about them but do not know how to use them	5.50	10.501	0.653	0.451	**0.751**
[Q26.3] Free wifi hotspots: difficult to set up	5.14	9.671	0.721	0.523	**0.680**
[Q26.6] Free wifi hotspots: more difficult to use then normal data services	5.16	10.317	0.615	0.388	**0.791**

6.3.3.2 Perceived Ease of Use Construct B (PEU_B)

This factor consisted on seven items, Questions 28.2, 28.4, 28.6, 28.9, 28.10, 28.12 and 28.13. The Cronbach's Alpha was 0.834 which was the highest when testing with single items deleted. The reliability and Inter-Item Statistics for Construct Perceived Ease of Use Construct B (PEU_B) are given in Figure: 6-9.

Again the Cronbach's Alpha at 0.834 was above the minimum of 0.7 and could not be improved upon by removing an individual question from the seven questions and thus Perceived Ease of Use Construct B (PEU_B) was a valid construct for the framework.

Figure: 6-9: Reliability and Inter-Item Statistics for Construct PEU_B

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.834	0.840	7

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
[Q28.2] Download and use a new application agreement: must be easy to download and install	37.87	17.019	0.578	0.455	**0.815**
[Q28.4] Download and use a new application agreement: easy to understand	37.91	16.773	0.598	0.464	**0.812**
[Q28.6] Download and use a new application agreement: easy to learn	37.94	16.297	0.598	0.397	**0.810**
[Q28.9] Download and use a new application agreement: must be flexible enough for me to do my specific task	38.04	16.640	0.507	0.269	**0.824**
[Q28.10] Download and use a new application agreement: easy and quick to navigate around	38.05	15.767	0.586	0.371	**0.812**
[Q28.12] Download and use a new application agreement: must not act in unexpected ways	38.24	14.435	0.663	0.493	**0.799**
[Q28.13] Download and use a new application agreement: must make it easy for me to correct any errors I make	38.27	14.412	0.610	0.448	**0.811**

6.3.4 Determining Factors of Perceived Usefulness (PU) Construct

The methodology outlined in 5.3.4 was used for this analysis. The initial extraction using PAF to assess the factor structure resulted in four questions/ items being removed as their communalities were below 0.3. They were Questions 23.7, 23.9, 23.13 and 26.12. The initial Factor Matrix was extracted using PAF and after 22 iterations 5 factors emerged, and after the Rotated Factor Matrix was extracted a further three items were removed, namely Questions 23.12, 26.9 and 28.14.

The analysis was then re-conducted with the seven questions/ items removed. For this second iteration the Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.764 and Bartlett's Test of Sphericity was 0.000 so the reduced group of questions/ items was suitable for factor analysis.

The Communalities were extracted using Principal Axis Factoring (PAF) and in this iteration all the Communalities were above 0.3. PAF was then used to extract the factor matrix. The extraction was terminated after 25 iterations with a convergence at 0.03

after attempting to extract two factors. The Factor Matrix was then rotated using Orthogonal Rotation (Varimax with Kaiser Normalization) and a two factor solution was extracted after 3 iterations. The final Rotated Factor Matrix is given in Table: 6-17.

Table: 6-17: Rotated Factor Matrix for the Perceived Usefulness (PU) Construct

Rotated Factor Matrix[a]	Factor		Final Factor Choice
	1	2	
[Q28.3] Download and use a new application agreement: must do required function better or faster than similar app or method	0.732		**PU_B**
[Q28.1] Download and use a new application agreement: must be useful	0.715		**PU_B**
[Q28.8] Download and use a new application agreement: must make me more effective	0.707		**PU_B**
[Q28.7] Download and use a new application agreement: must save me time	0.668		**PU_B**
[Q28.11] Download and use a new application agreement: add value to me	0.620		**PU_B**
[Q28.5] Download and use a new application agreement: must make it easier for me to accomplish a task	0.551		**PU_B**
[Q26.13] Free wifi hotspots: use them as they allow me to save money		0.808	**PU_A**
[Q26.7] Free wifi hotspots: happy to use as they allow me to save data		0.696	**PU_A**
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.[a]			
a. Rotation converged in 3 iterations.			

6.3.4.1 Perceived Usefulness Construct 1 (PU_A)

This construct consisted of two questions, Question 26.7 and 26.13. The Cronbach's Alpha at 0.722 was in an acceptable range of greater than 0.7. Again with only two items the test of removing an item and re-measuring the Cronbach's Alpha could not be performed. With a Cronbach's Alpha above the minimum value of 0.7 the two question (Questions 26.7 and 26.13) Perceived Usefulness Construct A (PU_A) was a valid construct for the framework. The results of the analysis are given in Figure: 6-10.

Figure: 6-10: Reliability and Inter-Item Statistics for Construct PU_A

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.722	0.725	2

Inter-Item Correlation Matrix

	[Q26.7] Free wifi hotspots: happy to use as they allow me to save data	**[Q26.13]** Free wifi hotspots: use them as they allow me to save money
[Q26.7] Free wifi hotspots: happy to use as they allow me to save data	1.000	**0.569**
[Q26.13] Free wifi hotspots: use them as they allow me to save money	**0.569**	1.000

6.3.4.2 Perceived Usefulness Construct B (PU_B)

This factor consisted of six questions, namely Questions 28.1, 28.3, 28.5, 28.7, 28.8 and 28.11. The initial reliability as measured by the Cronbach's Alpha was 0.822 and above the minimum of 0.7, and this was the highest Alpha obtained in the Item-Total Statistics where the Cronbach's Alpha factor was measured with individual questions being removed. Therefore, the six question, Questions 28.1, 28.3, 28.5, 28.7, 28.8 and 28.11, Perceived Usefulness Construct B (PU_B) Construct was a valid construct for the framework, See: Figure: 6-11 for the details.

Figure: 6-11: Reliability and Inter-Item Statistics for Construct PU_B

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.822	0.827	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
[Q28.1] Download and use a new application agreement: must be useful	32.38	9.740	0.622	0.473	**0.787**
[Q28.3] Download and use a new application agreement: must do required function better or faster than similar app or method	32.44	9.810	0.625	0.504	**0.787**
[Q28.5] Download and use a new application agreement: must make it easier for me to accomplish a task	32.50	10.251	0.500	0.263	**0.811**
[Q28.7] Download and use a new application agreement: must save me time	32.43	9.849	0.609	0.375	**0.790**
[Q28.8] Download and use a new application agreement: must make me more effective	32.51	9.298	0.643	0.467	**0.781**
[Q28.11] Download and use a new application agreement: add value to me	32.68	8.653	0.573	0.395	**0.804**

6.3.5 Determining Factors of Intention to Use (IU) Construct

The Intention to Use construct only had two questions, Question 24 and Question 27, so Factor analysis was not possible. Therefore, the Cronbach's Alpha was measured to test the reliability of the construct. The Cronbach's Alpha was only 0.419 which is below the suggested minimum. However, as indicated in section 6.3.1.2, in such circumstances where there is a low Cronbach's Alpha, but only a few items, the inter-item correlation becomes important. The inter-item correlation was 0.267 which meant it was in the optimal range of 0.2 to 0.4, and was acceptable (Briggs and Cheek, 1986; Pallant, 2011). See Figure: 6-12 for details of the analysis.

Figure: 6-12: Reliability and Inter-Item Statistics for Construct Intention to Use (IU)

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.419	0.422	2

Inter-Item Correlation Matrix		
	[Q24] How likely to adapt if network operators were to preload and set them up on your device and encourage you to use them	**[Q27]** If network provider were to preload them on phone or by using an app, how likely to use them
[Q24] How likely to adapt if network operators were to preload and set them up on your device and encourage you to use them	1.000	**0.267**
[Q27] If network provider were to preload them on phone or by using an app, how likely to use them	**0.267**	1.000

6.3.6 Summary on Determination of Constructs for the Framework

The statistical analyses, Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and the Bartlett's Test of Sphericity, were conducted on the questions in the proposed constructs of the framework and the results found that they were all suitable for Factor Analysis. Factor Analysis was conducted on the constructs using Principal Axis Factoring (PAF) to assess the initial factor structure and all questions that had a Communality of less than 0.3 were discarded and the analyses repeated. The matrix was rotated using the Orthogonal Rotation method (Varimax with Kaiser Normalization). The proposed factors which emerged were subject to the Cronbach's Alpha test for reliability where a value of 0.7 was considered acceptable. In certain cases where there were only two or three items per factor and the Cronbach's Alpha was below 0.7, then the Inter-Item Correlation was used instead and it was optimal with a value between 0.2 and 0.4. The final constructs are given in Table: 6-18.

6.4 CONSTRUCTING THE FRAMEWORK

The next step was creating the final Framework. The constructs Mobile Service Provider Marketing Tactics (MOSPMT), Social Pressure and Aspirational Value (SPAV), Perceived Ease of Use (PEU) and Perceived Usefulness (PU) have two factors each while the Intention to Use (IU) construct has a single factor. This means there were too many ways in which the five constructs of the Framework could be assembled together by trial and error to get the best possible combination.

Table: 6-18: Final Constructs after Rotated Factor Analysis and Reliability Analysis

	Factor 1			Factor 2		
	Name	Items in Factor	Items	Name	Items in Factor	Items
Mobile Service Provider Marketing Tactics (MOSPMT)	MOSPMT_A	7	Questions [12.1] to [12.7] inclusive	MOSPMT_B	2	Questions [23.5] and [26.5]
Social Pressure and Aspirational Value (SPAV)	SPAV_A	3	Questions [23.4], [23.10] and [26.4]	SPAV_B	2	Questions [26.10] and [26.11]
Perceived Ease of Use (PEU)	PEU_A	4	Questions [23.3], [26.2], [26.3] and [26.6]	PEU_B	7	Questions [28.2], [28.4], [28.6], [28.9], [28.10], [28.12] and [28.13]
Perceived Usefulness (PU)	PU_A	2	Questions [26.7] and [26.13]	PU_B	6	Questions [28.1], [28.3], [28.5], [28.7], [28.8] and [28.11]
Intention to Use (IU)	IU	2	Questions [24] and [27]			

6.4.1 Correlation Analysis

Each of the various constructs was tested together using a Pearson product-moment correlation coefficient by using a two-tailed test at 0.05 and 0.01 significance levels.

Table: 6-19: Correlation Table between all the factors

Correlations

		MOSPMT_A	MOSPMT_B	SPAV_A	SPAV_B	PEU_A	PEU_B	PU_A	PU_B	IU
MOSPMT_A	Pearson Correlation	1	.108*	-0.079	-0.079	0.024	.172**	0.037	.207**	-0.012
	Sig. (2-tailed)		0.030	0.113	0.114	0.631	0.001	0.460	0.000	0.811
	N	400	400	400	400	400	400	400	400	400
MOSPMT_B	Pearson Correlation	.108*	1	.481**	0.046	.651**	0.062	-0.066	-0.052	-0.021
	Sig. (2-tailed)	0.030		0.000	0.360	0.000	0.216	0.190	0.302	0.674
	N	400	400	400	400	400	400	400	400	400
SPAV_A	Pearson Correlation	-0.079	.481**	1	.260**	.444**	.118*	-0.048	-0.034	-0.087
	Sig. (2-tailed)	0.113	0.000		0.000	0.000	0.019	0.336	0.500	0.081
	N	400	400	400	400	400	400	400	400	400
SPAV_B	Pearson Correlation	-0.079	0.046	.260**	1	-0.011	.136**	.453**	0.050	.300**
	Sig. (2-tailed)	0.114	0.360	0.000		0.821	0.007	0.000	0.318	0.000
	N	400	400	400	400	400	400	400	400	400
PEU_A	Pearson Correlation	0.024	.651**	.444**	-0.011	1	0.094	-.200**	-0.011	0.002
	Sig. (2-tailed)	0.631	0.000	0.000	0.821		0.060	0.000	0.830	0.965
	N	400	400	400	400	400	400	400	400	400
PEU_B	Pearson Correlation	.172**	0.062	.118*	.136**	0.094	1	0.054	.830**	.261**
	Sig. (2-tailed)	0.001	0.216	0.019	0.007	0.060		0.283	0.000	0.000
	N	400	400	400	400	400	400	400	400	400
PU_A	Pearson Correlation	0.037	-0.066	-0.048	.453**	-.200**	0.054	1	.123*	.297**
	Sig. (2-tailed)	0.460	0.190	0.336	0.000	0.000	0.283		0.014	0.000
	N	400	400	400	400	400	400	400	400	400
PU_B	Pearson Correlation	.207**	-0.052	-0.034	0.050	-0.011	.830**	.123*	1	.205**
	Sig. (2-tailed)	0.000	0.302	0.500	0.318	0.830	0.000	0.014		0.000
	N	400	400	400	400	400	400	400	400	400
IU	Pearson Correlation	-0.012	-0.021	-0.087	.300**	0.002	.261**	.297**	.205**	1
	Sig. (2-tailed)	0.811	0.674	0.081	0.000	0.965	0.000	0.000	0.000	
	N	400	400	400	400	400	400	400	400	400

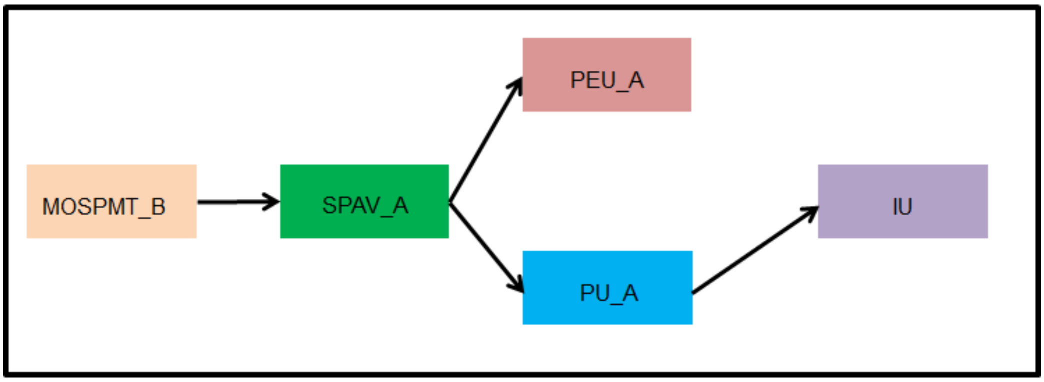
*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Strong correlations between constructs would suggest ways in which the constructs could be assembled into the final framework. These correlations are given in Table: 6-19.

Possible configurations of the final Framework could be built up by joining factors which have significant correlations together. The coloured blocks in the table above indicate a possible configuration, see Figure: 6-13.

Figure: 6-13: Possible Configuration of Final Framework constructed by joining constructs with significant correlations



6.4.2 Structural Equation Modelling

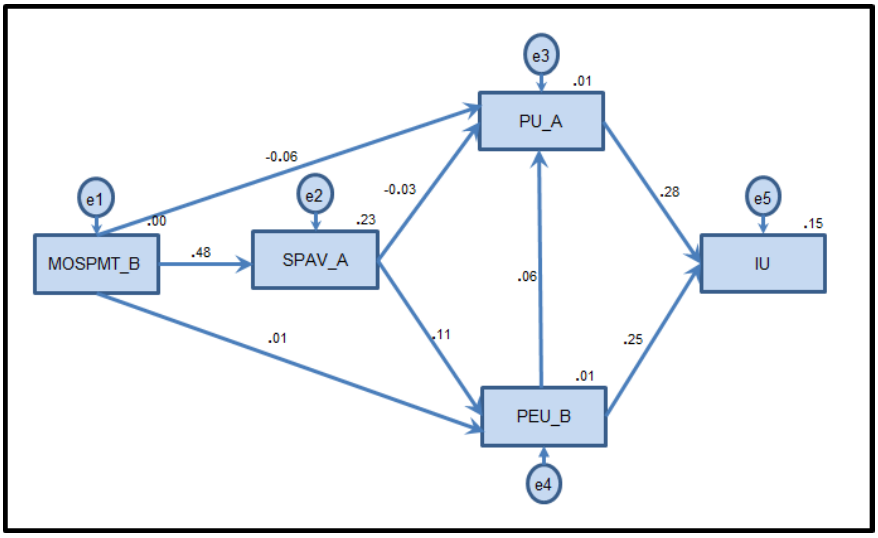
The final stage of the analysis was to test various combinations of the framework which were suggested by the regression analysis. The frameworks were tested in two ways, first by a multiple regression analysis technique and the secondly by using AMOS, version 22, a module that is added to SPSS in order to conduct a path analysis. The analyses were carried out on several possible variations of the different constructs and from those two frameworks of interest emerged. The first was the framework which had the maximum explanatory power and the second showed a strong relationship between the two new constructs of Mobile Service Provider Marketing Tactics (MOSPMT) and Social Pressure and Aspirational Value (SPAV).

6.4.3 Framework with Maximum Explanatory Power

As explained above the framework was first analysed using a multiple regression analysis. This analysis gave a total regression coefficient (R^2) of 0.152 or a Framework that only explains 15.2% of the variation. The Durbin-Watson test only had a value of 0.185 which was well below minimum value of 1. However, the F statistic was 18.89 and thus was highly significant at the 0.01 level. All the β's were significant at the 0.01 level except MOSPMT_B. The regression analysis shows a significant correlation between all the factors except with MOSPMT.

Figure: 6-14 below is the framework that had the maximum explanatory power.

Figure: 6-14: Framework with Maximum Explanatory Power



The multiple regression statistics are given in Figure: 6-15.

Figure: 6-15: Multiple Regression Analysis and Path Analysis on Framework with the largest explanatory power

Regression Analysis

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.401[a]	0.161	0.152	0.713	0.185

a. Predictors: (Constant), PU_A, SPAV_A, PEU_B, MOSPMT_B

b. Dependent Variable: IU

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38.439	4	9.610	18.892	.000[b]
	Residual	200.920	395	0.509		
	Total	239.359	399			

a. Dependent Variable: IU

b. Predictors: (Constant), PU_A, SPAV_A, PEU_B, MOSPMT_B

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.727	0.359		4.804	0.000
	MOSPMT_B	0.025	0.033	0.041	0.778	0.437
	SPAV_A	-0.089	0.038	-0.124	-2.345	0.020
	PEU_B	0.304	0.055	0.258	5.542	0.000
	PU	0.122	0.020	0.280	6.056	0.000

Path Analysis

Regression Weights

			Estimate	S.E.	C.R.	P
SPAV_A	<---	MOSPMT_B	0.414	0.038	10.955	***
PEU_B	<---	SPAV_A	0.07	0.035	2.013	0.044
PEU_B	<---	MOSPMT_B	0.004	0.03	0.124	0.901
PU_A	<---	SPAV_A	-0.047	0.095	-0.499	0.618
PU_A	<---	PEU_B	0.164	0.136	1.207	0.227
PU_A	<---	MOSPMT_B	-0.079	0.081	-0.979	0.328
IU	<---	PU_A	0.124	0.02	6.145	***
IU	<---	PEU_B	0.29	0.055	5.307	***

Standardized Regression Weights

			Estimate
SPAV_A	<---	MOSPMT_B	0.481
PEU_B	<---	SPAV_A	0.114
PEU_B	<---	MOSPMT_B	0.007
PU_A	<---	SPAV_A	-0.029
PU_A	<---	PEU_B	0.061
PU_A	<---	MOSPMT_B	-0.056
IU	<---	PU_A	0.284
IU	<---	PEU_B	0.245

Variances

	Estimate	S.E.	C.R.	P
e1	1.554	0.11	14.124	***
e2	0.884	0.063	14.124	***
e4	0.423	0.03	14.124	***
e3	3.134	0.222	14.124	***
e5	0.509	0.036	14.124	***

Squared Multiple Correlations

	Estimate
MOSPMT_B	0
SPAV_A	0.231
PEU_B	0.014
PU_A	0.008
IU	0.149

6.4.4 Framework illustrating the relationship between Mobile Service Provider Marketing Tactics, Social Pressure and Aspirational Value and Perceived Ease of Use Constructs

One of the frameworks which emerged in this analysis indicated a strong relationship between the MOSPMT and SPAV Constructs.

Figure: 6-16: Framework with strong relationships between MOSPMT, SPAV and PEU

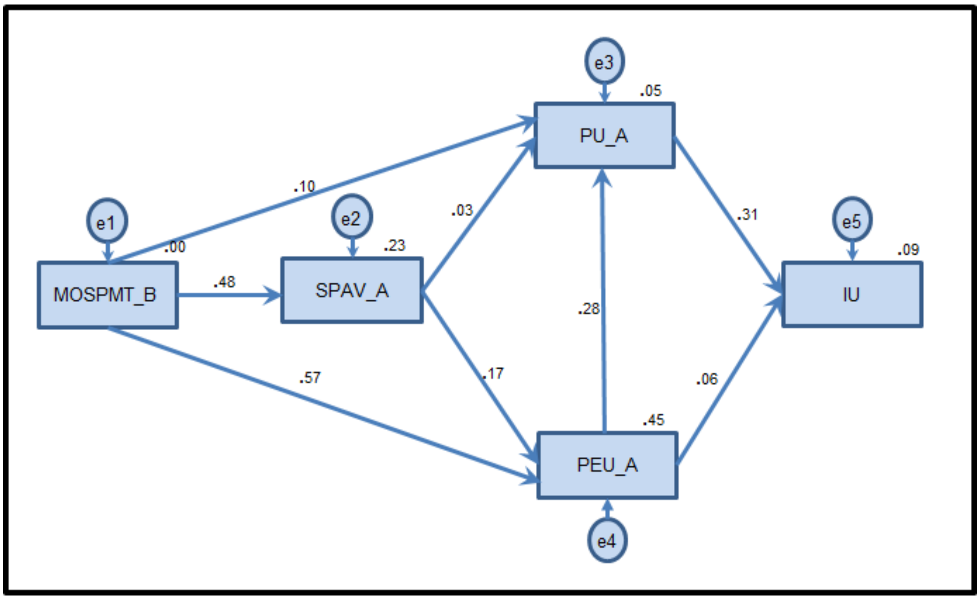
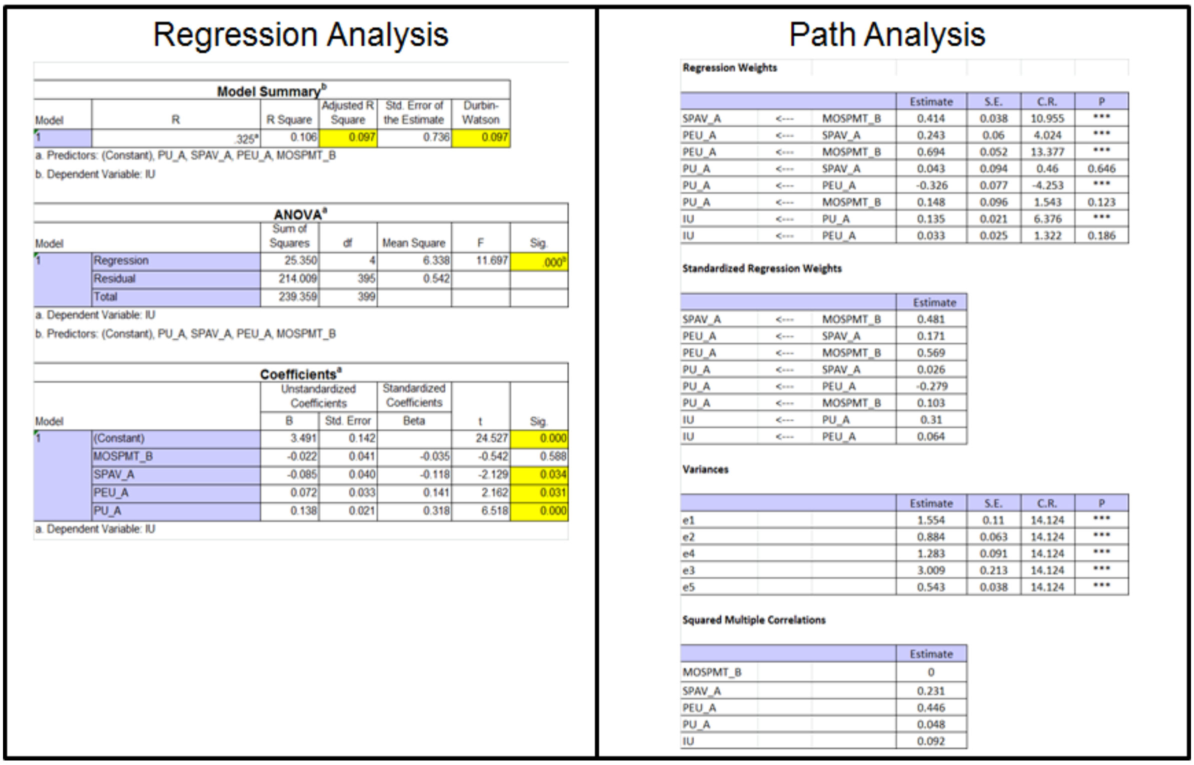


Figure: 6-17: Multiple Regression Analysis and Path Analysis on Framework with strong relationships between MOSPMT, SPAV and PEU



Regression Analysis

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.325[a]	0.106	0.097	0.736	0.097

a. Predictors: (Constant), PU_A, SPAV_A, PEU_A, MOSPMT_B

b. Dependent Variable: IU

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.350	4	6.338	11.697	.000[b]
	Residual	214.009	395	0.542		
	Total	239.359	399			

a. Dependent Variable: IU

b. Predictors: (Constant), PU_A, SPAV_A, PEU_A, MOSPMT_B

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.491	0.142		24.527	0.000
	MOSPMT_B	-0.022	0.041	-0.035	-0.542	0.588
	SPAV_A	-0.085	0.040	-0.118	-2.129	0.034
	PEU_A	0.072	0.033	0.141	2.162	0.031
	PU_A	0.138	0.021	0.318	6.518	0.000

a. Dependent Variable: IU

Path Analysis

Regression Weights

			Estimate	S.E.	C.R.	P
SPAV_A	<---	MOSPMT_B	0.414	0.038	10.955	***
PEU_A	<---	SPAV_A	0.243	0.06	4.024	***
PEU_A	<---	MOSPMT_B	0.694	0.052	13.377	***
PU_A	<---	SPAV_A	0.043	0.094	0.46	0.646
PU_A	<---	PEU_A	-0.326	0.077	-4.253	***
PU_A	<---	MOSPMT_B	0.148	0.096	1.543	0.123
IU	<---	PU_A	0.135	0.021	6.376	***
IU	<---	PEU_A	0.033	0.025	1.322	0.186

Standardized Regression Weights

			Estimate
SPAV_A	<---	MOSPMT_B	0.481
PEU_A	<---	SPAV_A	0.171
PEU_A	<---	MOSPMT_B	0.569
PU_A	<---	SPAV_A	0.026
PU_A	<---	PEU_A	-0.279
PU_A	<---	MOSPMT_B	0.103
IU	<---	PU_A	0.31
IU	<---	PEU_A	0.064

Variances

	Estimate	S.E.	C.R.	P
e1	1.554	0.11	14.124	***
e2	0.884	0.063	14.124	***
e4	1.283	0.091	14.124	***
e3	3.009	0.213	14.124	***
e5	0.543	0.038	14.124	***

Squared Multiple Correlations

	Estimate
MOSPMT_B	0
SPAV_A	0.231
PEU_A	0.446
PU_A	0.048
IU	0.092

The framework explains 48% of the variation between MOSPMT_B and SPAV_A while the MOSPMT_B construct and PEU_A construct explains 57% of the variation. The framework is illustrated in Figure: 6-16 and the statistical analyses in Figure: 6-17.

The relationship between MOSPMT_B, SPAV_A and PEU_A is further explored in section 6.6.1.

6.4.5 Summary on Construction of the Framework

The final framework which was assembled with the following constructs, MOSPMT_B, SPAV_A, PU_A and, PEU_B and Intention to Use IU only explained 0.15 or had an explanatory power of 15%. This framework is displayed in Figure: 6-14.

However, a second framework in which the Construct PEU_B is replaced by PEU_A produced a framework which only had an explanatory power of 9% but it showed an interesting interaction between the three constructs of MOSPMT_B, SPAV_A, and PEU_A. The constructs had correlation coefficients between MOSPMT_B and SPAV_A of 0.48 and between MOSPMT_B and PEU_A of 0.57 and thus appeared strongly related. This framework is displayed in Figure: 6-16.

6.5 ANALYSIS OF MODERATING FACTORS ON THE FRAMEWORK

There were two final analyses that needed to be carried out on the final framework. The first was to the determine if any of the demographic, socio-economic and personal factors highlighted in section 6.2.2 to section 6.2.4 inclusive, were in fact moderating factors on the framework. The second was to determine if there were any mediating factors. The explanation of what is are moderating and mediating factors and the differences between them are described in detail in section 5.3.5.

6.5.1 Moderating Factors

It was found earlier in the analysis that factors such as Grouped Age, Province, Ethnicity, Highest Academic qualifications, Income and LSM levels had an effect on the individual questions. This analysis was to test if these factors influenced the relationships between the different constructs of the final framework. Two important points are highlighted at this point. The first is that the factors were initially tested against the individual questions which were used to develop the various constructs and if the factor did not affect the individual questions, they were unlikely to affect the constructs and relationships between the constructs. The second point was the design of the framework which indicated the moderating factors influencing the framework as a whole, and just proof of moderating one relationship in the framework would validate it as a moderating factor. Model 1 of the PROCESS software module of Hayes (2013a) with the process as explained in section 5.3.5.4 was used to determine the moderating factors.

6.5.1.1 Gender as a Moderating Factor

Three questions were found in which gender was shown to have an influence, being Questions 12.1, 12.2 and 26.10. In the factor analysis Questions 12.1 and 12.2 were allocated to MOSPMT_A and Question 26.10 was allocated in SPAV_A, and as neither of these constructs was in the final framework, Gender could not be a moderating factor on the final framework. However, to confirm this effect of Gender on the relationship of MOSPMT_B towards SPAV_A, the constructs used in the framework were tested and Gender was found not to be a moderating factor.

6.5.1.2 Grouped Age as a Moderating Factor

In order to test if Grouped Age was a moderating factor in the framework, its effect on the interaction between various constructs in the Framework was tested using the Pearson Correlation. Table: 6-20 below shows the analysis of Grouped Age on the relationship between constructs PEU_A and MOSPMT_B.

Table: 6-20: Correlation table of Age as a moderating Factor between the PEU_A and MOSPMT_B Constructs

Correlations

[v2] Grouped age			MOSPMT_B	PEU_A
18-24	MOSPMT_B	Pearson Correlation	1	.775**
		Sig. (2-tailed)		0.000
		N	78	78
	PEU_A	Pearson Correlation	.775**	1
		Sig. (2-tailed)	0.000	
		N	78	78
25-34	MOSPMT_B	Pearson Correlation	1	.706**
		Sig. (2-tailed)		0.000
		N	149	149
	PEU_A	Pearson Correlation	.706**	1
		Sig. (2-tailed)	0.000	
		N	149	149
35-44	MOSPMT_B	Pearson Correlation	1	.430**
		Sig. (2-tailed)		0.000
		N	108	108
	PEU_A	Pearson Correlation	.430**	1
		Sig. (2-tailed)	0.000	
		N	108	108
45+	MOSPMT_B	Pearson Correlation	1	.576**
		Sig. (2-tailed)		0.000
		N	65	65
	PEU_A	Pearson Correlation	.576**	1
		Sig. (2-tailed)	0.000	
		N	65	65

**. Correlation is significant at the 0.01 level (2-tailed).

The results show that all four of the grouped age categories, 18-24, 25-34, 35-44 and 45+, are showing a significant correlation on the relationship between the MOSPMT_B and PEU_A at a 0.01 significance level. Therefore, Grouped Age is a moderating factor on the framework particularly between MOSPMT_B and PEU_A.

Grouped Age was also found to be a moderating factor between MOSPMT_B and PU_A, as well as between the constructs IU and PU_A. However, it was found not to be a moderating factor between constructs IU and PEU_A. Table: 6-21 below displays the results of all the other factors on the various constructs of the framework with the results being discussed in the following sections.

6.5.1.3 Location as a Moderating Factor

Location was found to have the greatest influence on the individual questions, so 6 different relationships between constructs were tested and in all cases it was found that location was a moderating factor. Additionally most of the correlations were at the 0.01 significance level, see Table: 6-21 for details.

Table: 6-21: Overview View of all Moderating Factors Tested

Factor Group	Factor	Dimension X	Dimension Y	Moderating Factor? (YES/NO)	No of bands in the factor with Correlation Coefficients Significant at	
					p=0.05	p=0.01
Demographic	Age	PEU_A	MOSPMT_B	YES	0	4
		PU_A	MOSPMT_B	YES	0	1
		IU	PEU_A	NO	0	0
		IU	PU_A	YES	1	1
	Location	SPAV_A	MOSPMT_B	YES	1	2
		PEU_A	MOSPMT_B	YES	0	3
		PEU_A	SPAV_A	YES	0	2
		PU_A	SPAV_A	YES	0	1
		PU_A	PEU_A	YES	1	2
		IU	PEU_A	YES	1	2
	Ethnicity	SPAV_A	MOSPMT_B	YES	0	4
		PU_A	PEU_A	YES	0	1
	Maximum Academic Level	IU	PU_A	YES	1	2
		PEU_A	SPAV_A	YES	1	2
Socio-economic	Income Level	PEU_A	SPAV_A	YES	1	4
		PU_A	SPAV_A	YES	3	0
	LSM Band	PU_A	MOSPMT_B	YES	0	1
		PEU_A	MOSPMT_B	YES	2	3
Personal Factors	Technical Knowledge	PEU_A	MOSPMT_B	YES	0	3
		IU	PEU_A	YES	0	1
	Attitude towards Technology	PEU_A	MOSPMT_B	YES	0	4
		IU	PEU_A	NO	0	0

6.5.1.4 Ethnicity as a Moderating Factor

The factor Ethnicity was tested on two different relationships between constructs, SPAV_A with MOSPMT_B and PU_A with PEU_A and in both cases Ethnicity was found to be a moderating factor, see Table: 6-21 for details. It is worth noting the strength of all four correlations between the ‘MOSPMT_B and the SPAV_A were at the 0.01 significance level.

6.5.1.5 Maximum Academic Level, as a Moderating Factor

Maximum Educational Level was tested against the relationships of IU with PU_A of ‘PEU_A with SPAV_A to see if the was a moderating factor. In both cases the Maximum Educational Level was found to be a moderating factor, see Table: 6-21 for details.

6.5.1.6 Income Level and Living Standards Measures (LSM) Band as Moderating Factors

The two socio-economic factors Income level and LSM band were tested and both were confirmed to be moderating factors on the relationships between two separate constructs in the framework, see Table: 6-21 for details.

6.5.1.7 Technical Knowledge, Ability and Skills and Attitude towards Technology as Moderating Factors

The last set of factors to be tested were the two personal factors Technical Knowledge, Ability and Skills and Attitude towards Technology. The Technical Knowledge was found to moderate the two relationships it was tested against PEU_A with MOSPMT_B and PEU_A with IU.

However, Attitude towards Technology was proved to moderate the relationship PEU_A with MOSPMT_B but it did not moderate the relationship between PEU_A and IU., see Table: 6-21 for details.

The complete analyses are in Appendix 7.

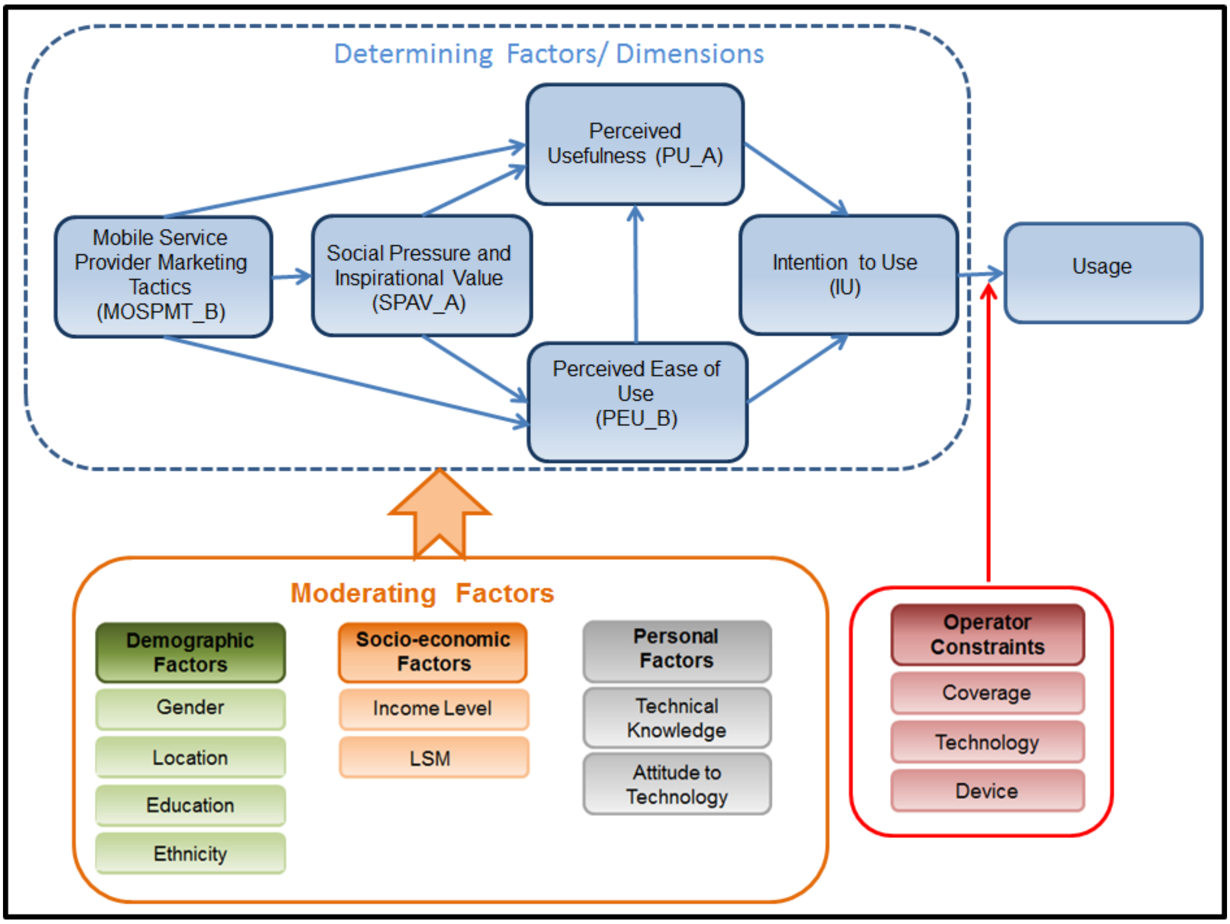
6.5.2 Summary of Moderating Factors

The demographic, socio-economic and personal factors identified earlier were tested against the various constructs of the framework to confirm the findings of the tests which were achieved when the factors were tested against the individual questions. All the factors, except Gender, were determined to be moderating factors on the framework. Also, the factors Age and Attitude towards Technology were found not to be moderating factors towards the relationship of PEU_A. with IU.

6.5.2.1 Final Framework

By combining all the analyses and results from sections 6.3 to section 6.5.2.1 the final framework was constructed. The major differences to the preliminary framework are the naming of the constructs and the dropping of Gender as a moderating factor. The final framework is given in Figure: 6-18.

Figure: 6-18: Final Framework with Maximum Explanatory Power



6.6 MEDIATING FACTORS

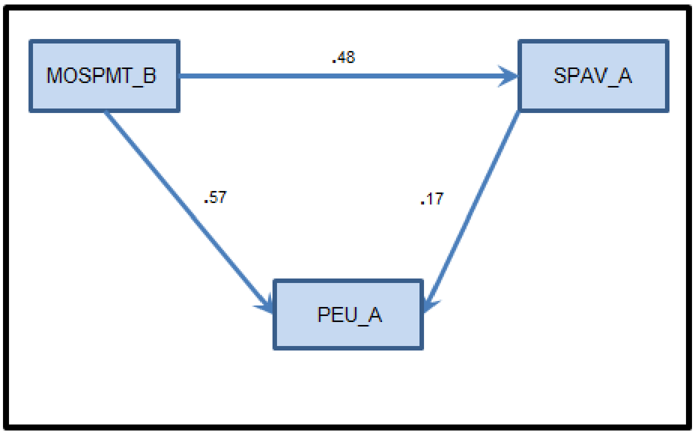
The last analysis carried out on the Framework was to determine if there were any mediating factors, which Baron and Kenney (1986) formulate as follows *"a variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion*" (Baron and Kenny, 1986: 1176).

The mediating factor analysis was carried out using the PROCESS Software Add-On (Hayes, 2013a) and the methodology outlined in section 5.3.5.2.

6.6.1 Test for Mediation on the Two Frameworks

When the Framework with the maximum explanatory power was tested, no mediating factors were found. However, when the framework which displays the strong relationship between MOSPMT_B, SPAV_A and PEU_A was analysed, there was evidence of a strong mediating relationship between the three constructs, see Figure: 6-19.

Figure: 6-19: Constructs showing a Mediating Relationship



This relationship is very important as it sheds light on one of the anomalies experienced in mobile telecommunications in South Africa. Although there are many complaints about the cost of mobile telecommunications in South Africa (Pretorius, 2019), the two Mobile Service Providers with the lowest rates have the lowest market shares and combined they only have a combined market share of around 20%, versus the nearly 80% of the other two Service Providers, Vodacom and MTN (See section 2.2.4.6). The construct SPAV comprises aspects of the influence of society, family and friends on the mobile user as well as aspects of the Aspirational Value of mobile usage and devices which includes service provider and device brands. The fact that these aspects are tied to the Mobile Service Providers Marketing Tactics indicates that the use of a low cost provider may send a message that one is poor and cannot afford the more expensive service provider. This concept will be explored further in section 7.2.5.

6.6.2 Summary of Mediating Factors

There was only one mediating factor uncovered in the Frameworks. However, this mediating factor between the Constructs MOSPMT_B, SPAV_A and PEU_A may well assist in explaining an anomaly found in the South African Mobile telecommunications market, where the two Mobile Service Providers with the lowest tariffs have the lowest market share.

6.7 USAGE

In this last section the usage of mobile services in South Africa was examined. The analysis was conducted in three parts, the first examined the amount of time and money that people spend on mobile services and would they spend more time online if mobile prices were to drop. It examined this usage in light of the demographic factors: Gender, Age, Location, Highest Academic Levels, Ethnicity, Income levels and LSM Bands.

The second part of this analysis examined the services used by subscribers grouped according to service types. The four types are: Messaging Services, including messaging applications and e-Mail; Data Services; Financial Services including e-commerce; and Entertainment services including streaming services. Again these services were examined with regard to the demographic factors indicated in the first part of this analysis.

The third part examined various other aspects of mobile usage such as security, choice of service providers including the reasons for the choice and the key attributes of applications that cause subscribers to download and use them.

The analysis methodology used was descriptive statistics as well as the analyses described in section 5.3.4.1 with regard to the tests for independence and variations between groups of factors.

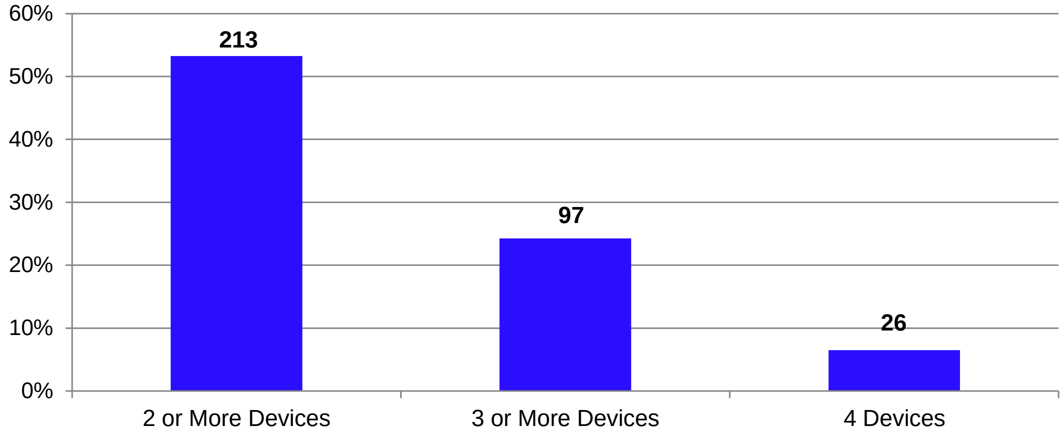
6.7.1 Number of Devices/ Subscriptions

The analysis on Question 13 displayed interesting results when the number of mobile devices/ subscriptions was determined. It was found that a significant number of the respondents were using more than 1 device and had multiple subscriptions or SIM cards, often with different network service providers.

It was found that of the 400 respondents they had together a total of 736 Devices/ Subscriptions, 213 of the 400 had two or more, 97 had three or more while 26 had 4 devices see Figure: 6-20. This very clearly highlights the difference, explained section 5.3.1, between individuals who utilise mobile services and subscriptions.

An interesting trend is visible with regard to which Mobile Network Operator is used for the second, third and fourth devices/ subscriptions. For a subscriber's primary device the subscriber generally use the larger more expensive Network Operators Vodacom and MTN and the breakdown of the Network Operators is very similar to the overall market shares of the various operators shown in section 2.2.4.6.

Figure: 6-20: Total Number of Devices/ Subscriptions and Mobile Network Operators Used



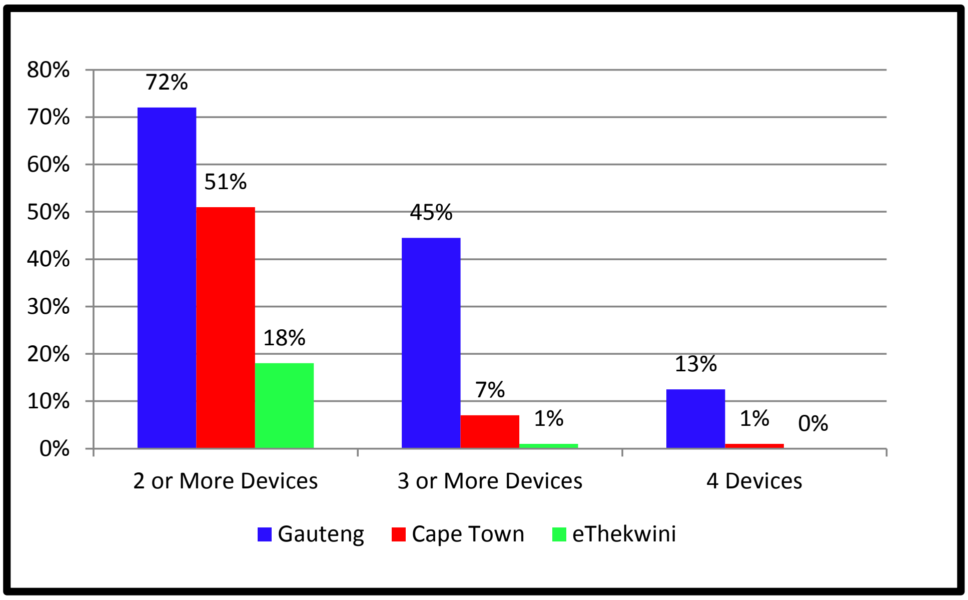
Device	Vodacom	MTN	CellC	Telkom (8ta)	Others	Total Number
Primary Device	38%	34%	22%	6%	1%	**400**
2nd Device	31%	36%	17%	15%	2%	**213**
3rd Device	24%	23%	14%	28%	11%	**97**
4th Device	15%	31%	12%	27%	15%	**26**
Overall	33%	33%	19%	12%	3%	**736**

However, with the second, third and fourth devices the market share of the larger more dominant Network Operators declines and there is a corresponding increase in the usage of the smaller, less expensive Network Operators Telkom and Others (MNVO's). Subscribers are more willing to use the smaller less expensive Network Operators for the less important functions.

6.7.1.1 Multiple Devices and Location

The analysis of Question 13 with regard to number of devices/ subscriptions versus location showed results that were very much in line with that of overall usage in the three provinces. Figure: 6-21 shows how the use of multiple devices/ subscriptions varies with the location with 72% of the participants from Gauteng having 2 or more devices, compared to 45% in Cape Town and only 13% in eThekwini.

Figure: 6-21: Breakdown of Multiple devices/ Subscriptions by Location



6.7.2 Actual Usage

In this section the actual amount of data used on a monthly basis was examined; the actual spend on mobile voice and data services, and the amount of time spent interacting with mobile services on a daily basis. The last question analysed was whether people would spend even more time interacting with their mobile device if prices were to drop. All the usage factors were examined with respect to the moderating factors to highlight any variations within them. The prior analyses had indicated that Gender was not a moderating factor and analysis indicated that it had no effect on usage and hence although, it was analysed, it was not specifically shown in any of the following analyses.

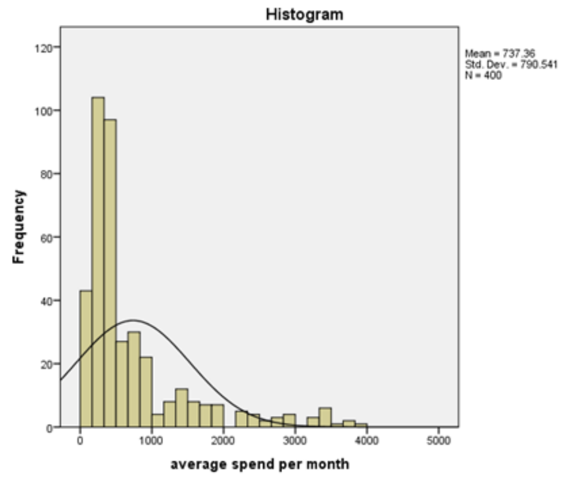
6.7.2.1 Average Monthly Spend on Mobile Services

This analysis was carried out on Question 14, which asked for a respondent's actual monthly spend on voice and data services. The analysis commenced with descriptive statistics to determine the actual usage and then evaluated it to determine if there were any variations with regard to the moderating factors determined earlier.

The monthly spend on mobile services, see Figure: 6-22, is good illustration of the long tail distributions which are standard in the mobile telecommunications industry (Anderson, 2006). In such distributions the majority of the telecommunications spend is clustered towards the left (low value) side of the distribution with a long tail to the right (high value) side. In this distribution the minimum spend per month in the research sample was ZAR50 and the maximum was ZAR4000, with a mean value of ZAR737.

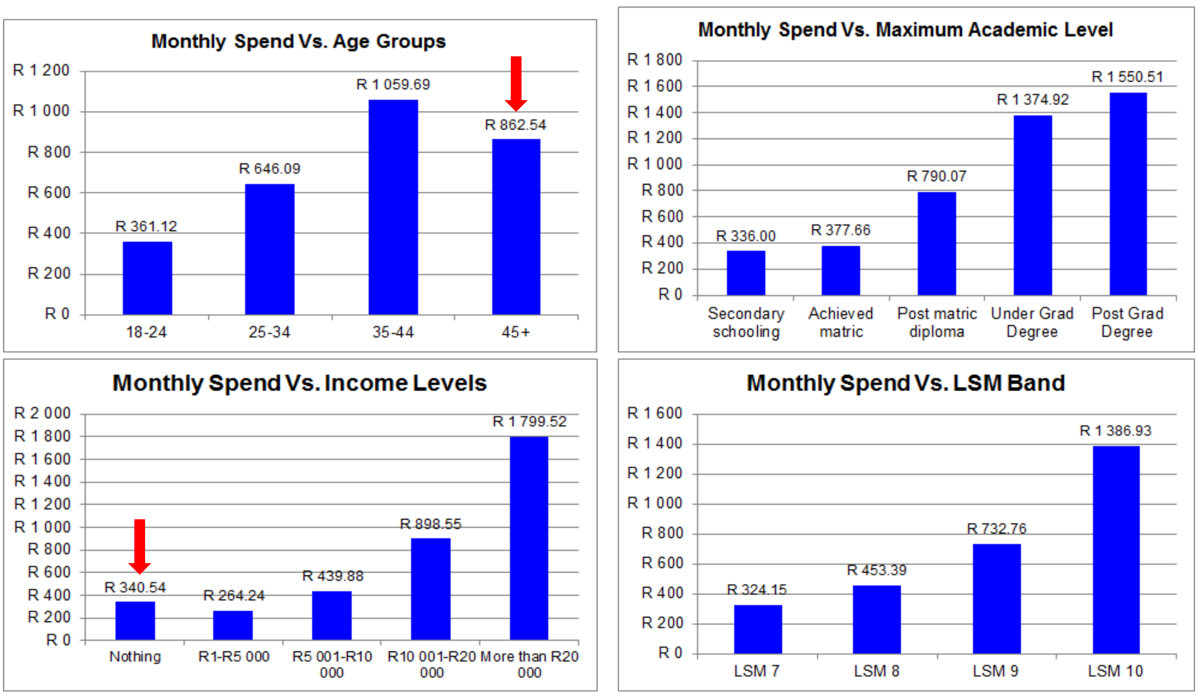
Figure: 6-22: Monthly spend on Mobile Services

Monthly Spend	ZAR
No of Samples	400
Minimum	50
Maximum	4000
Average Spend	737.30
Standard Deviation of Spend	790.54



Generally, the average amount spent on mobile services on a monthly basis follows the expected patterns, in that as a subscriber’s income increases, so does their ability to spend on mobile services. This fact is evident in the four diagrams in Figure: 6-23. Also, the telecommunications spend across all the income groups indicates the importance of mobile services to the South African community.

Figure: 6-23: Mobile Spend Versus Moderating Factors



However, there are two anomalies, marked with red arrows on Figure: 6-23, to the trend described above which need further in depth explanation. The first anomaly was the decline in usage between the 35-45 age groups and the +45 year olds. This is most likely due to generational issues where older users above 45 years do not use mobile services as much as the younger aged people, even though they can afford it, because they are used to doing things differently.

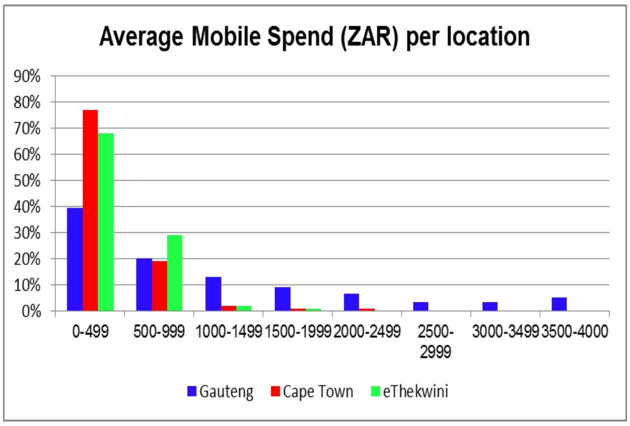
The second anomaly was the relatively high monthly spend of the people who have no monthly income compared to those earning R1-R5000 per month. The majority of subscribers who constitute the group earning ZAR0 per month are aged 18 to 24 and are thus most likely students of some kind and their spend is being sponsored by parents or some other institution. However, the magnitude of the monthly spend indicates the importance of mobile services to all the people in this income group.

6.7.2.1.1 Average Monthly Spend and Location

As mentioned in previous chapters, the strongest variations that were highlighted in the analysis of the constructs, which constitute the framework, were with regard to the differences between the metropolitan areas where the research was conducted. This difference was also very evident in the Usage information; particularly with respect to monthly spend on mobile services.

Figure: 6-24: Average Monthly Spend by Metropolitan Area

Metropolitan	Factor	Result
Gauteng (JHB & Tshwane)	Average Spend (ZAR)	ZAR1085.75
	% of subscribers spending less than ZAR1000 per month	59.5%
Cape Town	Average Spend (ZAR)	ZAR370.45
	% of subscribers spending less than ZAR1000 per month	96%
eThekwini	Average Spend (ZAR)	ZAR407.50
	% of subscribers spending less than ZAR1000 per month	97%

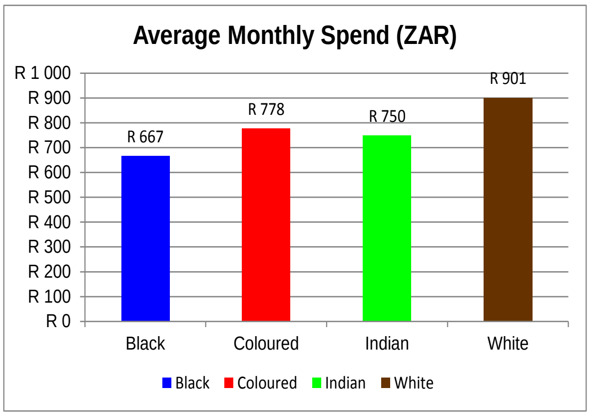


The monthly spend in Gauteng is on average more than double that of the other two metropolitan areas, ZAR1085 versus ZAR370 and ZAR407 for Cape Town and eThekwini respectively. Additionally, slightly over 40% of subscribers in the Gauteng sample spent more than ZAR1000 per month while in Cape Town and eThekwini it was 4% and 3% respectively see Figure: 6-24.

6.7.2.1.2 Average Monthly Spend and Ethnicity

In South Africa, a country that has a long history of being split along ethnic lines, the average monthly spend on mobile services per ethnic group gave surprising results in that there is no statistical variation detectable between the ethnic groups, see Figure: 6-25.

Figure: 6-25: Statistical Analysis of Average Monthly Spend vs Ethnicity



Test of Homogeneity of Variances			
Levene Statistic	df1	df2	Sig.
1.281	3	395	0.280

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3265732.8	3	1088577.60	1.759	0.155
Within Groups	244493108.6	395	618969.90		
Total	247758841.4	398			

Robust Tests of Equality of Means	Statistic[a]	df1	df2	Sig.
Brown-Forsythe	1.842	3	196.853	0.141

a. Asymptotically F distributed.

6.7.2.2 Average Monthly Mobile Data Usage

The next analysis tried to answer the question "*Is the monthly spend on mobile data services similar to that of the total mobile spend highlighted in the previous section?*" Question 17 examined the average amount of mobile data a subscriber uses on a monthly basis and was subjected to the same analysis as the data from Question 14.

Figure: 6-26: Overview of Average Data Used per Month

	Frequency	Percent	Valid Percent	Cumulative Percent
zero to 250MB	23	5.8	5.8	5.8
251 to 500MB	59	14.8	14.8	20.5
501MB to 1GB	61	15.3	15.3	35.8
1GB to 2GB	61	15.3	15.3	51.0
2GB to 5GB	79	19.8	19.8	70.8
more than 5GB	117	29.3	29.3	100.0

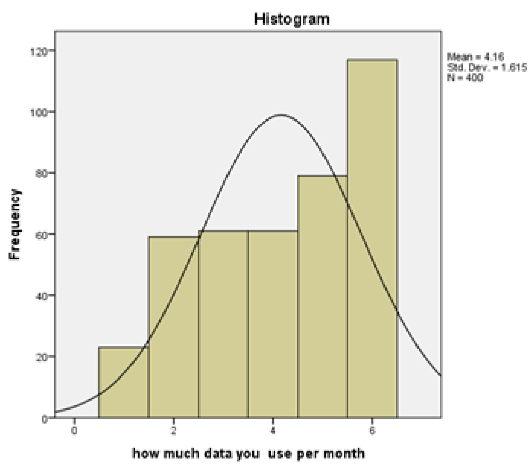


Figure: 6-26 above shows an overview of the average mobile data used on a monthly basis. It shows that 49% of subscribers use 2GB or more of data per month, with 29% of subscribers, the largest individual group at nearly 30% of the subscribers, using over 5GB per month.

The analysis of the amount of data used gave very similar results to that of the average spend on mobile services, in that as income increases so does the average amount of data used. The moderating factors Age, Academic Qualifications and LSM Bands show greater data usage in the higher level groups than in the lower level groups. Table: 6-22, below, shows the variation in the average monthly mobile data used against these various factors.

Table: 6-22: Summary of Tests for Variance of Demographic factors and Average Monthly Data Usage

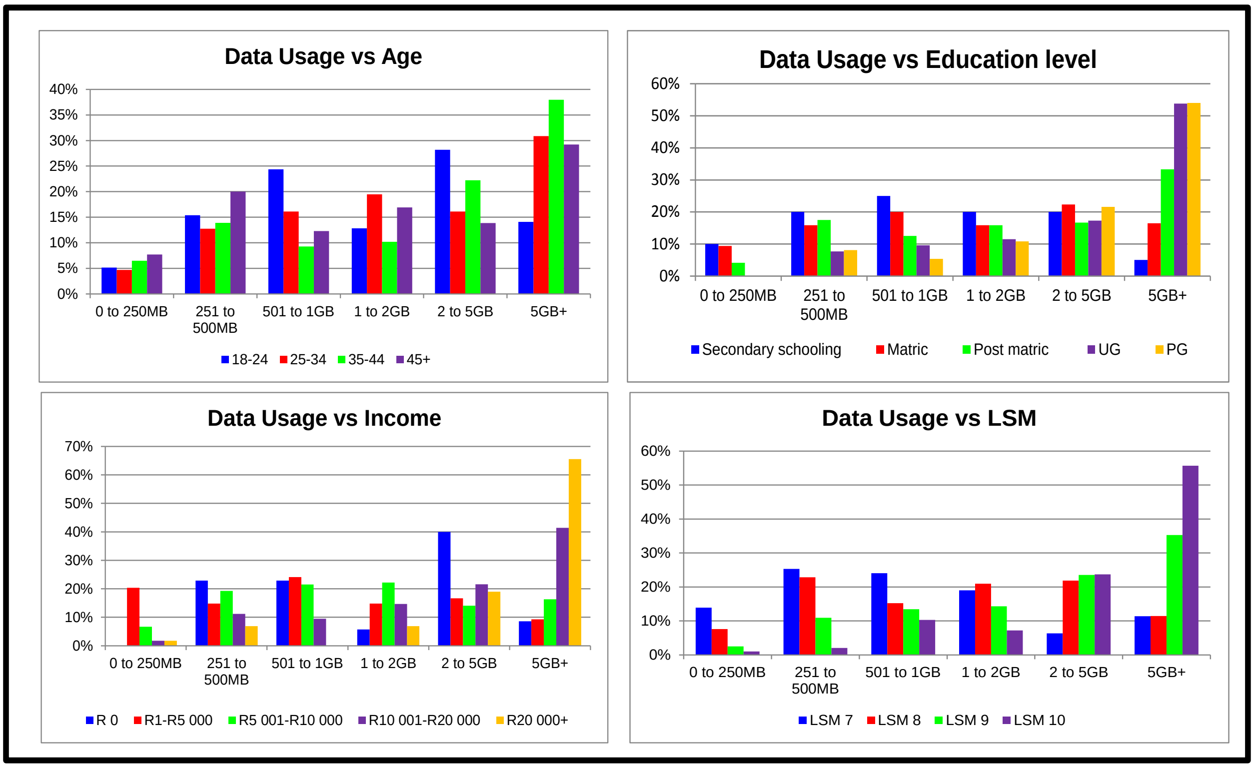
	Demographic Factor	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Question 17	Grouped Age	0.006	0.314	0.057	0.055	0.035		18-24 with 35-45
	Location	0.001	0.473	0.012	0.008	0.133	eThekwini with Cape Town	eThekwini with Cape Town
	Highest Academic Level	0.000	0.000	0.000	0.000	0.007	Under Grad with all except Post Grad; Post Grad with all except Under Grad	Under Grad with all except Post Grad; Post Grad with all except Under Grad
	Ethnicity	0.050	0.023	0.023	0.02	0.011	Black with White	Black with White
	Average Monthly Income	0.000	0.000	0.000	0.000	0.023	R10001 to R20000 with All; R20000+ with All	R10001 to R20000 with All; R20000+ with All
	LSM Band	0.000	0.000	0.000	0.000	0.001	LSM 9 with All; LSM 10 with All	LSM 9 with All; LSM 10 with All

(Note: the lowest two levels 0 to 250MB and 251 to 500MB were combined in order to conduct the analyses as in several of the higher levels of the factors such as Maximum Academic Level, Income level and LSM band there was either 0 or 1 respondents in the 0-250MB band so it had to be combined with the 251 to 500MB group.)

The Bonferroni and Games-Howell Post-hoc tests shown above in Table: 6-22 are very important as they show the groups that are significantly different at the 0.05 significance level from each other with that factor.

From the above it can be seen that the variations in the Highest Academic Level, Income Level and LSM band are all at the 0.01 highly significant level and that the variations are between the highest and lowest groups. However, with ethnicity the variations are only at the 0.05 significance level and the variation is only between Black and White.

Figure: 6-27: Graphical representations of Data Usage versus Moderating Factors



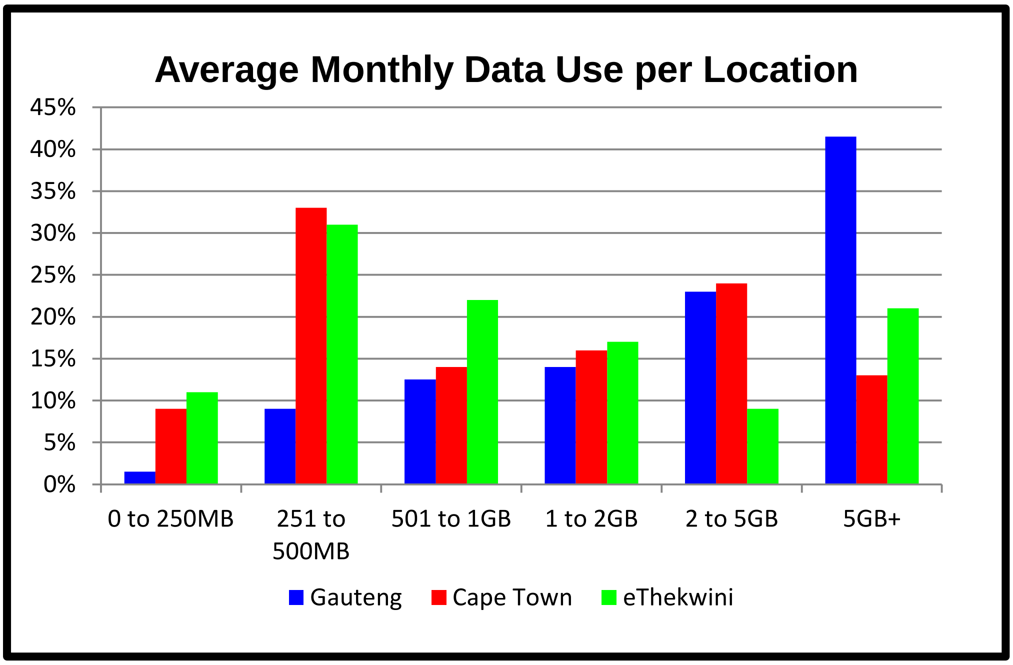
(Note: In factors such as Maximum Academic Level, Income level and LSM band there was very few or even zero respondents in the 0-250MB band.)

6.7.2.2.1 Average Monthly Mobile Data Usage with Moderating Factors

The average monthly data usage for the moderating factors of Age, Educational level, Income and LSM band follow what would be the expected pattern as data usage rises in line with Age and increasing Income, Educational level and LSM band. The only variation is with the Age group of 18-24, with that group being the highest in the 2-5GB band considerably higher than would be expected.

However, with regard to Location the average monthly data usage confirmed the result obtained in average monthly spend by indicating that the average monthly data usage in Gauteng was significantly higher than that of the other two metropolitan areas. Figure: 6-28 shows that in Gauteng 64.5% of subscribers are using 2GB or more per month while it is only 37% in Cape Town and only 30% in eThekwini. In Gauteng 41.5% of the subscribers are using more than 5GB per month against 13% in Cape Town and 21% in eThekwini.

Figure: 6-28: Average Monthly Data Usage by Metropolitan

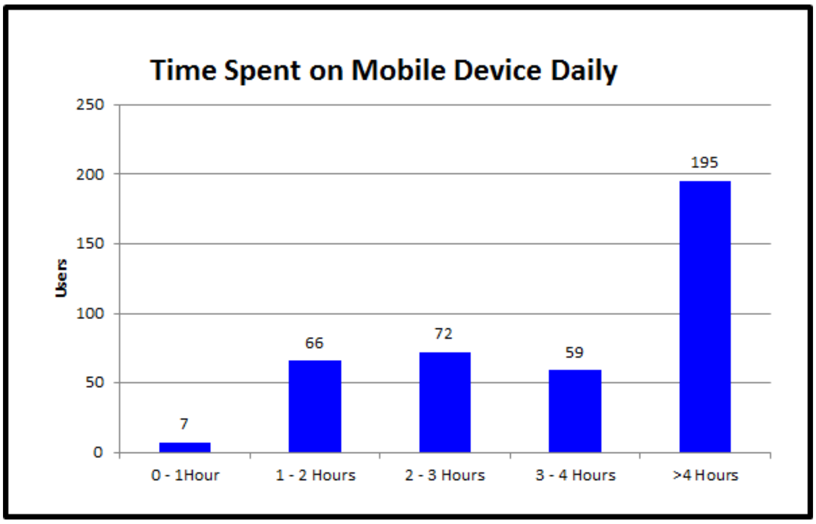


6.7.2.3 Average Length of Time Interacting with a Mobile Device

Question 18 in the survey asked the subscribers "*how long on average do you spend interacting on your mobile phones on a daily basis?*", Figure: 6-29 shows the results.

Out of 399[22] participants 195, which is nearly 50% spent, on average more than four hours per day interacting with their mobile device. This means that if the average waking time for a person is 16 hours then they spend more than 25% of their waking time interacting with their mobile device.

Figure: 6-29: Average Time Spent on a Mobile Device Daily



[22] Only 399 responses valid, one excluded.

The question that must be answered is '*Is this indicative of all the participants or is it similar to Questions 14 and 17 where there were significant differences between the groups when examined along demographic lines?*'

Table: 6-23: Summary of Tests for Variance of Demographic factors and Average Length of Time Interacting with a Mobile Device Daily

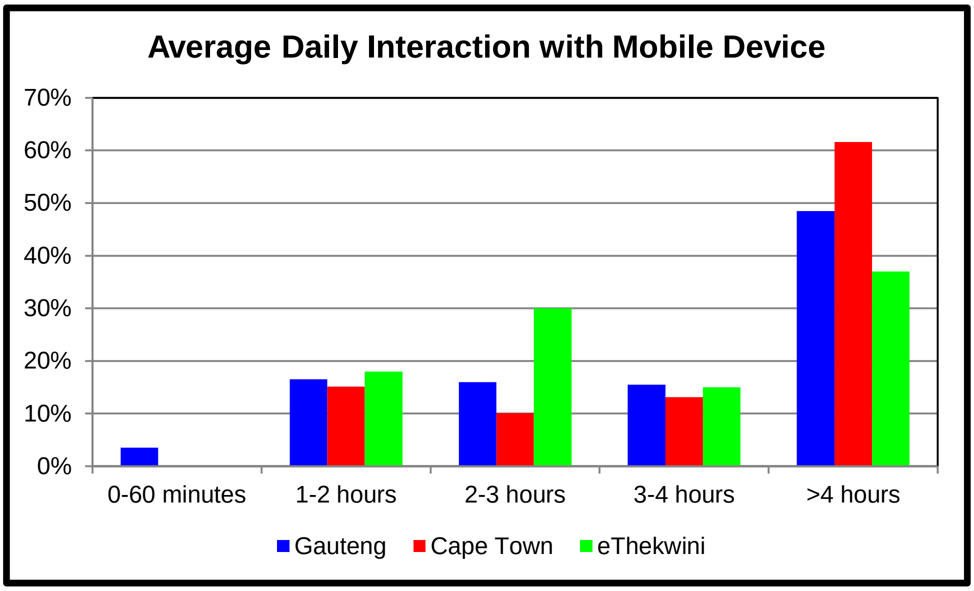
	Demographic Factor	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Question 18	Grouped Age	0.144	0.965	0.113	0.118	0.000		
	Location	0.001	0.001	0.012	0.008	0.113	Cape Town with eThekwini	Cape Town with eThekwini
	Highest Academic Level	0.024	0.025	0.068	0.064	0.021		
	Ethnicity	0.071	0.285	0.245	0.260	0.712		
	Average Monthly Income	0.794	0.980	0.705	0.703	0.557		
	LSM Band	0.020	0.000	0.000	0.000	0.078	LSM 7 With LSM 9 and LSM 10	LSM 7 With LSM 9 and LSM 10

The results were surprising in that there was very little variation when compared to the previous usage factors examined, compared with Table: 6-22, Table: 6-23 and Figure: 6-23. In fact the only significant variations evident, apart from Location, which is discussed below, were between the lowest and highest groups in the LSM Bands.

6.7.2.3.1 Average Length of Time on the Phone Daily and Location

Figure: 6-30 below shows that this analysis gives different results when compared to the other usage measurements. There is considerably less variation between Gauteng and the other two metropolitan areas. In fact the only variation shown by the Post-hoc tests is between Cape Town and eThekwini and not between Gauteng and the other two Metropolitan areas. This is the only usage measurement where Gauteng is not the user in the highest usage group. At first glance, the 61% of subscribers in Cape Town who indicate that they interact with their mobile devices for more than 4 hours per day appears to be inconsistent with the other usage factors, particularly total mobile spend. However, a possible explanation for this incongruity is that the Metropolitan of Cape Town has the most comprehensive free WiFi network and that subscribers are off-loading on this network and saving their own data and reducing their spend.

Figure: 6-30: Average Daily Time Spent Interacting with a Mobile Device per Metropolitan



6.7.2.4 Would Subscribers Spend more Time On-line if Tariffs were Cheaper?

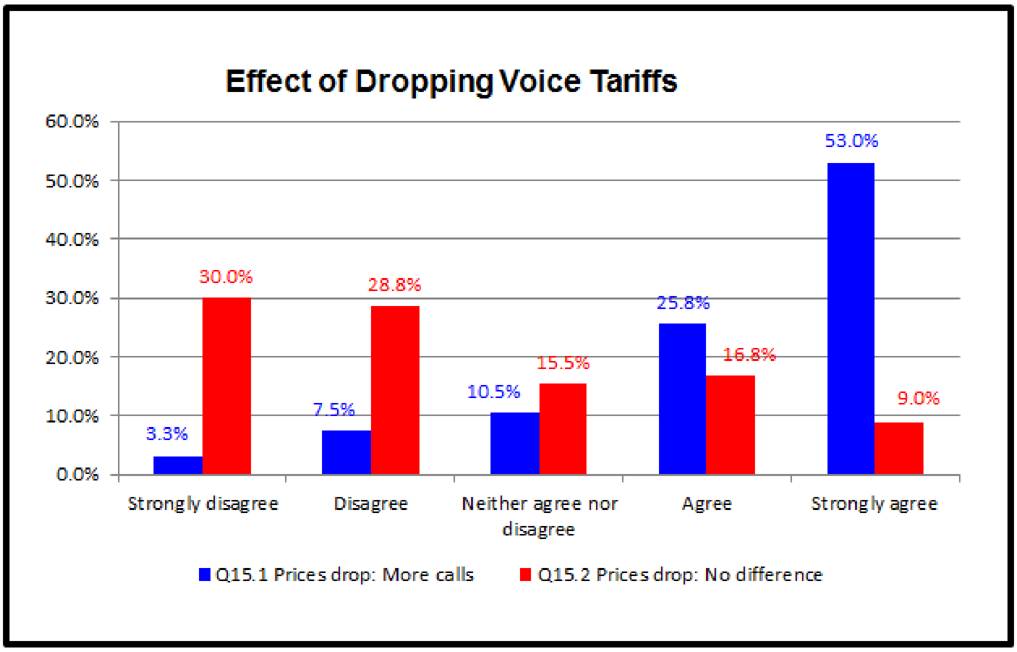
As shown in the previous sections subscribers were spending on average ZAR737 per month and nearly 50% of subscribers were spending more than 4 hours per day interacting with their mobile devices, so the question must be asked "*Is this sufficient, or if tariffs were dropped would I spend more time interacting with my device?".* Question 15 in the survey instrument sought to answer this question. It did it for voice and data by first asking "*If mobile voice prices were to drop I would make more calls?*", and then the negative *"If mobile voice prices were to drop it would not make much difference to me as I make as many calls as I need to?*" and then with similar questions for data.

6.7.2.4.1 Effect of Dropping Voice Tariffs

Figure: 6-31 shows the overall responses to the questions regarding usage and the dropping of voice tariffs.

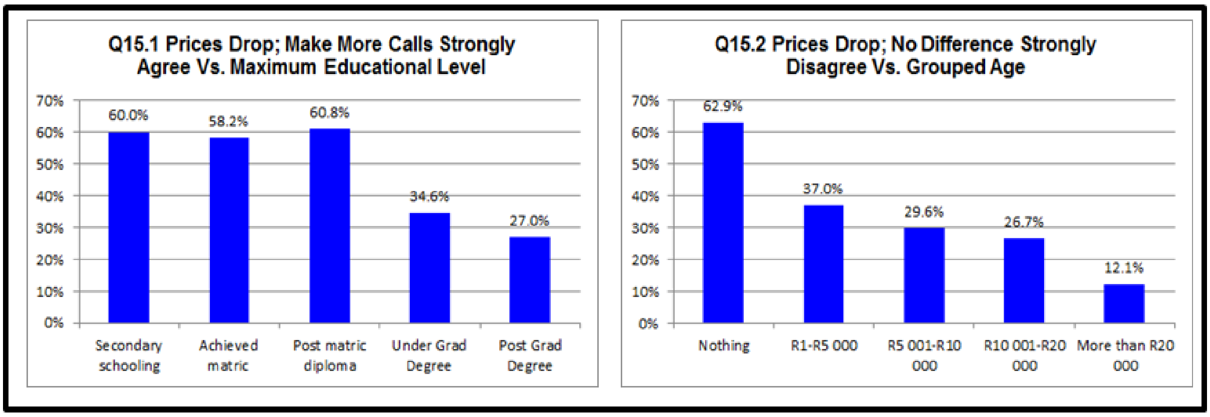
Nearly 79% of respondents agreed or strongly agreed that if prices were to drop they would make more calls, while only 26% agreed and strongly agreed with the statement "*if prices dropped it would make no difference to the amount of calls I would make as I make all the calls I want to"*.

Figure: 6-31: Effect of Dropping Voice Tariffs on the Amount of Voice Calls Made



The analysis of Questions 15.1 and its negative Question 15.2 follow the same pattern as the other Usage analyses but in reverse, in that the higher the income level, the less likely the subscriber would make more calls if mobile voice tariffs were to drop, see Figure: 6-32.

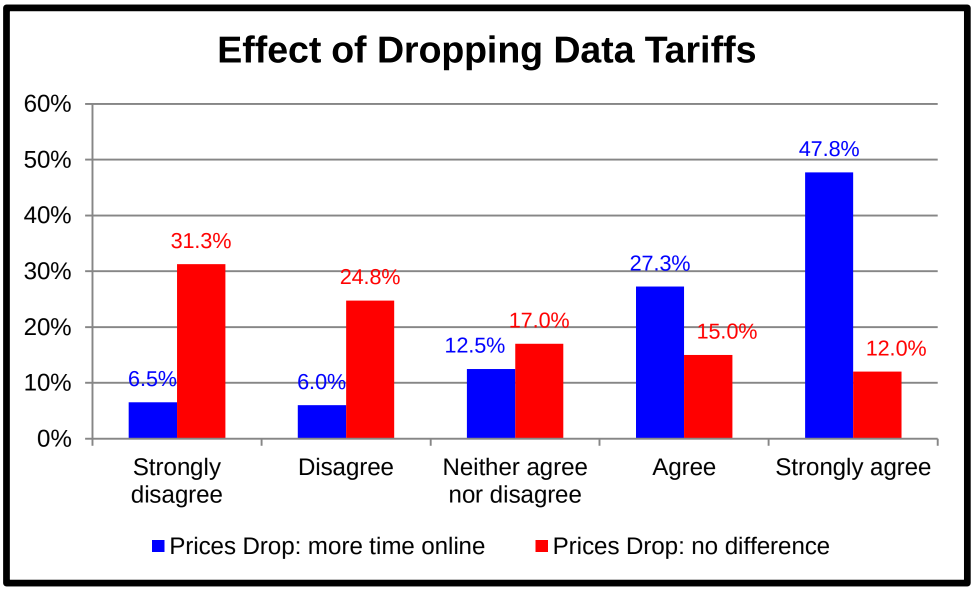
Figure: 6-32: Results of Dropping the Tariff for Voice Calls



6.7.2.4.2 Effect of Dropping Data Tariffs

Questions 15.3 and 15.4 are similar to the previous two questions, but they are focused on data usage and time spent on line. Question 15.3 asks "*If mobile data prices were to drop significantly I would buy more data and spend more time online*", and its negative Question 15.4 "*If mobile data prices were to drop significantly it would not make much difference as I have adequate data to do what I want*".

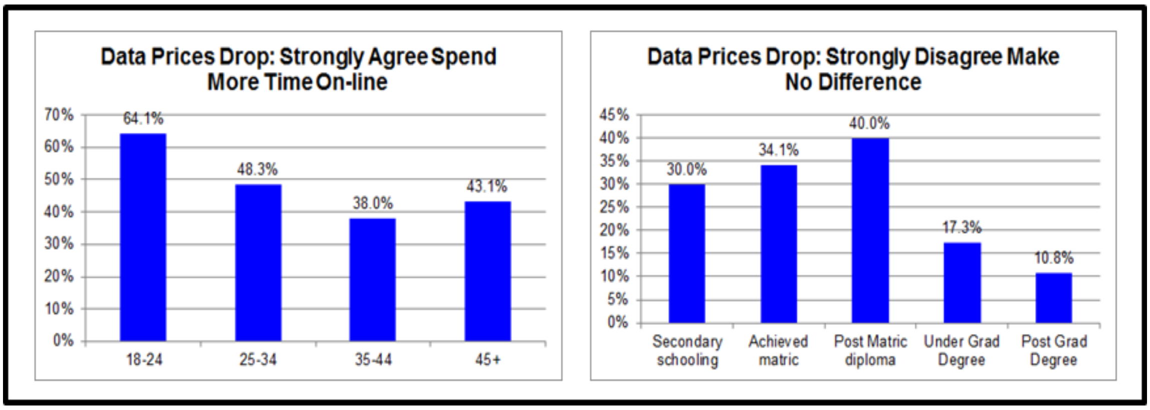
Figure: 6-33: Effect of Dropping Data Tariffs on the Amount of Time Subscribers spend On-line



The results are very similar to those of voice calls in that 75% of respondents Agreed or Strongly Agreed that if the price of Data tariffs were reduced they would spend more time on-line. The inverse question, Question 15.4, had similar results with only 27% Agreeing or Strongly Agreeing that the dropping of Data tariffs would make no difference to the amount of time they spent on-line, see Figure: 6-33.

As with dropping of Voice tariffs, Data tariffs follow exactly the same trends and with variances between groups being very similar, compare Figure: 6-34 with Figure: 6-32.

Figure: 6-34: Effect of Dropping Data Tariffs



6.7.3 Mobile Data Services Being Used

Question 16 of the survey was designed to determine what mobile data services were being used and if there were any demographic factors which were important to their usage. The data services or applications were combined into four groups to aid understanding and analysis. The four groups are Communication Services, Information Services, Financial Services and Entertainment Services.

6.7.3.1 Usage of Mobile Communication Services and Applications

The first group of services were the Communication Services. The services which constitute this group and relevant questions were the following:

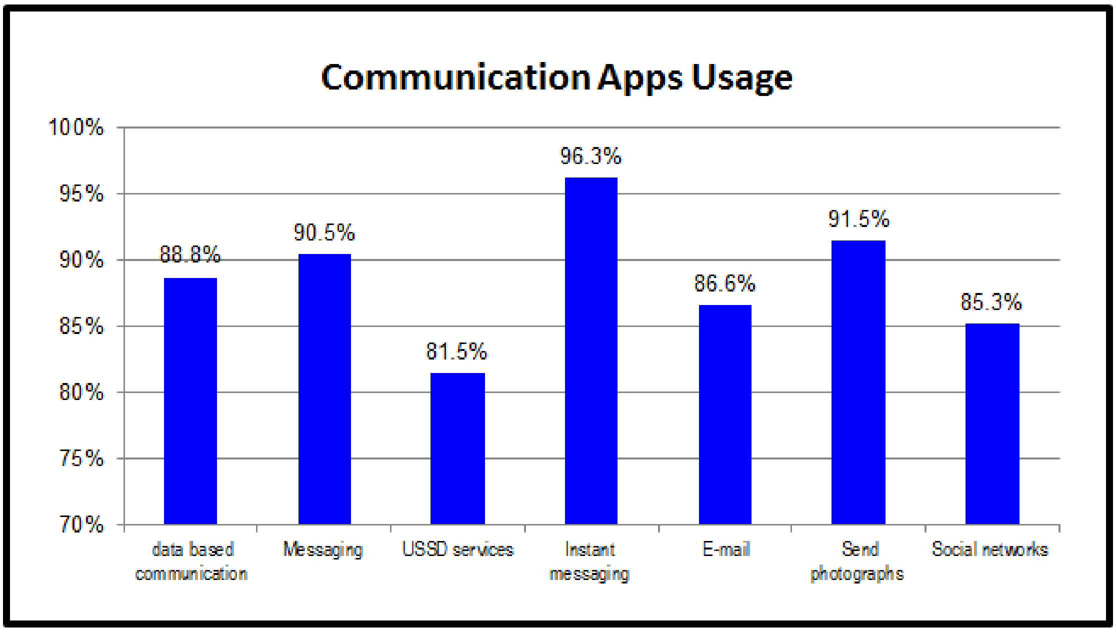
Messaging services: Messaging services include SMS (Question 16.3), USSD Commands (Question 16.4), Instant Messaging (Question 16.5), E-mail (Question 16.6), Picture Sharing (Question 16.9) and Social Networks (Question 16.17).

Alternative voice services: Video and voice services such as Skype, Face Time, WeChat and Whatsapp Voice (Question 16.2).

This group of applications has a high usage with the usage above 85% excepting for USSD Services, which are more difficult to use and remember, at 81.5%.

The analysis of these applications indicated that in contrast to the other usage measurements, there was no discernible trend visible with regard to factors such as age, income, etc. In fact any variation that was visible appeared to depend on the particular application and its functions.

Figure: 6-35: Usage of Communication Services and Applications



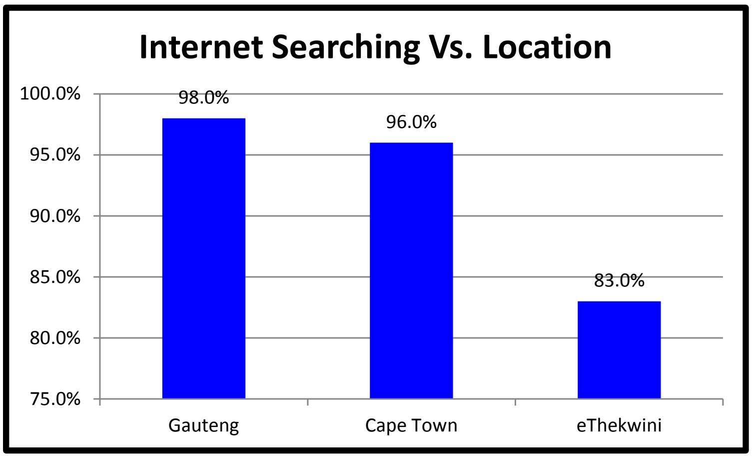
The detailed outputs of these factors are to be found in Appendix 8

6.7.3.2 Usage of Mobile Informational Services and Applications

Question 16.7 inquired about the usage of the subscriber's mobile device for general internet searching and usage and Question 16.19 for general information applications such as weather and maps.

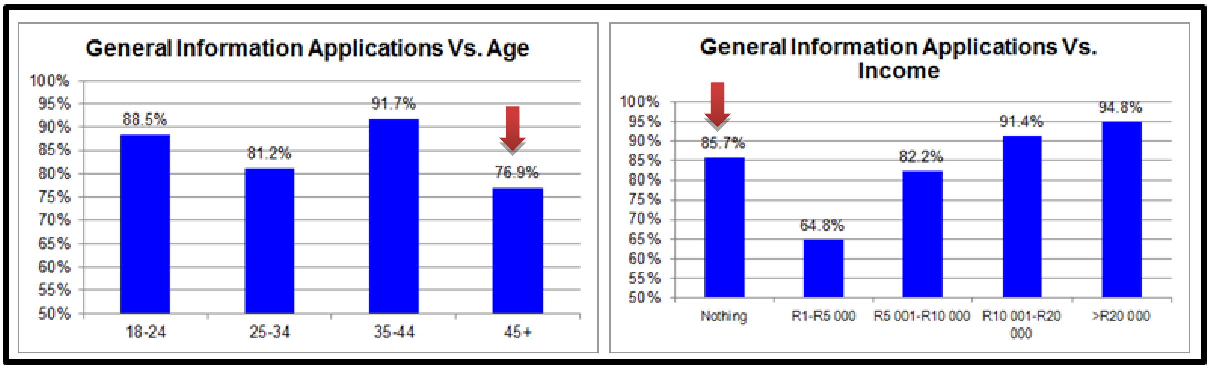
For general internet usage and searching, the average usage per demographic factor was generally above 90% and relatively constant across all the factors. Location was the only factor which shows a significant variation where eThekwini at 83% is considerably below Cape Town and Gauteng at 96% and 98% respectively, see Figure: 6-36.

Figure: 6-36: Internet Usage per Location (Question 16.7)



However for Question 16.19, General Information Applications, the usage patterns were different to the other two factors in this group. With this application the trends revert to the general trends, increasing usage with increased income. These trends are clearly highlighted in the usage versus monthly spend graph in Figure: 6-23 and discussed in section 6.7.2.1. This includes the drop between ages 35-45 and 45+ and high value for the group who are earning Nothing (ZAR0) per month.

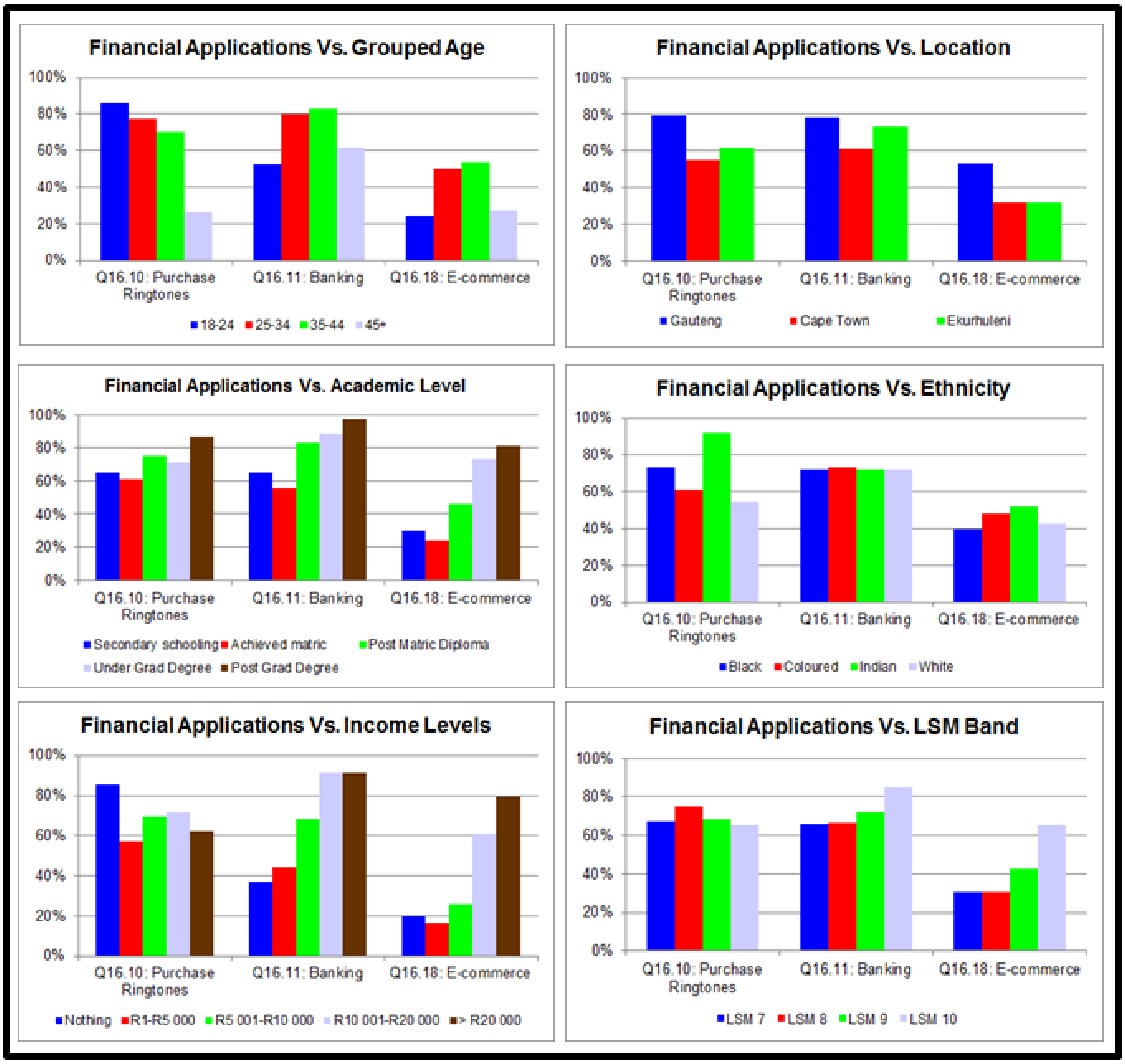
Figure: 6-37: Selected General Information Applications (Question 16.19)



6.7.3.3 Usage of Mobile Financial Services and Applications

The third group of applications is those applications that deal with Financial Services and e-commerce. There are two types of applications here, firstly the applications from financial institutions which allow the user to carry out all their banking and functions, while the second type is the e-commerce applications which enable a person to view and purchase a variety of commercial items. In the survey Questions 16.10, 16.11 and 16.18 address these applications.

Figure: 6-38: Financial Applications versus Demographic Factors



From Figure: 6-38 it can be seen that the usage of a particular financial application is very dependent on the application itself and which section of the population it attracts.

However, generally the trends first observed in the average monthly spend are present. These trends are the following:

Age: Usage increases until the age group of 34-44 and thereafter it falls, possibly due to the well-defined generational trends.

Maximum Academic Levels, Income levels and LSM bands: these grow in line with the trend that as income increases, subscribers have more disposable income and can afford to spend more on mobile services.

Ethnicity: also follows the trend of having little variation between the ethnic groups, except for the Indian ethnic group's purchasing of Ringtones (Ringtones can also be seen as entertainment and would then tie up with the ethnic trend in entertainment applications).

Location: again Gauteng has a much higher usage of these applications than eThekwini and Cape Town.

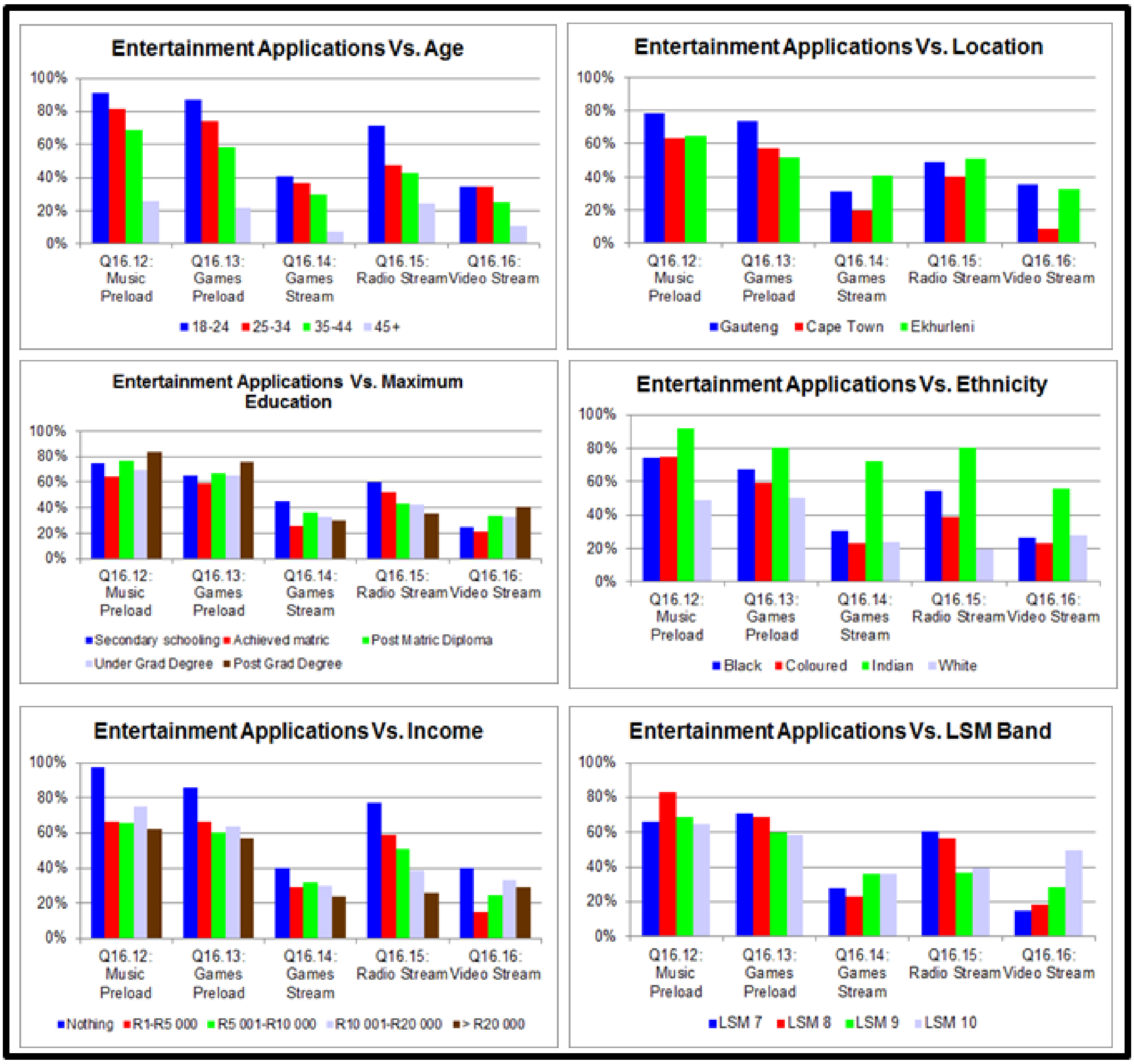
The complete tables are available in Appendix 8

6.7.3.4 Usage of Entertainment Services and Applications

There were two groups of Entertainment Applications surveyed here. The first was music or games that can be preloaded or downloaded once on to the mobile device, are then saved on the device and then have no further data requirements. The second types of applications were streaming applications where the entertainment was downloaded and consumed at that point and was not saved on the device. This second type of applications are very data intensive, especially those streaming both voice and video, and hence are the most expensive to use.

Figure: 6-39 gives a visual picture of the use of entertainment applications versus the various demographic factors. Two things are obvious when examining these applications and comparing them to the other applications examined in previous sections. The first point highlighted is that the usage of these applications is very dependent on the application itself, for example the average usage for video streaming is only 28%, while for preloaded music it is 71%. The second point to note is that the usage patterns per demographic factor are very different to the usage patterns in general. Some of these differences, with the appropriate demographic factors, are discussed below.

Figure: 6-39: Entertainment Applications versus Demographic Factors



Age: Contrary to normal trends for usage, the largest consumers for entertainment on their mobile devices are the 18-24 year olds and usage declines as they get older and do not increase as with the other types of applications. Also the drop off between the 35-44 year olds and the 45+ year olds is much more marked than with the other types of applications.

Location: Generally, entertainment follows the other types of applications with Gauteng being the highest consuming metropolitan area. However, when it comes to the streaming applications the consumption in eThekwini matches Gauteng.

Maximum Education Level: As opposed to the other application types, the pattern of increasing usage as Educational Levels increase is not repeated.

Ethnicity: With this factor the high consumption of entertainment on mobile devices by the Indian ethnic community is not matched anywhere else.

Income Levels: Again those who report Nothing (ZAR0) are the highest consumers of entertainment applications while those with the highest income (>R20000 per month) are generally some of the lowest consumers.

LSM Bands: Generally, the higher LSM bands are not larger consumers of entertainment applications than the lower bands. However, the games streaming applications and video streaming applications do increase with increasing LSM bands, but this is most likely driven by the financial concerns as these applications are data intensive and more expensive to consume. Also, only the most expensive satellite entertainment packages have a streaming option.

6.7.4 Summary of Usage Analyses

The analyses of the usage information collected in the survey phase highlighted very useful results with regard to usage patterns and the demographic factors associated with them. The various key outputs are discussed below.

6.7.4.1 Actual Usage

The analysis of the average amount of money spent on mobile services showed that the average subscriber in Gauteng spends ZAR1085.75; more than double that of subscribers in Cape Town at ZAR370.45 and eThekwini at ZAR407.50. Also, in terms of data used, in Gauteng 64.5% of subscribers were using 2GB or more per month and 41.5% of the subscribers were using more than 5GB per month, while in Cape Town only 37% were using 2GB or more and in eThekwini it was only 30%. These results support the assertion deduced from the analysis of the framework that location is the most important moderating factor.

6.7.4.2 Time Spent Interacting With a Mobile Device

The analysis showed that nearly 50% of subscribers interact with their mobile device for more than 4 hours per day. The surprising result here was that Cape Town at 61% had the highest percentage of people who interact with their mobile device, more than 4 hours per day. The results of the analysis on the questions regarding whether subscribers would spend more time making calls and use more data if tariffs were to decline was an overwhelming yes. Nearly 75% of subscribers felt that the ‘high’ mobile tariffs were constraining the time they spent interacting with their mobile device.

6.7.4.3 Demographic Factors and Usage

In general the following trends were discernible from the analysis of mobile usage.

Age: Usage increased as the subscribers got older, but there was then a drop in usage for the 45+ age group; often back to the levels of the 25-34 year age group.

Location: Generally, usage was higher in Gauteng than both Cape Town and eThekwini.

Maximum Academic Level, Income Levels and LSM Bands: As a general trend usage increased as academic and income levels increased, as subscribers had more disposable income and were able to spend more on mobile services. LSM Bands, which do not take into account income, per se, but look at lifestyles, followed this trend.

Ethnicity: There was no definite trend with regard to usage in the different ethnic groups that whites would use their mobile devices more than the other ethnic groups. In fact, surprisingly, for a country which has spent a significant part of its past history being segregated along ethnic lines, this demographic factor displayed the least variation.

6.7.4.4 Usage of the Different Types of Mobile Services and Applications

Question 16 in the survey examined the usage of different mobile services and applications. From this survey the services and applications were split into four types, namely: Communication Services, as it contains services and applications which are used to communicate between people such as messaging and e-mails; Information Services which are applications used to obtain information such as weather, traffic etc.; Financial Services; and Entertainment Services.

As a rule the usage was often very dependent on the application or service itself and usage would vary accordingly. However, generally the usage of the different types of applications followed the demographic trends outlined in section 6.7.4.3.

The usage for Entertainment Services was completely different to the other types of applications and services. The 18-25 age group were the largest consumers by age groups of these services, the Indian ethnic group was the largest consumer by ethnicity and the subscribers, who had no income, were the largest consumers by income levels.

6.7.5 Other Analyses

The survey included questions which collected additional information that could be used, if required, to help understand what influences the adoption of mobile data services. These factors are explained in more detail in the following sections.

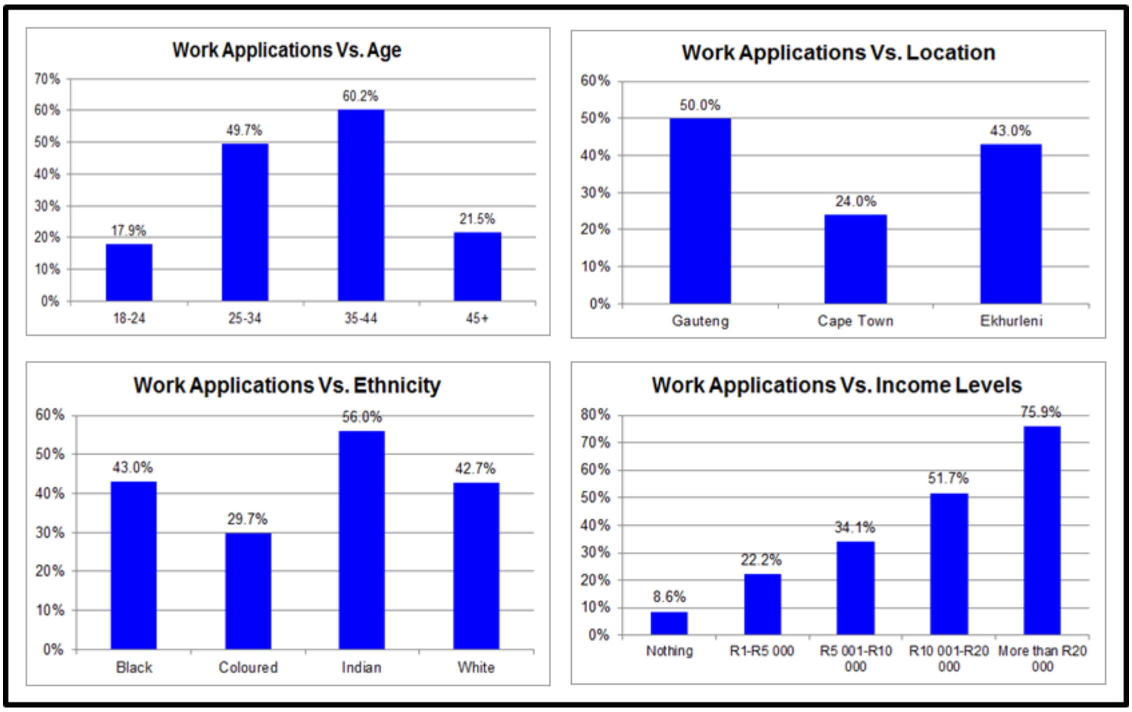
6.7.5.1 Usage of Work Applications

The first additional factor which was examined was with regard to the use of work related applications on mobile devices. It was included in Question 16, but not included in that analysis, as the motivation for the use of this application was different to the rest of Question 16. The usage of all the other applications was purely voluntary while with the work application usage was not totally voluntary.

As would be expected the use of these types of applications was lower than a lot of voluntary applications, but at an overall average of 41.8% was higher than expected. This indicates the extent of the penetration of the work situation and applications into the mobile services market.

Another surprising aspect was, although use was probably not totally voluntary, the usage per demographic factor was very similar to the usage of the other types of applications in terms of increasing usage with increased income and educational levels. Again grouped age showed the decline in usage in the 45+ age group.

Figure: 6-40: Work Applications versus Demographic Factors



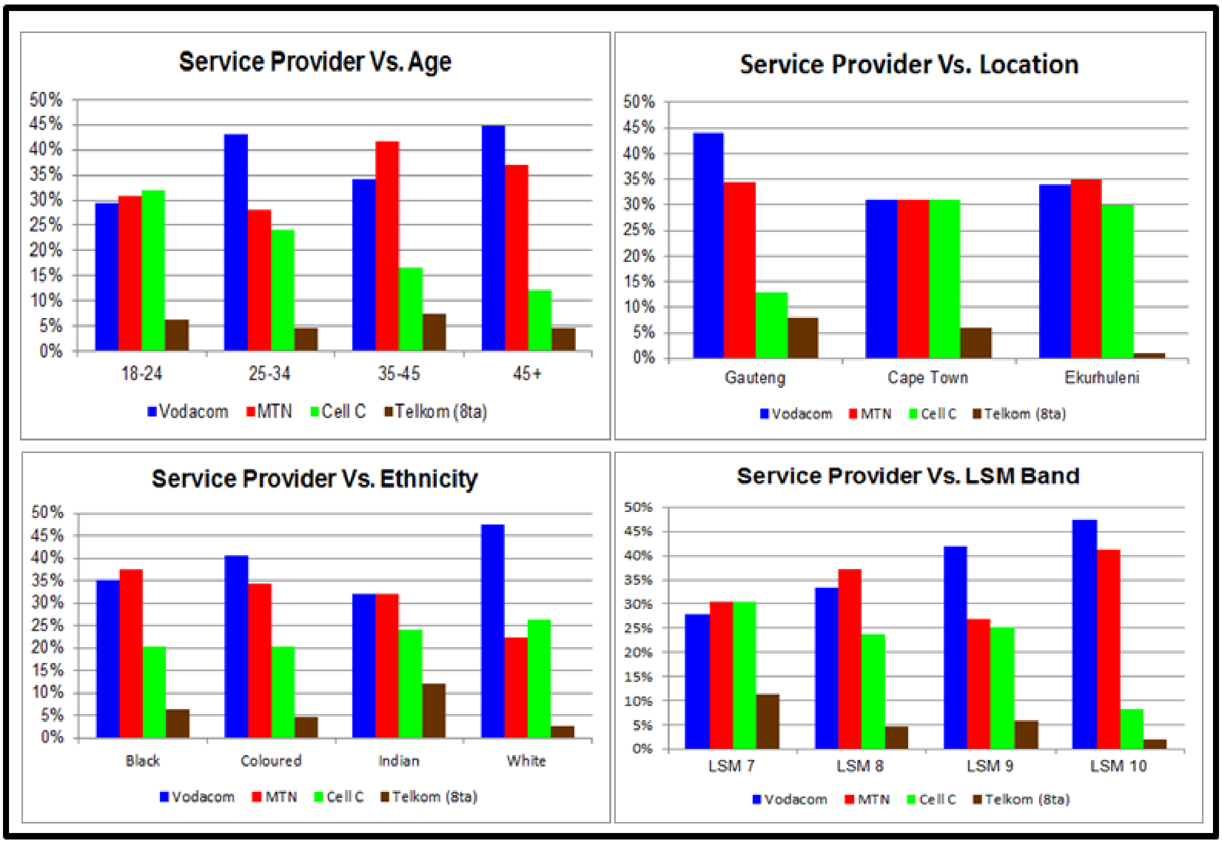
Gauteng was where the highest number of users resided, followed by eThekwini, with Cape Town being the least. A surprising result was with ethnicity where the usage by the black and white groups was similar at 43%, but at least 10% lower than the 56% for the Indian ethnic group, see Figure: 6-40

6.7.5.2 Choice of Service Provider

The next analysis conducted was to find out from subscribers which Service Provider they used and what drives their choice of service provider.

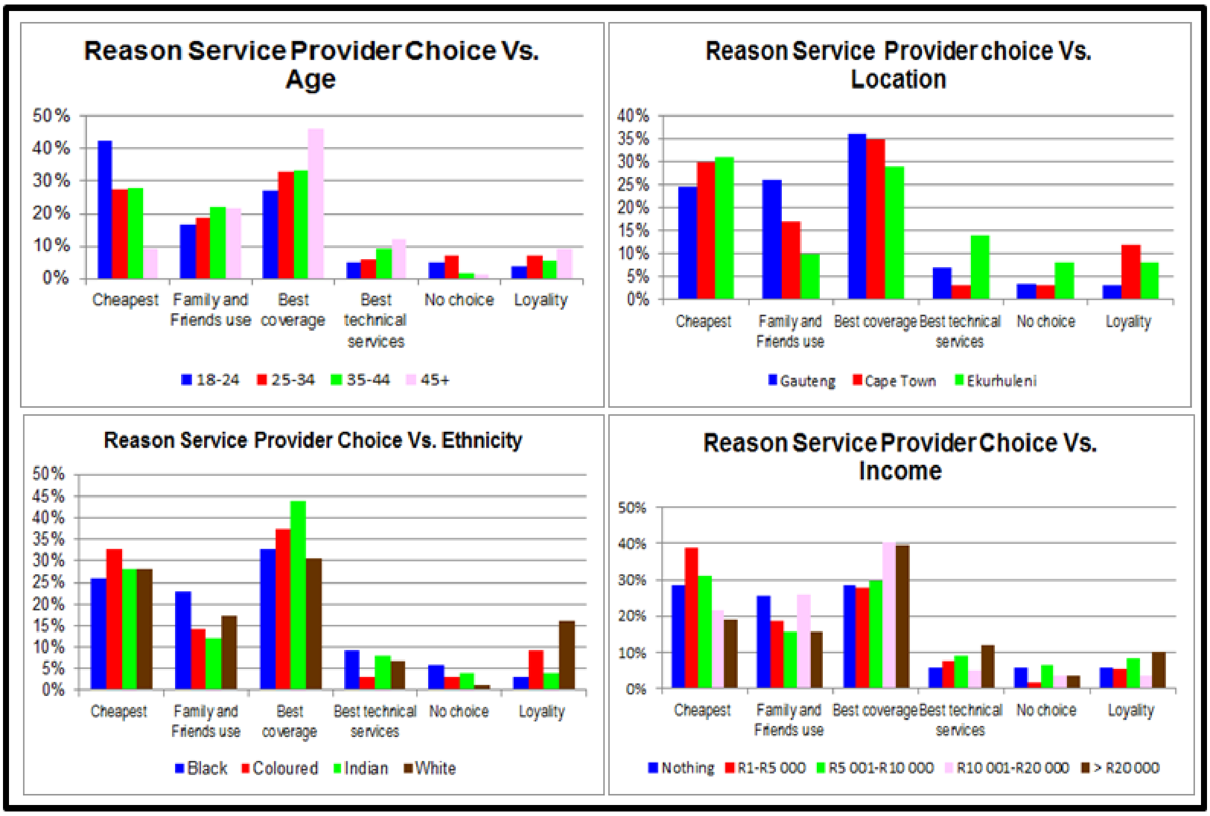
For these analyses the information that was recorded in Question 13.1 parts 7 and 8 was used. (Only the information from the primary device was used as not all users had two or more devices and the unequal use of multiple devices would distort the data.) The analysis concentrated on how the choice of service provider varied with various demographic factors. As can be seen from the graphs in Figure: 6-41 there were no distinct trends visible.

Figure: 6-41: Service Provider Choice versus Demographic Factors



The second analysis examined why people chose the network they did and also examined if there were any demographic variations. The analysis indicated with all the demographic factors that the top three reasons for the choice constituted nearly 80% of responses. The reasons subscribers chose a particular network were, in terms of overall choice, ‘Best Network Coverage’ at 34%, ‘Cheapest to Use’ at 27.5% and the ‘Network my Friends and Family Use’ at 19.8%. The first reason, ‘Best Network Coverage’ was strongly related to the MOSPMT construct of the framework, while the ‘Network my Family and Friends Use’ relates very strongly to the SPAV construct of the framework. The graph with Network Choice versus Grouped Age gives a very good indicator that for the 18-24 year olds cost is the driving factor but for the 45+ year olds it is Coverage and by default Quality of Service. The graphs of these analyses are found in Figure: 6-42.

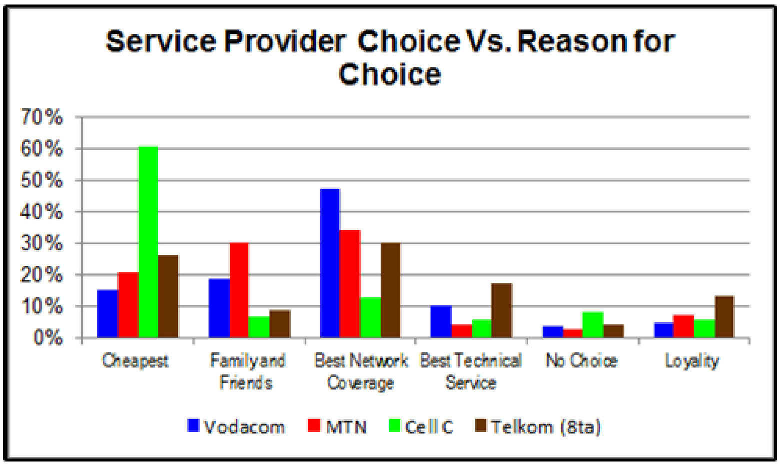
Figure: 6-42: Reason for Network Choice versus Demographic Factors



The final question asked was which of reasons subscribers attribute to their choice of service provider, see Figure: 6-43.

It is interesting to see that each of the Mobile Service Providers have a dominant characteristic that was recognised by subscribers: 60% of Cell C subscribers use that service provider because it is the cheapest network and the same reason was evident with Telkom. (The tariff tables given in Figure: 2-12 supported this). Nearly 50% of Vodacom subscribers choose it because they feel it has the best Network Coverage, while MTN had two attributes, high in Network Coverage at around 35% and around 30% for Family and Friends where it is highest of the four service providers.

Figure: 6-43: Network Attributes that Determine the Choice of Network



6.7.5.2.1 Analysis of Mobile Service Providers across all devices

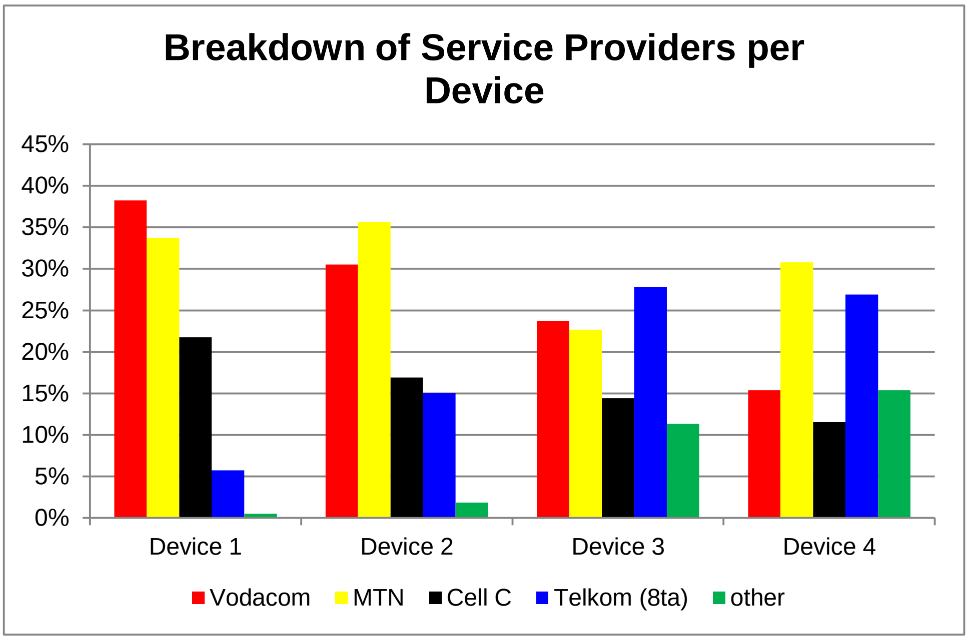
Question 13 made allowances for the fact that many people had more than one subscription and used more than one device. As indicated earlier although subscribers had more than one subscription only the data for the first or primary subscription was used for analysis purposes. One analysis was carried out across all devices to see if there was any change in network operators across the devices.

There were 26 subscribers who had four or more devices, while 97 or nearly 25% had 3 devices and 213 or 53% of subscribers had two devices, in total the 400 individual subscribers had a total of 736 subscriptions meaning each subscriber had on average 1.84 subscriptions each.

One interesting point emerged when the different mobile service providers were analysed across the different devices. For the primary device the market share splits per mobile service provider were fairly similar to the overall market with Vodacom and MTN being the dominant service providers. However, across the second, third and fourth devices an interesting trend emerged in that the market share of the larger more expensive operators declined while the share of the lower cost service providers increased. These third and fourth devices would be almost exclusively used for heavy data applications such as streaming and PC data applications and not used as an individual's primary handset. In such circumstances the criteria for choice of mobile service provider was driven purely by cost and other factors such as social pressure and aspirational value decline in importance. Figure: 6-44 shows this trend very clearly. Telkom, the cheapest data service provider, has 5.8% market share of the primary devices but has over 25% market share for the 3rd and 4th devices.

Figure: 6-44: Mobile Service Providers across all devices

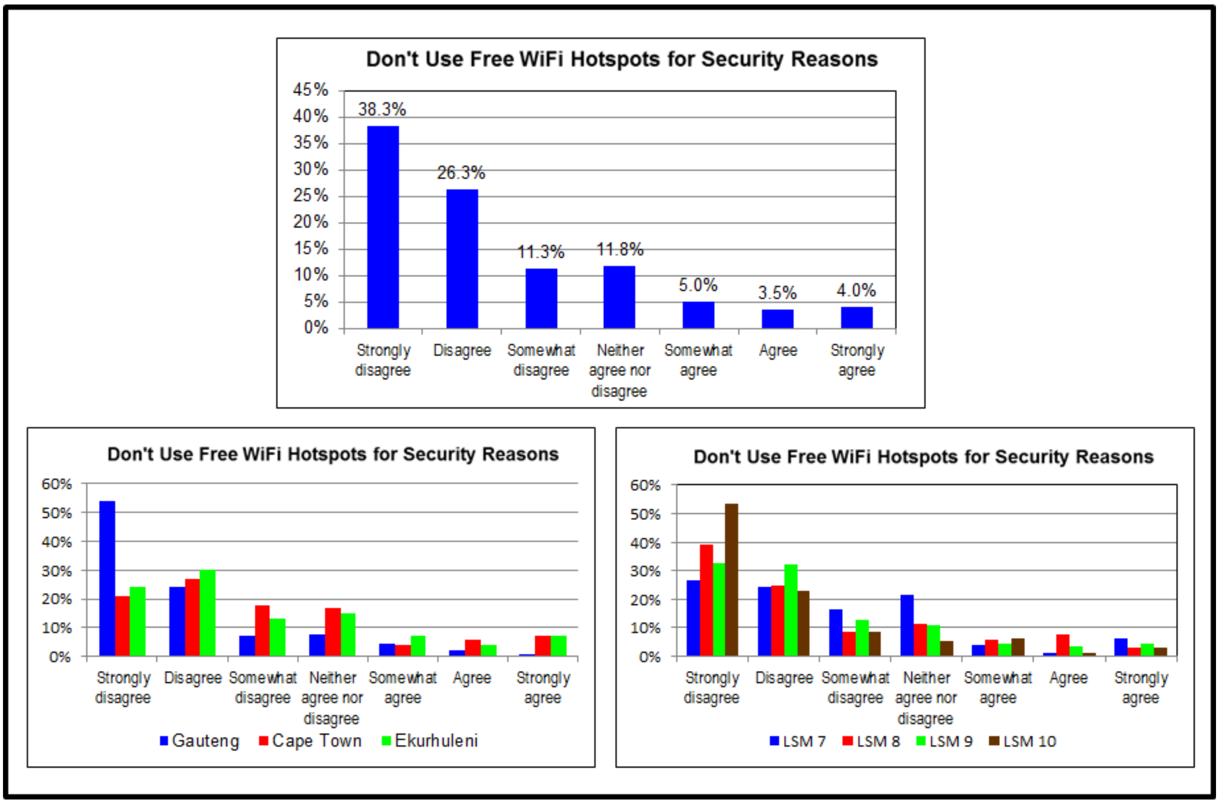
	Device 1	Device 2	Device 3	Device 4	Total
Vodacom	38.3%	30.5%	23.7%	15.4%	33.3%
MTN	33.8%	35.7%	22.7%	30.8%	32.7%
Cell C	21.8%	16.9%	14.4%	11.5%	19.0%
Telkom (8ta)	5.8%	15.0%	27.8%	26.9%	12.1%
other	0.5%	1.9%	11.3%	15.4%	2.9%
Total Devices	400	213	97	26	736



6.7.5.3 Security

The next analysis was to see if subscribers were aware of security concerns with mobile devices, especially if they use them for financial transactions, and that the use of free unsecured WiFi Hotspots was one of the easiest ways of getting malicious software on to a mobile device. The question was Question 26.12 in the survey instrument and asked respondents to rate the statement "*I don't use them [Free WiFi hotspots] for data security issues".*

Figure: 6-45: Responses to Question 26.12 "*I don't use Free WiFi Hotspots for security reasons*"



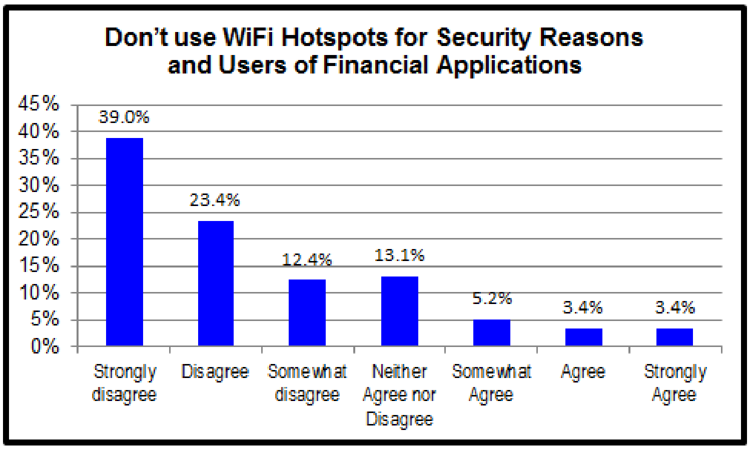
The result of this question was a serious concern, with on average 75% of subscribers being in the three bands that disagree with the statement regarding security concerns. Only two demographic factors showed a variation, namely Location where Gauteng at 54% was significantly higher in the Strongly Disagree category than other metropolitan areas of Cape Town at 21% and eThekwini at 24%. There was a similar result in LSM Bands where LSM 10 was at 53.6% in the Strongly Disagree category while LSM 7 was at 26.6%. See Figure: 6-45 for details.

6.7.5.3.1 Security and the Usage of Financial (Banking) Applications

The penultimate analysis in this section compared the response of subscribers with regard to their response to Question 26.12 in the survey instrument "*I don't use them [Free WiFi hotspots] for data security issues"* and the Users of Financial (Banking) Applications on their mobile device (Question 16.12).

The results were similar to the overall results of the subscribers who disagree with the Question 26.12 in that nearly 75% disagree with Free WiFi Hotspots having security issues and use financial applications on their mobile device at these Free WiFi Hotspots, see Figure: 6-46.

Figure: 6-46: Comparison of subscribers who disagree about Free WiFi Hotspots having security issues and using Financial Applications on their mobile devices

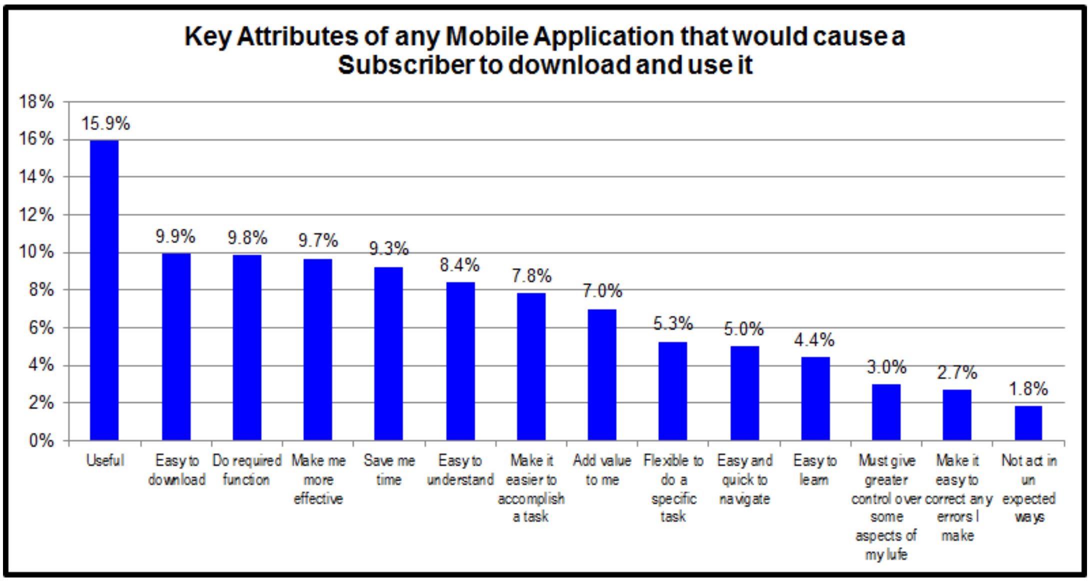


6.7.5.4 Key Factors in the Choice of Downloading and Using Applications

The last analysis in this section was to try and determine '*what were the key attributes of any mobile application that would cause a subscriber to download and use that application*?' In order to glean this information survey participants were asked to rate what they considered as the three most important factors from the list of PEU and PU factors that constituted Question 28 in the survey. The PEU and PU factors in the question were sourced directly from the research of Davis (1986) who used them with regard to the usage of Electronic Mail.

The results show that the key attribute is that the application must be 'Useful' at 15.9%', followed by 'Easy to Download' at 9.9%, 'Does the required Function' at 9.8% and 'Make me more effective' at 9.7%, see Figure: 6-47.

Figure: 6-47: What were the Key Attributes of any Mobile Application that would cause a Subscriber to Download and Use that application?



6.7.5.5 Summary of Additional Analyses

The first analysis performed in this section was to investigate whether there was any difference between the uses of mobile applications for business applications as opposed to voluntary use of applications. The results show that although the total usage might be lower, the trends with regard to the demographic factors are very similar.

The second analysis was to examine two aspects of mobile usage. The first part was to determine what Mobile Service Providers subscribers chose and if there were variances due to demographic factors. The analysis showed no discernible trends. The second analysis was to determine '*what was the key reason that caused subscribers to use that Mobile Service Provider*'. The three main reasons were 'Best Network Coverage' at 34%, 'Cheapest to Use' at 27.5% and the 'Network my Friends and Family Use' at 19.8%. Demographic factors played a big role in the choice, for example, in the Grouped Age category 'Cheapest' was major reason with the 18-24 age group, while for the 45+ group it was 'Best Network Coverage'. The results of this analysis support the Mobile Service Provider Marketing Tactics (MOSPMT) construct of the framework with the 'Best Network Coverage' and Social Pressure and Aspirational Value (SPAV) construct of the framework which is supported by the 'Network my Family and Friends Use' reason.

The final part of this analysis was to compare the choice of Mobile Service Provider to the attributes of that service provider. It was clear that Cell C was the choice of those who wanted the cheapest service provider and Vodacom for those who wanted the best network coverage and MTN for those who wanted to be on the same service provider as their friends and family.

The second last analysis was regarding Security issues with Free WiFi Hotspots. The results show that around 75% 'Disagree' with the statement that '*they don't use Free WiFi Hotspot due to security concerns*', and that was a similar result to those who were using financial applications on their mobile device.

The final analysis was regarding which were the most important attributes that subscribers required an application to have in order for them to download the application. The most important attribute was 'Useful' at 15% followed by 'Easy to Download' (9.9%), 'Does the required function' (9.8%) and 'Make me more effective' (9.7%).

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

There were three research questions which this research set out to answer. These three questions gave rise to five objectives and the achievement of these objectives enabled the research to answer the research questions. The first objective was to identify the particular factors that influence the adoption of mobile data services in the South African Mobile Telecommunications Market. The second objective was to use these factors to derive a framework that explains the adoption of mobile data services in this market. The third objective was to determine if there were any moderating or mediating factors with regard to the framework. See section 5.3.5 for a discussion regarding moderating and mediating factors and their differences. The fourth objective was to test the framework using a market survey and adjust it as necessary. The final objective was to use the survey to determine the current use of mobile data services, to and use the information gained to support the framework and moderating factors and to highlight any significant features in the South African mobile data market.

The research was carried out in two phases, the first phase was to determine what telecommunications experts in South Africa believed the adoption factors to be and use them in conjunction with already published research to develop a preliminary framework. The second phase was to test that framework in several metropolitan areas by way of a research survey, to analyse the resulting data to either confirm or improve the preliminary framework and test all the possible moderating and mediating factors. The usage data gained in the second phase would be used to support the findings with regard to the framework as well as moderating and mediating factors and highlight salient features in the market.

In this chapter all the information generated and analyses conducted in the previous chapters was gathered and discussed and from these conclusions recommendations were drawn. It then examined the research in terms of what new insights have been found and suggests further possible research.

7.2 FINAL FRAMEWORK

The interviews and subsequent analysis indicated that behavioural factors played a major role in the adoption of mobile data services in South Africa, hence the choice of the Technology Acceptance Model (Davies 1986) as the basis for the framework. The design of the framework resulted in the development of two new constructs for the adoption of mobile data services which will now be discussed in more detail.

7.2.1 Mobile Service Providers Marketing Tactics

This construct is defined as "*Actions and behaviours of the mobile service provider to get the individual mobile users to act in a specific way in terms of products used and when and where they use them*" (see section 4.3.2.1.1). Several of the participants in the interviews referred to the actions of the mobile service providers having an influence on the mobile services used. Mobile Service Providers Marketing Tactics (MOSPMT) was used in both a positive connotation where the service providers were promoting the use of a particular service by advertising it or by promotional pricing, which included reduced tariffs or bundling it at a reduced price with other services. The mobile service providers also used it in a negative way by trying to keep subscribers in the dark regarding a particular service, by denying subscribers support if they use that service and finally by threatening prohibitive pricing for those who use the service.

The Factor Analysis showed that this factor resolved into two constructs Mobile Service Providers Marketing Tactics Construct A (MOSPMT_A) and Mobile Service Providers Marketing Tactics Construct B (MOSPMT_B) with the second construct MOSPMT_B being used in the Final Framework and Framework of Interest.

7.2.2 Social Pressure and Aspirational Value

The second new construct was the Social Pressure and Aspirational Value (SPAV) construct. It is defined as "*Actions and/or pressures that the social groups surrounding an individual mobile telecommunications user place on that person and the social status that can be achieved through the use of mobile telecommunications*" (see section 4.3.2.2.1).

This factor was a combination of the image construct from the Perceived Characteristics of Innovating (PCI) framework (Moore and Benbasat, 1991) and the social factors construct from the Model of Personal Computer Utilisation (MPCU), and a third construct brand.

Social Pressure and Aspirational Value also acts as either a positive or as a negative inducer into the use of a telecommunications service. It acts to strengthen by increasing a person's status within their social circle if they use a particular service. Also, by making the use of a particular service a vital communication tool within a particular social circle, so as to be part of that circle one must use that service. However, the same thing works in reverse to inhibit adoption, if a particular service is seen to lower a person's status within the social circle, it will not be used.

Again the Factor Analysis showed that this factor resolved into separate constructs Social Pressure and Aspirational Value Construct A (SPAV_A) and Social Pressure and Aspirational Value Construct B (SPAV_B), with SPAV_A being the construct that was used in the Final Framework and Framework of Interest.

7.2.3 Perceived Ease of Use, Perceived Usefulness and Intention to Use

The final three constructs of the framework were taken from the Technology Acceptance Model (TAM) of Davis (1986), namely the Perceived Ease of Use, Perceived Usefulness and Intention to Use. The constructs are defined in section 4.4.3.1 and are based on the definitions from in the original Technology Acceptance Model (Davis, 1986).

7.2.3.1 Perceived Ease of Use

The construct Perceived Ease of Use (PEU) was defined as, "*the degree to which a person believes that using a particular system would be free of effort*" (Davis 1989: 320). Like the previous constructs, two separate constructs emerged in the Factor Analysis, Perceived Ease of Use Construct A (PEU_A) and Perceived Ease of Use Construct B (PEU_B). The construct PEU_B was used in the Final Framework, while PEU_A was used in the Framework of Interest.

7.2.3.2 Perceived Usefulness

The construct Perceived Usefulness (PU) was defined as "*the degree to which a person believes that using a particular system would have an intrinsic value for them*". As with the other constructs, two constructs emerged in factor analysis, Perceived Usefulness Construct A (PU_A) and Perceived Usefulness Construct B (PU_B). The construct PU_A was the construct which was used in the Final Framework and Framework of Interest.

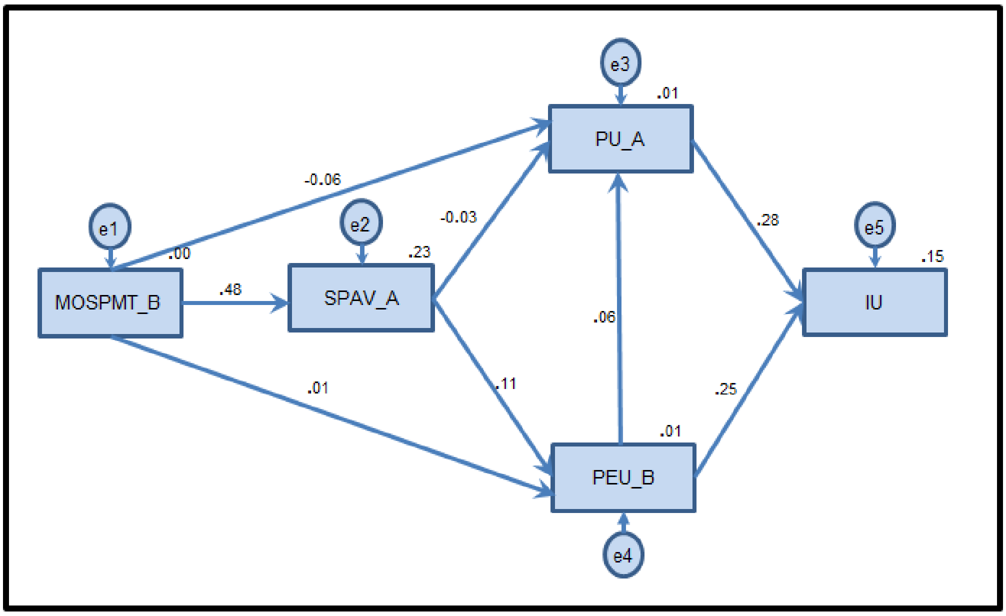
7.2.3.3 *Intention to Use*

The construct Intention to Use (IU) was defined as, "*the degree to which a person actually intends to use the system"* (see section 4.4.3.1). As there were only two questions for this construct only, one construct was identified and used in both frameworks.

7.2.4 Final Framework

Figure: 7-1 below shows the Final Framework, constructs only, with an explanatory power or R^2 of 15%. The fact that the Final Framework has an explanatory power of only 15% is not surprising. Section 2.3.5 discusses the Technology Acceptance Model (Davis, 1986) and indicates that all the current research on the model and its subsequent improvements and extensions such as the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh, *et al.*, 2003) are concerned with increasing the power and scope of the factors which influence the Constructs of PEU, PU and IU. Additionally, Rondan-Cataluña, *et al*. (2015) tested the TRA, Original TAM (with Attitude towards Use (A)), TAM (without A), TAM 2, TAM 3, UTAUT and UTAUT 2 on a sample of Mobile Internet users in Chile. They found that UTAUT 2 obtained the best explanatory power (R^2 of Use) of all the models at 0.247. The R^2 of Use of the UTAUT model was 0.232 and of the individual TAM models was around 0.196. Rondan-Cataluña *et al*. (2015) highlighted the fact that the levels of R^2 of Use were low in all models.

Figure: 7-1: Final Framework Maximum Explanatory Power



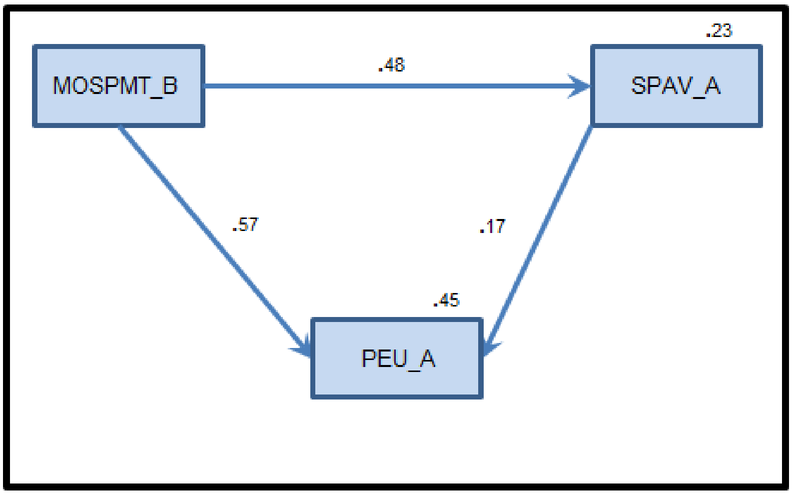
The fact that there were two factors which emerged in the Factor Analysis on all the constructs, except IU, meaning a 9 possible constructs to choose from, also acts to decrease the final R^2.

The key contribution of this framework is that it establishes Mobile Service Provider Marketing Tactics (MOSPMT) and Social Pressure and Aspirational Value (SPAV) as valid constructs in the Technology Acceptance Model.

7.2.5 Framework of Interest

A second framework was constructed where the construct PEU_B was replaced by the second construct from the factor analysis namely, PEU_A. This iteration of the Framework only produced an R^2 of 0.09, but it displayed a very important relationship that exists between the constructs MOSPMT_B, SPAV_A and PEU_A. This relevant portion of this framework, the Framework of Interest, is displayed in Figure: 7-2.

Figure: 7-2: MOSPMT, SPAV and PEU Triangle of the Framework of Interest



The model shows the correlation co-efficient between MOSPMT_B→ SPAV_A of 0.48 and between MOSPMT_B→PEU_A of 0.57 and between SPAV_A→PEU_A of 0.17. The correlation coefficients of 0.48 and 0.57 are highest in the framework. Additional analysis showed that SPAV_A is a mediating factor on the relationship between MOSPMT_B and PEU_A meaning that SPAV_A is a ‘mechanism’ variable through which MOSPMT_B exerts an effect on PEU_A. The mediator variable SPAV_A is one that helps explain the relationship between two other variables MOSPMT_B and PEU_A.

This relationship can be used to explain one of the anomalies of the South African and African mobile markets, namely the fact that mobile tariffs are expensive (see section 2.2.4.2) and yet the low price mobile service providers are not the leaders in market share. In South Africa the two mobile service providers with the lowest tariffs have only about 20% market share.

As explained in section 7.2.2 the SPAV construct has three parts, image, social factors and brand. Morgan and Govender (2017) showed that the mobile provider's brand is important in the use of mobile telecommunications services, and thus of the image the use of that brand portrays to others. Also, the PEU construct is one of the two factors which leads into the IU construct. If it is concluded that the three components of the SPAV construct affect the adoption of mobile services as well as the choice of mobile service provider, it would mean that the image which is associated with the service provider is important. Research with regard to consumers at the Middle of the Pyramid in South Africa has shown that brand plays a major role in any purchase decision in that any branded product which is purchased is displayed in that person's social networks to enhance their status (Chikweche and Fletcher, 2014), see section 2.4.4. A similar behaviour is seen with African consumers in the Bottom of the Pyramid in that they are becoming brand conscious and adopt modern technologies to prove their interest and desire for sophistication (Nakata and Weidner, 2012; Chikweche and Fletcher, 2010 and 2011; Weidner, Rosa & Viswanathan, 2010). Social networks are also very important to Bottom of the Pyramid consumers as they are a way of overcoming the vulnerabilities of poverty, because they can make individuals more confident and they can then assert themselves as consumers (Viswanathan, Sridharan and Ritchie, 2010). Also, the use of branded items, particularly in items in the mobile market, shows an individual's aspiration and desire to trade up (Jacobs and Smit, 2010).

Therefore, the low tariff mobile service providers have a problem with their image in that they are marked as cheaper (see section 6.7.4.2) and the use of such a service provider means the user can not gain as much social standing as by using a more expensive service provider. In short, using a cheaper network gives the message "*I am poor and cannot afford to use the more expensive service provider*", which is not the message they want to broadcast to their social network.

The following message which cannot be over-emphasised enough, is simple, "*Mobile Communications is not a "Price-Driven Market", but is driven by other factors not least of which is the status and social standing which it conveys"*.

A good example that shows the above can be seen with Bharti Airtel's entry into the African and particularly the Kenyan market where they bought the assets of the Kuwait based mobile service provider Zain in June 2010. They brought their successful 'Minute Factory' strategy from India and implemented it in Kenya and brought mobile tariffs down by nearly 70%. The result was that the other service providers simply dropped their prices to match the Bharti Airtel price and although Bharti Airtel's market share temporarily increased from about 9% to 15%, their actual revenues decreased as people used the savings on other consumer items (Safaricom, 2011; Kenya Communications Authority, 2011; Summers, 2013; Bharti Airtel, 2014). In fact it was only in April 2018 that Bharti Airtel finally made a full year profit on their African acquisition (Aulakh, 2018) eight years after the purchase.

7.2.6 Summary

The research found that the final framework is a valid framework that helps explain the adoption of mobile data services in South Africa and the two new constructs that were developed, the MOSPMT and the SPAV are valid constructs in the adoption of mobile data services. Therefore, the first four objectives of the research were achieved.

The mediating effect that the SPAV_A on the relationship MOSPMT_B to 'PEU_A in the Framework of Interest can explain why the low priced mobile service providers have a low market share.

The acceptance of the two new constructs in this framework indicates that the service providers are playing a role in the adoption of mobile data services including their marketing actions, both overt and discrete. The acceptance of the SPAV construct goes to highlight the importance that mobile plays in our society in that it is not just a mode of communication, but goes deeper into the fabric of society and has become a symbol by which people can show their social status and badge their importance.

7.3 USAGE OF MOBILE SERVICES, PARTICULARLY DATA SERVICES IN SOUTH AFRICA

The research also examined the usage of mobile services in four metropolitan areas in South Africa, namely Cape Town, eThekwini, Johannesburg and Tshwane, the last two being combined into a region called Gauteng. The analysis of this data was used to produce actual numerical data to confirm the findings of the analysis that produced the Framework. This data was also used to explain the effect of the various moderating factors on the adoption of mobile data services in terms of which the mobile service provider's understand most clearly, that of the amount of money an individual subscriber spends on the mobile services and how long that subscriber interacts with the services on a daily basis.

7.3.1 Monthly Spend and Monthly Data Usage on Mobile Services

The amount of money spent on mobile services showed the 'long-tail' distribution which is very prevalent with mobile telecommunications. On average, the respondents in the survey spent ZAR737.36 per month on mobile services with the lowest being ZAR50 and the highest being ZAR4000. Additionally, 22% of respondents spent more than R1000 per month on mobile services. The spend was very uneven with regard to location, in that subscribers in Gauteng were spending monthly on average 2½ to 3 times that what subscribers in eThekwini and Cape Town were spending. The effect of the various moderating factors, which are discussed in more detail in section 7.4, could clearly be seen on the patterns of spend and usage of mobile services.

With regard to mobile data usage nearly 50% of the respondents were using more than 2GB of mobile data per month, while nearly 30% were using more than 5GB per month.

7.3.2 Time Spent interacting with Mobile Devices Daily

The time the respondents spent interacting with their mobile devices on a daily basis supported the statistics with regard to spend and amount of data used, in that nearly 50% of the respondents spent more than 4 hours per day interacting with their mobile device. Admittedly, the survey was designed to look at the mobile subscribers who use their devices fairly extensively, but 4 hours equates to about half of a persons' working time or 25% of their waking hours. Additionally, the statistics on day and night time use showed that on average nearly 55% of the time respondents interacted with their mobile devices was during the day (6am to 6pm). This equates to 2¼ hours spent on the mobile device in peak working hours.

The respondents were also asked if mobile tariffs were to be reduced; whether they would they use more mobile data or make more calls. The results showed that 69% of the respondents would make more mobile telephone calls if mobile voice tariffs were to be reduced, and 66% said they would use more mobile data if data prices were to drop.

The amount of money people spend on mobile services monthly and the amount of time daily which they interact with their mobile device, shows the importance that mobile services have become in our lives. It also goes to strengthening the two new constructs especially the SPAV.

7.3.3 Use of Mobile Data Applications

For analysis purposes mobile data applications were divided into five groups based on the usage of application. The key trends of the five groups are highlighted.

7.3.3.1 Communication Services

This group of applications were those that were used for communicating between each other, the original purpose for the existence of mobile technology. It included both voice and text services, video calling services as well as data based communication services that are alternatives to the standard mobile voice service. These services were used by at least 95% of the respondents and no distinct usage trends based on moderating factors were visible. The one trend that was visible was that the usage was very dependent on the actual application itself. An example of this would be data intensive video calling and streaming services have generally a much lower usage than data efficient text based services.

7.3.3.2 Mobile Informational Services and Applications

There were two distinct patterns in this group of applications. The first was general internet services which were used by most of the respondents with no discernible deviations in usage as a result of moderating factors. However, for specific information applications such as weather, maps etc. the general trends outlined in section 7.4 were followed with usage increasing as income increases.

7.3.3.3 Mobile Financial Services and Applications

This group of applications consisted of two types, the first being applications from financial institutions such as banks, and the second type was e-commerce applications. From the data it was very clear that the usage of this set of applications was very dependent on the application itself and which segment of the population it was targeted at. The general trends were similar to those outlined below, with usage increasing as income increases, usage dropping in the 45+ age group and considerably more usage of these applications in Gauteng than the other two metropolitan areas.

One very interesting point with regard to the use of financial applications was the question regarding security of their device while using free WiFi Hotspots even though they pose a high risk for the introduction of malware and hacking of their mobile device. The frightening aspect was that the majority of users were willing to use free WiFi Hotspots and still use the same device for financial transactions.

7.3.3.4 Entertainment Applications

The usage of entertainment applications was very different to other classes of applications. Generally, usage was highest with the younger age groups, except for the high bandwidth video streaming applications where the cost of data restricted use and limited them to the more affluent sectors.

7.3.3.5 Work Applications

The usage of work applications was higher than expected in that nearly 42% of respondents indicated that they used such applications. This is a very good indicator of how ingrained mobile services have become in our lives. As the usage of work applications are generally mandatory and not voluntary, it was surprising to see that it followed general trends, namely: usage increases as income increases; usage drops for the 45+ year old age group; and the usage in Gauteng was significantly greater than the other two areas.

7.3.3.6 General Trends for the Usage of Applications

From the analysis of the usage of specific applications the following general trends can be deduced, while trends that relate to specific moderating factors are given in section 7.4

7.3.3.6.1 Usage generally depends on the function of the application:

The numbers of subscribers who used a particular application depended on the function of the application itself. For example, the usage of an application such as general internet search was used by at least 90% of subscribers, while video streaming was only used by 28%. Also, entertainment applications were generally used by younger subscribers and usage fell with increasing age, while the usage of financial and business applications increased with age.

7.3.3.6.2 Usage generally increased with an increase in income:

As would be expected the numbers of subscribers using an application increased as factors associated with increasing income grew, such as age and maximum educational level. There were however two general discrepancies to this general trend, and these were the low adoption of the subscribers in the oldest age category and the high usage of the subscribers who had no monthly income.

7.3.4 Summary

The analysis of the usage information indicates how deeply mobile communications has penetrated South African society. The subscribers surveyed indicated that on average they spent ZAR737 per month on mobile services with some subscribers spending ZAR4000 per month. 50% of subscribers indicated that they used 2GB or more of mobile data per month with a similar percentage of subscribers saying they spent more than 4 hours a day, that is 25% of their average waking hours, interacting with their mobile device, and probably the most disturbing statistic of all, over 65% said that if prices of mobile services, both voice and data, were to decline they would be using more mobile services and would be interacting with their device even more per day.

The usage information gained also indicated that the basic applications or services such as communication applications and internet searching were generally used by most subscribers with no real discernible patterns and trends with regard to the usage patterns. However, with the more specialist applications usage was driven by the actual application itself and the segment of users to which it was targeted and how data intensive it was. Also, in such applications the effect of the moderating factors was evident.

7.4 MODERATING FACTORS

The research examined which demographic, socio-economic and personal factors had an effect on the adoption of mobile data services in South Africa. These factors were examined from two directions, the first was their effect on the constructs of the framework as moderating factors and the second was their effect on the usage of mobile data services in South Africa.

The analyses of the constructs of the model and the usage analysis showed that Demographic factor, Maximum Educational Level, the Socio-economic factors, Income Levels and LSM Band and the Personal factors Technical Knowledge, Ability and Skills and Attitude towards Technology followed two general trends. The first trend was that the variations between the different groups in the factors were between the four groups at the extremes of the factor such as Secondary Schooling and Matric with Post Graduate Degree and Undergraduate Degree in the maximum educational factor. The second trend was that usage increased as the factors that were related to increasing available disposable income increased.

The income level Nothing (ZAR0) often produced results that were out of step with the general trends, for example the average spend on mobile services for this group was ZAR340.56 per month, nearly 3.5 times the average spend of ZAR104 per month for South Africa as a whole. However, this could be explained by the fact that the majority of subscribers interviewed in this group were aged 18-24 years old and were most likely to be students and were being financed by an outside source.

The following four factors require a more intensive discussion as they highlight several interesting aspects of the market.

7.4.1 Gender

The analysis of gender on the constructs of the framework indicated that gender was not a moderating factor, while the analysis of usage of mobile services confirmed this finding. It therefore can be concluded that gender differences do not play a factor in the adoption of mobile data services in South Africa.

This appears to be in contradiction to other research which shows it to be a factor. However, the discrepancy can be explained by the fact that this research used urban middle and upper class mobile subscribers and in these population groups the gender divide is probably not as significant as in the poorer rural segments of the population. The results could have been different if that segment of the population was included in the survey.

7.4.2 Age

In the analysis used to develop the Final Framework of the 47 questions analysed, variations between the various factors were found, by way of the Bonferroni and Games-Howell Post-hoc tests, in 18 questions, that is in about 38%. These Post-hoc tests showed that the variation was generally between the 45+ age group and the 18-24 and 25-35 age groups. Testing on the Final Framework confirmed that Age was a moderating factor on the framework.

The point is that the effects of biological age in the use of mobile services are often masked by other moderating factors particularly income. The fact is that, apart from two groups, generally the usage of mobile services increases along with biological age. However, as people get older their generally their responsibilities in employment increase and consequently so does their disposable income. The question is then whether the increased usage is being driven by age or by increased disposable income.

However, in the two groups which show exceptions, the usage drivers are certainly connected to biological age and the generational cohorts. The first is the 18-24 year old group, who were born after the introduction of mobile technologies, and whose usage is much greater than would be expected for their income levels. This is best highlighted by the portion of this age group who have no monthly income, but are spending on average ZAR340 per month on mobile services. So for them the amount spent on mobile services has a very high priority. This is the generation which were brought up in the information age and are totally comfortable with technology. Also, this group has the highest use of entertainment applications, indicating that entertainment services across a mobile device is the preferred channel of entertainment.

The second exception is the group of subscribers who are over 45 years of age. This group of people are probably at the height of their income generating potential, but with this group there is a very marked drop-off in the use of mobile services compared to the 35-44 age group. This drop can be attributed directly to biological age factors, as this group consists of people who were born before 1971, members of the Baby Boomer and first part of the Generation X age cohorts. These people would have reached maturity before the introduction of personal computing and mobile technologies. This group of people are not embracing mobile and information technology as much as those subscribers who were introduced to it in their formative years. The reason is they could possibly lack the technical knowledge and skill sets combined with the lack of confidence with the technology.

7.4.3 Ethnicity

In a country such as South Africa with its history of Apartheid, the differences between the different ethnic groups would be expected to be a major factor in a survey such as this. It is a moderating factor, but it is nowhere as strong as would be expected, especially between the black and white ethnic groups.

For the questions that were used to build the constructs of the framework, out of the 47 questions there were only 25 (53%) where there were variations between the ethnic groups. The largest variation was between the Asian and Black Ethnic groups, followed by the variation between the Asian and White Ethnic groups. In the questions which were used to determine usage, 62% of questions showed a variation in the groups. The largest variations were seem between the Black and Coloured ethnic groups followed by Coloured over against the Indian ethnic group.

The fact that ethnicity is not as large a factor in the adoption of mobile services as was expected can probably be explained by the following points. Firstly, the survey was carried out on the higher echelons of society, so the poorer less literate subscribers have not been included and as the majority of those people come from either the black or coloured ethnic groups, their inclusion could have changed the dynamic. Secondly, the construct SPAV indicates how important mobile technologies are in the structure of modern South African society, and this effort of using mobile to indicate status with mobile services and devices diffuses the social divide.

It must also be highlighted that certain types of applications are used more by some ethnic groups than others; with the use entertainment applications being higher for the Indian ethnic group than any the other three groups.

The last reason for the lack of variance between the ethnic groups could be that the efforts over the last 25 years to make South Africa a society in which the barriers of gender and ethnicity are fading and beginning to bear fruit.

7.4.4 Location

This demographic factor which gave the most unexpected results, in that the highest number of questions which had variations was the demographic factor Location. In fact, of the questions used to build the constructs of the framework, fully 75% of them had variations between the three locations and of these questions with variations at least, 80% were at the higher <0.01significance level. The majority of the variations were between Gauteng and the other two metropolitan areas.

With regard to usage the difference was even more startling. The monthly spend on mobile services in Gauteng, at ZAR1084 per month, was more than 2½ times that of eThekwini, at ZAR407, and nearly 3 times that of Cape Town, at ZAR370. Similar results were visible in the amount of data used, with nearly 65% of subscribers in Gauteng using more than 2GB per month, which is nearly double that of the other metropolitan areas. More than 80% of the questions with regard to usage showed statistically significant variations in the responses between Gauteng and the other two locations.

The research makes it very clear that the mobile technology is far more incorporated in peoples' lives in Gauteng than in eThekwini and Cape Town. The subscribers in Gauteng spend at least 2½ times the amount of money on mobile services than the other metropolitan areas. They also have more high monthly data users than the others, they use more applications voluntarily and Gauteng has a higher incidence of the use of work related applications.

The large difference between Gauteng and the other two metropolitan areas have significant consequences for mobile service providers and regulatory bodies in South Africa and these will be discussed further in the following section.

Statistically, the variations are such that the question needs to be asked whether the variations are of such a magnitude that Gauteng should be treated as a different population than eThekwini and Cape Town, or whether they are just at the two extremes of one population.

7.4.5 Summary

The information gained from the framework part of the survey and the usage sections of the survey were used to analyse the moderating factors that were acting on the framework, and the usage that gave substance to those factors.

The moderating factor Location was the largest and strongest moderating factor in all parts of the research. Gauteng was very different to eThekwini and Cape Town in terms of amount spent on mobile services and the associated behaviour.

The moderating factor Age showed distinct patterns with higher than expected usage in the younger 18-24 year old age groups and lower in the people who did not grow up in the computer and mobile communications era, namely the subscribers over 45 years of age.

Another factor which was acting in concert with the age factor was that of Income. Generally, as monthly income and factors associated with income such as education level and LSM band increased so did the usage and spend on mobile services. However, for the 18-24 year olds and the 45+ year olds, the age factor was stronger than the income effect.

Surprisingly the effect of ethnicity was much smaller than expected.

With the moderating factors being the link between the framework and usage sections of the research and supporting each other and highlighting significant features, all five objects of this research have been achieved and the three research questions have been answered.

7.5 IMPLICATIONS OF THIS RESEARCH

The implications of this research are discussed in conjunction with the results which gave rise to them.

The first important research finding is the addition of two new constructs for the final framework, namely the Mobile Service Providers Marketing Tactics (MOSPMT) and the Social Pressure and Aspirational Value (SPAV).

The SPAV construct is very important in that it highlights the importance of mobile communications in the social structure of South African society, and that it is one of the methods by which people badge their wealth and social standing, either by their mobile device(s) or by the use of social media applications like Facebook

The fact that the MOSPMT construct influences the adoption of mobile data services is not a surprise, in that after all why do companies do marketing if it was not to increase sales. However, what is important here is the mechanism by which it influences through the SPAV Construct. The fact that it the SPAV Construct is a mediating factor in the relationship between the MOSPMT and the Perceived Ease of Use (PEU) means they are intrinsically linked in a system. It highlights the importance of brand, image and social pressure with regard to the use of a mobile service provider. Also, as explained earlier, this link explains why the mobile service providers, who compete using a low price strategy, are not as successful as the others.

This research finding has implications for mobile service providers, particularly those who have a low price strategy, in that they are using a sub-optimal strategy.

This research finding also has significant implications for the Government and the Information and Communications Regulatory Authorities in South Africa with regard to future developments in the market. They must take cognisance of this with future licensing of any new service providers and the development of the Wireless Open Access Network (WOAN), (BMI Research, 2017). Rolling out a WOAN and having small scale regional service providers, such as municipalities or local empowerment groups as a way to increase the competition in the market should be avoided, as this would not be successful due to the brand issues. The municipal WiFi systems which are successful, such as in Cape Town, have been built on the fact that they can be used free of charge. However, such a model is only really viable in the large urban areas where there is enough income to support the cost.

The second research finding that has major implications for South Africa is the extent to which mobile communications has penetrated the very core of South African society. Anything that takes up a quarter of a person’s waking hours, a significant amount of their disposable income and people are indicating that they would spend more time on their devices if prices dropped, must be influencing our society in numerous ways and society as a whole does not appear to be aware of it.

The moderating factor Location shows that as far as mobile communications are concerned Gauteng is very different from Cape Town and eThekwini in terms of spend, usage and attitudes. This means that the metropolitan areas of South Africa can no longer be considered as a single market for mobile communications. The implications of this for mobile service providers is large, as they will now have to start having separate marketing campaigns, promotions and strategies for the Gauteng and the other metropolitan areas, if they want to avoid using sub-optimal strategies.

The dynamics that are at play in the interactions between the moderating factors Age, Income Levels and Maximum Educational Levels needs to be understood as the implications of this can be large on any future rollouts of e-government and e-services. For the youngest group, the 18-24 year olds, there would be no issues as mobile is already fully integrated into their lives. However, the for the age groups 25-34 and 45-44 above that as income increases so does usage, until the age group of 45+ where it drops dramatically. Additionally, as the maximum educational level increases, so does usage. These trends have two implications. The first is with regard to the mobile service providers who are not properly servicing this 45+ age group who, because of the lack of information technology in their formative years, do not use it to its fullest as with other age groups. The second implication is with regard to the proposed rollout of e-services in South Africa. Any rollout of such services will mean that the providers will have to pay special attention to the people who are less well educated and especially those above 45 years old, as they will need intensive training and support to be able to utilise the technology. Failure to do this will mean that such initiatives will have little chance of success.

7.6 LIMITATIONS

As explained above, this research does not cover the poorer rural segments of the population. The General Household Survey of Statistics South Africa (2012) indicates that this segment is likely to be poorest, least educated and with the most basic of lifestyles.

The research was cross-sectional and conducted on the South African mobile data urban telecommunications market and thus may not be valid outside of this region.

This study only covers mobile data services delivered by Communication Service Providers and those suppliers which offer services across this medium. Hence, it includes suppliers such as mobile Value Added Service Providers (VAS) and Internet Service providers (ISP's), but it excludes all fixed telecommunications services, broadcast and media services.

7.7 CONTRIBUTIONS FROM THIS RESEARCH

This research builds on the current body of research into the Technology Adoption Model. It adds to current research which is aimed at determining all the factors which are precursors to the constructs of Perceived Ease of Use (PEU) and Perceived Usefulness (PU) by adding two new factors in the form of the Mobile Service Providers Marketing Tactics (MOSPMT) and the Social Pressure and Aspirational Value (SPAV).

The research proposes an alternative framework where the SPAV is a mediating factor on the relationship between the MOSPMT and PEU*.* This relationship can be used to explain why the Mobile Service Providers who compete on a low price strategy, are not as successful as other service providers who compete on technical, coverage and quality factors.

This research confirms that the demographic factors Age, Maximum Educational Level and Ethnicity are moderating factors for the final framework. It also confirms that Income Levels and Living Standards Measure are socio-economic moderating factors. Technical Knowledge, Ability and Skills as well as Attitude towards Technology are also moderating factors.

The research shows that Gender is not a moderating factor on attitudes towards or use of mobile services in South Africa.

The research shows that Location is the strongest moderating factor with regard to the adoption of Mobile Data Services in urban South Africa. The drivers of adoption and the actual usage of mobile data services in the Province of Gauteng, which includes the metropolitan areas of Johannesburg and Tshwane, are completely different to those in the metropolitan areas of eThekwini and Cape Town. The differences are large enough that mobile service providers should be considering them to be completely different segments and have separate marketing strategies and plans for Gauteng.

The research shows that in South Africa the group of people who were born before 1970 are not being optimally serviced by the mobile service providers, in that these are the subscribers who generally have the most disposable income to spend on mobile services, yet are smaller users than the subscribers younger than them.

7.8 FURTHER RESEARCH

This study has raised questions that need to be answered by further research. These questions are in four major areas.

The first area is the universality of these findings with regard to South Africa. The research was conducted in three metropolitan areas with current mobile data service users and those in Living Standard Measures (LSM) bands 7 to 10. Research needs to be conducted to see if it is applicable to less sophisticated subscribers who live in rural areas and fall into the LSM bands 1 to 6.

The second area is regarding the constructs of Mobile Service Provider Marketing Tactics (MOSPMT) and Social Pressure and Aspirational Value (SPAV) and to see if they are only valid in South Africa or also in the rest of Africa. Further research particularly needs to be carried out with regard to the importance of image and social standing associated with mobile communications. Is it applicable to the rest of Africa or even other developing countries?

The third area is in regard to the difference location makes in the behaviours and usage of mobile communications. The question that needs to be asked is if this is unique to South Africa as a result of its past history and large distances between the metropolitan areas, or are there other countries with similar findings? If there are other areas, it means the period in which mobile service providers could work with a country level segmentation, are over and that they must start segmenting at city level as well as smaller micro segmentation level.

The fourth area of future research is to examine the effects that mobile communications and particularly mobile data services is having on South African society. The amount of time and money which South Africans put into mobile communications cannot leave society untouched.

7.9 FINAL REFLECTIONS

When starting on this journey many years ago, the researcher had no idea where it would lead. The researcher had a vision to try and understand why, by using purely statistical and economic knowledge and techniques, (Well after all, the researcher is by training a natural scientist), the researcher could never produce an accurate forecast for the take-up and use of new telecommunications services in Sub-Saharan Africa. The researcher was always way too optimistic with some, and way too pessimistic with others, so a search to hunt for that missing ingredient was undertaken.

Years later the researcher finally thinks that they have found that missing ingredient, and it boils down to the core of our existence, our needs, wants, behaviours, values and all those things that make us human beings so complex. The researcher learnt that you cannot do forecasting or explain the use of products that end up having such an influence on peoples' lives with purely economic factors. You cannot remove the people and their influence, because it is core to the problem.

So the researcher has come to the end of this journey of discovery, sweat, tears and hard work and as they reflect on it, has come to the conclusion that for every question that was answered, about ten new ones are created. The more that is learnt, the less is known. This journey to understand the world and its people will never end. The researcher has just reached that waystation to rest, recuperate and prepare for the next stage of the journey.

LIST OF REFERENCES

Abbate, J. 1999. *Inventing the Internet.* Cambridge, MA: MIT Press.

Abdinoor, A. and Mbamba, U.O.L. 2017. 'Factors influencing consumers' adoption of mobile financial services in Tanzania', *Cogent Business and Management*, 4(1): 1-19

Agar, M. 1979. 'Themes revisited: Some problems in cognitive anthropology'. *Discourse Processes,* 2(1): 11–31.

Agar, M. 1980. 'Getting better quality stuff: Methodological competition in an interdisciplinary niche'. *Urban Life,* 9(1): 34–50.

Agrawal, J., Patel, R., Mor, P., Dubey, P. & Keller, J.M. 2015. 'Evolution of Mobile Communication Network: from 1G to 4G', *International Journal of Multidisciplinary and Current Research*, 3(Nov/Dec): 1100-1103.

Agarwal, R. and Prasad, J. 1997. 'The role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies', *Decision Sciences*, 28(3): 557-582.

Agarwal, R. and Prasad, J. 1998. 'A Conceptual and Operational Definition of Personnel Innovativeness in the Domain of Information Technology', *Information Systems Research,* 9(2): 204-215.

Ahmed, Z., Kader, A., Rashid, M.H.U. & Nurunnabi, M. 2017. 'User perception of mobile banking adoption: an integrated TTF-UTAUT model', *Journal of Internet Banking and Commerce*, 22(3): 1-19.

Ajzen, I. 1991. 'The Theory of Planned Behavior', *Organizational Behavior and Human Decision Processes*, 50(2): 179-211.

Ajzen, I., Timko, C. & White, J.B. 1982. 'Self-monitoring and the Attitude–Behavior Relation', *Journal of Personality and Social Psychology*, 42(3): 426-435.

Alfreds, D. 2016. *Here's how free public Wi-Fi is growing in SA*, [online]. Johannesburg: Fin24tech 24 June. Available from <https://www.fin24.com/Tech/Mobile/heres-how-free-public-wi-fi-is-growing-in-sa-20160624>, [Accessed: 13 May 2017].

Almasri, A.K.M. 2018. 'New mobile learning process model for higher education students in Jordanian universities', *International Journal of Information, Business and Management*, 10(1): 201-213.

Al-Somali, S.A., Gholami, R. & Clegg, B. 2009. 'An investigation into the acceptance of online banking in Saudi Arabia' *Technovation*, 29(2): 130-141.

Alzubi, M.M., Al-Dubai, M.M. & Farea, M.M. 2018. 'Using the Technology Acceptance Model in understanding citizens' behavioural intention to use m-marketing among Jordanian citizens', *Journal of Business and Retail Management Research,* 12(2): 224-231.

Amin, H., Hamid, M.R., Tanakinjal, G. & Lada, S. 2006. 'Undergraduate attitudes and expectations for mobile banking', *Journal of Internet Banking and Commerce*, 11(3): 1-9.

Amornkitpinyo, T. and Piriyasurawong, P. 2017. 'The Concept Framework of Structural Equation Model of Mobile Cloud Learning Acceptance for Higher Education Students in the 21st Century', *TEM Journal*, 6(3): 464-468.

Anderson, C. 2006. *The Long Tail*. London: Random House

Anderson, C. 2010. 'Presenting and Evaluating Qualitative Research', *American Journal of Pharmacuetical Education*, 74(8): 1-7.

Anderson, O.R. 1992. 'Some interrelationships between constructivist models of learning and current neurobiological theory, with implications for science education', *Journal of Research in Science Teaching*, 19(10): 1037-1058.

Antonelli, C. 1991. *The Diffusion of Advanced Technologies in Developing Countries.* Paris: Organization for Economic Cooperation and Development.

Armstrong, C.M., Hoyt, T., Kinn, J.T., Ciulla, R.P. & Bush, N.E. 2017. 'Mobile Behavioral Health Applications for the Military Community: Evaluating the Emerging Evidence Base', *Best Practices in Mental Health*, 13(1): 105-118.

Arthur, C. 2012. *Digital wars: Apple, Google, Microsoft and the battle for the internet*. London: Kogan Page Publishing

Aslam, W., Ham, M. & Arif, I. 2017. ‘Consumer behavioral intentions towards mobile payment services: an empirical analysis in Pakistan’, *Trziste = Market*, 29(2): 161-176.

Asnafi, A.R., Moradi, S., Dokhtesmati, M. & Pakdaman, N.M. 2017. ‘Using Mobile-Based Social Networks by Iranian Libraries: The Case of Telegram Messenger’, *Library Philosophy and Practice,* [online], 1539: 1-16. Available from <http://digitalcommons.unl.edu/libphilprac/1539>, [Accessed: 12 April 2018].

Aulakh, G. 2018. *Airtel Africa completes full year of profitable operations with 4Q 2018 profit of Rs 698.7 crore*, [online]. India: ET Telecom, Economic Times 24 April. Available from <https://telecom.economictimes.indiatimes.com/news/airtel-africa-completes-full-year-of-profitable-operations-with-4q-2018-profit-of-rs-698-7-crore/63898977>, [Accessed: 16 July 2018].

Avgerou, C. 2010. ‘Discourses on ICT and Development’, *Information Technologies and International Development*, 6(3): 1-18.

Awa, H.O., Baridam, D.M. & Nwibere, B.M. 2015. ‘Demographic determinants of electronic commerce (EC) adoption by SMEs: A twist by location factors’, *Journal of Enterprise Information Management*, 28(3): 326-345

Babbie, E. 2008. *The Basics of Social Research*. 4th ed. Belmont, CA: Wadsworth.

Babbie, E. and Mouton, J. 2001. *The Practice of Social Research*. Cape Town: Oxford University Press.

Bagchi, K., Hart, P. & Peterson, M. F. 2004. ‘National Culture and Information Product Adoption’, *Journal of Global Information Technology Management*, 7(4): 29-46.

Bakare, A.S., Owusu, A. & Abdurrahama, D.T. 2017. ‘The behavior response of the Nigerian youths toward mobile advertising: An examination of the influence of values, attitudes and culture’, *Cogent Business and Management,* 4(1): 1-18.

Bandura, A. 1978. ‘Reflections on self-efficacy’, *Advances in Behaviour Research and Therapy,* 1(4): 237-269.

Bandura, A. 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice Hall.

Bankole, F.O., Bankole, O.O. & Brown, I. 2017. 'Influences on cell phone banking adoption in South Africa: an updated perspective', *Journal of Internet Banking and Commerce*, 22(3): 1-16.

Baptista, R. 1999. 'The diffusion of Process Innovations: A Selective Review', *International Journal of the Economics of Business*, 6(1): 107-109.

Baron, R.M. and Kenny, D.A. 1986. 'The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations', *Journal of Personality and Social Psychology*, 51(6): 1173-1182.

Barry, A.E., Chaney, E.H., Stellefson, M.L. & Chaney, J.D. 2011. 'So you want to develop a survey: Practical considerations', *American Journal of Health Studies*, 26(2): 97-105.

Bass, F.M. 1969. 'New Product Growth for Model Consumer Durables', *Management Science*, 15(5) Theory Series: 215-227

Bećirović, S., Plojović, Š. & Ujkanović, E. 2017. 'Mobile Network Operators as Banks – Opportunities and Threats', *Journal of International Technology and Information Management*, 26(2): 618-628.

Becker, H. 1970. 'Socio-metric location and innovativeness: Reformulation and extension of the diffusion model', *American Sociological Review*, 35(2): 267-303.

Bencsik, A., Horváth-Csikós, G. & Juhász, T. 2016. 'Y and Z Generations at Workplaces', *Journal of Competitiveness,* 8(3): 90-106.

Bendary, N. and Al-Sahouly, I. 2018. 'Exploring the extension of unified theory of acceptance and use of technology, UTAUT2, factors effect on perceived usefulness and ease of use on mobile commerce in Egypt', *Journal of Business and Retail Management Research*, 12(2): 60-71.

Bernt, P. and Weiss, M. 1993. *International Telecommunications*. Carmel, IN: SAMS Publishing/Prentice Hall Computer Publishing.

Berry, H., Guillen, M. & Zhou, N. 2010. ‘An institutional approach to cross-national distance’, *Journal of International Business Studies*, 41(9): 1460-1480.

Bess, C. and Bartolini, C. 2011. ‘Cultivating Millennials and harvesting the value they produce’, *Cutter IT Journal*, 24(9): 11.

Bharali, R.K. and Borman, R. 2017. ‘Mobile Banking for Financial Inclusion: Adoption and Challenges’, *Splint International Journal of Professionals*, IV(6): 75-80.

Bhardwaj, N.N., Wodajo, B., Gochipathala, K., Paul, D.P.III & Coustasse, A. 2017. ‘Can mHealth Revolutionize the Way We Manage Adult Obesity?’, *Perspectives in Health Information Management*, 14(Spring 2017): 1-16.

Bharti Airtel Limited, 2014. *Management Presentation, January 2014*, [online]. Delhi, India: Bharti Airtel Limited. Available from <https://s3-ap-southeast-1.amazonaws.com/bsy/iportal/images/Bharti_Management_Presentation_vfc_Jan_2014_71B0BF03C9945E2BEA1D2010FC66828E.pdf>, [Accessed: 16 July 2018].

Birkhoff, S.D. and Smeltzer, S.C. 2017. ‘Perceptions of Smartphone User-Centered Mobile Health Tracking Apps across Various Chronic Illness Populations: An Integrative Review’, *Journal of Nursing Scholarship*, 49(4): 371–378.

Blank, G. and Reisdorf, B. 2012. ‘The Participatory Web’, *Information, Communication & Society*, 15(4): 537-554.

BMI Research 2004. *South African Telecommunications Report 3Q 2004*. London: Business Monitor International.

BMI Research 2009. *South African Telecommunications Report 1Q 2009.* London: Business Monitor International.

BMI Research 2012. *South African Telecommunications Report 2Q 2012.* London: Business Monitor International.

BMI Research 2017. *South African Telecommunications Report 1Q 2018*, London: Business Monitor International.

Bogdan, R. and Taylor, S.J. 1975. *Introduction to qualitative research methods*. New York: John Wiley.

Boyatzis, R.E. 1998. *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, CA: Sage.

Bradburn, N.M., Sudman, S. & Wansink, B. 2004. *Asking Questions: The Definitive Guide to Questionnaire Design – For Market Research, Political Polls, and Social and Health Questionnaires*, San Francisco, CA: Jossey-Bass.

Braun, V. and Clarke, V. 2006. 'Using Thematic analysis in Psychology', *Qualitative Research in Psychology*, 3(2): 77-101.

Briggs, S.R. and Cheek, J.M. 1986. 'The role of factor analysis in the development and evaluation of personality scales', *Journal of Personality*, 54(1): 106–148.

Brown, S.A., Dennis, A.R. & Venkatesh, V. 2010. 'Predicting collaboration technology use: integrating technology adoption and collaboration research', *Journal Management Information Systems*, 27(2): 9–53.

Bryman, A. and Bell, E. 2011. *Business Research Methods*. Oxford: Oxford University Press.

Businesstech 2016. *Lack of spectrum slowing down SA broadband roll out,* [online]. Johannesburg: Businesstech, 16 May. Available from <https://businesstech.co.za/news/mobile/123697/lack-of-spectrum-slowing-down-sa-broadband-roll-out/>, [Accessed: 4 November 2017].

Campbell, D.T. and Stanley, J.C. 1963. 'Experimental and Quasi-Experimental Designs for Research'. In: Gage, N.L. Ed, *Handbook of Research on Teaching*. Chicago: Rand McNally & Co.

Cant, M.C., Brink, A. & Brijball, S. 2006. *Consumer Behaviour*. Cape Town: Juta & Co Ltd.

Carter, S. and Yeo, A.C-M. 2017. 'From Hedonism and Utilitarianism to anticipated actual behavior: do UK and Malaysian postgraduate students behave differently to mobile apps?' *Economics, Management, and Financial Markets,* 12(2): 11–34.

Caspi, A. 1987. 'Personality in the life course', *Journal of Personality and Social Psychology*, 53(6): 1203-1213.

Centre for Advanced Research on Language Acquisition (CARLA) 2014. '*Definitions on Culture'*, [online]. University of Minnesota: Centre for Advanced Research on Language Acquisition, Available from <www.carla.umn.edu/culture/definitions.html>, [Accessed: 14 April 2014].

Chawla, D. and Joshi, H. 2017. 'High Versus Low Consumer Attitude and Intention Towards Adoption of Mobile Banking in India: An Empirical Study', *Vision: The Journal of Business Perspective*, 21(4): 410-424.

Charmaz, K. 1990. '"Discovering" chronic illness: Using grounded theory'. *Social Science and Medicine,* 30(11): 1161–1172.

Chen, X. and Li, S. 2017. 'Understanding Continuance Intention of Mobile Payment Services: An Empirical Study', *Journal of Computer Information Systems*, 57(4): 287–298.

Central Intelligence Agency (CIA) 2017. *CIA World FactBook – South Africa,* [online]. United States: Central Intelligence Agency. Available from <www.cia.gov/library/publications/the-world-factbook/geos/sf.htm>, [Accessed: 20 November 2017].

Cheong, J.H. and Park, M-C. 2005. 'Mobile internet acceptance in Korea', *Internet Research*, Vol. 15(2): 125-140.

Chikweche, T. and Fletcher, R. 2010. 'Understanding factors that influence purchases in subsistence markets', *Journal of Business Research*, 63(6): 643-650.

Chikweche, T. and Fletcher, R. 2011. 'Branding at the base of pyramid: a Zimbabwean perspective', *Marketing Intelligence & Planning*, 29(3): 247-263.

Chikweche, T. and Fletcher, R. 2014. 'Rise of the middle of the pyramid in Africa: theoretical and practical realities for understanding middle class consumer purchase decision making', *Journal of Consumer Marketing*, 31(1): 27-38.

Cingel, D.P., Lauricella, A.R., Wartella, E. & Conway, A. 2013. ‘Predicting Social Networking Site Use and Online Communication Practices among Adolescents: The Role of Access and Device Ownership’, *Media and Communication*, 1(1): 28–38.

Cisco 2017. *VNI Mobile Forecast Highlights, 2017-2022 South Africa*, [online]. San Jose, CA: Cisco Available from <https://www.cisco.com/c/dam/assets/sol/sp/vni/forecast_highlights_mobile/index.html#~Country>, [Accessed: 27 December 2018].

Clark, J. F. 2012. *History of Mobile Telephony MAS 490: Theory and Practice of Mobile Applications*, [online]. Lexington, KY: University of Kentucky. Available from <http://www.uky.edu/~jclark/mas490apps/History%20of%20Mobile%20Telephony.pdf>, [Accessed: 28 December 2017].

Clarke R. N. 2014. ‘Expanding Mobile Wireless Capacity: The Challenges Presented By Technology And Economics’, *Telecommunications Policy*, 38(8–9): 693-708.

Cohen, A.C. and Whitten, B.J. 1988. *Parameter estimation in reliability and life span models*. New York, NY: M. Dekker.

Compeau, D.R. and Higgins, C.A. 1995. ‘Application of Social Cognitive Theory to Training for Computer Skills’, *Information Systems Research*, 6(2): 118-143.

Compeau, D.R. and Higgins, C.A. 1995a. ‘Computer Self-Efficacy: Development of a Measure and Initial Test’, *MIS Quarterly*, 134(3): 189-211.

Concise Oxford Dictionary, 1999. 10th ed. Oxford: Oxford University Press Inc.

Crabbe, M., Standing, C., Standing, S. & Karjaluoto, H. 2009. ‘An adoption model for mobile banking in Ghana’, *International Journal of Mobile Communication,* 7(5): 515-543.

Crabtree, B. and Miller, W. 1999. ‘A template approach to text analysis: Developing and using codebooks’. In: Crabtree B. & W. Miller W. Eds. *Doing Qualitative Research*. Newbury Park, CA: Sage.

Creswell, J. W. 2007. *Qualitative Inquiry and Research Design: Choosing Among 5 Approaches*. 3rd ed. Thousands Oak, CA: Sage.

Creswell, J. W. 2009. *Research Design: Qualitative, Quantitative, and Mixed Method Approaches*. 3rd ed. Thousands Oak, CA: Sage.

Creswell, J.W. and Plano Clark, V.L. 2007. *Designing and Conducting Mixed Methods Research*. Thousand Oaks, CA: Sage.

Creswell, J.W., Plano Clark, V., Gutmann, M. & Hanson, W. 2003. 'Advanced Mixed Methods Designs'. In: Tashakkori A. and Teddlie C. Eds. *Handbook of Mixed Method Research in the Social and Behavioral Sciences*. Thousand Oaks, CA: Sage.

Creswell, J. W. and Tashakkori, A. 2007. 'Differing Perspectives on Mixed Methods Research', *Journal of Mixed Methods Research*, 1(4): 303-308

Cronin, F.J., Colleran, E.K., Herbert, P.L. & Lewitzky, P. 1993. 'Telecommunications and Economic Growth: The Contribution of Telecommunications Infrastructure Investment to Aggregate and Sectoral Productivity', *Telecommunications Policy*, 17(9): 677-690.

Crowe, M., Inder, M. & Porter, R. 2015. 'Conducting qualitative research in mental health: Thematic and content analyses', *Australian & New Zealand Journal of Psychiatry*, 47(7): 616-623.

Dalkey, N. and Helmer, O. 1963. 'An Experimental Application of the Delphi Method to the Use of Experts', *Management Science*, 9(3): 458-467.

Danaher, P.J., Hardie, B.S.J. & Putsis, W.P.Jr. 2001. 'Marketing-mix Variables and the Diffusion of Successive Generations of Technical Innovation', *Journal of Marketing Research*, 38(4): 501-514.

Das, P. and Srinivasan, P.V. 1999. 'Demand for Telephone Usage in India', *Information Economics and Policy*, 11(2): 177-194.

Dasbit, S. and Sikdar, B.K. 2009. *Mobile Computing*, New Delhi: PHI Learning Private Limited.

Davidson, A.R. and Jaccard, J.J. 1979. 'Variables that Moderate the Attitude–Behavior Relation: Results of a Longitudinal Survey', *Journal of Personality and Social Psychology*, 37(8): 1364-1376.

Davis, F.D. 1986. A Technology Acceptance Model for Emperically Testing End-User Information Systems: Theory and Results, PhD in Management. Massachusettes Institute of Technology, Cambridge, MA.

Davis, F.D. 1989. ‘Perceived Usefulness, Perceived Ease of Use and User Acceptance of Information Technology’, *MIS Quarterly*, 13(3): 319-340.

Davis, F.D., Bagozzi, R.P. & Warshaw, P.R. 1989. ‘User Acceptance of Computer Technology: A Comparison of Two Theoretical Models’, *Management Science*, 35(8): 982-1002.

Davis, F.D., Bagozzi, R.P. & Warshaw, P.R. 1992. ‘Extrinsic and Intrinsic Motivation to Use Computers in the Workplace’, *Journal of Applied Social Psychology*, 22(14): 1111-1132.

Dennis, A.R., Wixom, B.J. & Vandenberg, R.J. 2001. ‘Understanding fit and appropriation effects in group support systems via meta-analysis’, *MIS Quarterly*, 25(2): 167–197.

Denzin, N.K. 1978. *The research act: A theoretical introduction to sociological methods* 2nd ed. New York: McGraw-Hill.

DeSanctis, G. and Gallupe, R.B. 1987. ‘A foundation for the study of group decision support systems’, *Management Science*, 33(5): 589–609.

Dholakia, R.R. and Uusitalo, O. 2002. ‘Switching to electronic stores: consumer characteristics and the perception of shopping benefits’, *International Journal of Retail & Distribution Management*, 30(10): 549-469.

Dictionary.com 2017. [online]. Available from <http://www.dictionary.com/browse/demographics>, [Accessed 15 November 2017].

Dobni, D. and Zinkhan, G.M. 1990. ‘In Search of Brand Image: a Foundation Analysis’, *Advances in Consumer Research*, 17: 110-119.

Doty, D.H. and Glick, W.H. 1998. ‘Common Methods Bias: Does Common Methods Variance Really Bias Results?’ *Organizational Research Methods*, 1(4): 374–406.

Dowe, D.L., Gardiner, S. & Oppy, G.R. 2007. ‘Bayes not Bust! Why Simplicity is No Problem for Bayesians’, *British Journal for the Philosophy of Science*, 58(4): 709-754.

Driscoll, D.L., Appiah-Yeboah, A., Salib, P. & Rupert, D.J. 2007. ‘Merging Qualitative and Quantitative Data in Mixed Methods Research: How to and Why Not’, *Ecological and Environmental Anthropology,* 3(1): 19-28.

Eadicicco, L. 2017. *This Is Why the iPhone Upended the Tech Industry*, [online]. New York, NY: Time Inc. 29 June. Available from <https://time.com/4837176/iphone-10th-anniversary/> [Accessed: 12 January 2018].

Easingwood, C. 1989. ‘An Anological Approach to the Long Term Forecasting of Major New Product Sales’, *International Journal of Forecasting*, 5(1): 69-82.

Eastman, J.K. and Liu, J. 2012. ‘The Impact of Generational Cohorts on Status Consumption: An Exploratory Look at Generational Cohorts and Demographics on Status Consumption’, *Journal of Consumer Marketing*, 24(2): 93-102.

Erel, M., Arslan, Z., Ozcevik, Y. & Canberk, B. 2015. ‘Software-defined wireless network (SDWN): A new paradigm for next generation network management’. In: Obaidat, M.S., Nicopolitidis, P. & and Zarai, F. Eds, *Modeling and Simulation of Computer Networks and Systems Methodologies and Applications*. Waltham MA: Morgan Kaufmann Elsevier. 751-766

Ericsson Telecom and Telia. 1998. *Understanding Telecommunications*, *Volumes 1 and 2*. Lund: Studentlitteratur.

Ericsson 2012. *Traffic and market data report June 2012*, [online]. Stockholm, Sweden: Ericsson. Available from <http://www.ericsson.com/res/docs/2012/traffic_and_market_report_ june_2012.pdf>, [Accessed: 12 January 2018].

Ericsson 2018. *Traffic and market data report June 2018*, [online]. Stockholm, Sweden: Ericsson. Available from <https://www.ericsson.com/en/mobility-report/reports >, [Accessed: 12 October 2018].

Eurostat 2018. *Statistics Explained: EU statistics on Household Consumption Expenditure by purpose’,* [online]. Brussels, Belguim: European Commission.

Available from <http://ec.europa.eu/eurostat/statisticsexplained/index.php/Household_consumption_by_purpose>, [Accessed: 28 February 2018].

Facebook 2018. *Global Digital Report 2018*, [online]. Menlo Park, CA: Facebook Inc. Available from <https://wearesocial.com/blog/2018/01/global-digital-report-2018>, [Accessed: 15 January 2019]

Facebook 2018a. *Facebook Q2 Results*, [online]. Menlo Park, CA: Facebook Inc Available from <https://s21.q4cdn.com/399680738/files/doc_financials/2018/Q2/Q2-2018-Earnings-Presentation.pdf>, [Accessed: 14 September 2018].

Fawzy, S.F. and Esawai, N. 2017. ‘Internet banking adoption in Egypt: Extending technology acceptance model’, *Journal of Business and Retail Management Research*, 12(1): 109-118.

Fereday, J. and Muir-Cochrane, E. 2006. ‘Demonstrating Rigour Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development’, *International Journal of Qualitative Methods*, 5(1): 80-92.

Field, A. 2009. *Discovering statistics using SPSS*, 3rd ed. London: Sage.

Fildes, R. and Kumar, V. 2002. ‘Telecommunications Demand Forecasting – a Review’, *International Journal of Forecasting*, 18(4): 489-522.

Fildes, R. and Kumar, V. 2002a. ‘Telecommunications Forecasting’, *International Journal of Forecasting*, 18(4): 487-488.

Fishbein, M. 1993. Introduction by Martin Fishbein. In: Terry, D.J. Gallois, C. & McCamish, M. Eds. *The theory of reasoned action: Its application to aids preventive behaviour.* Oxford: Pergamon Press. xv – xxv.

Fishbein, M. and Ajzen, I. 1975. *Belief, Attitude, Intention and Behaviour: An introduction to Theory and Research*. Reading, MA: Addison-Wesley.

Fishbein, M. and Ajzen, I. 1980. *Understanding attitudes and predicting social behaviour*, New Jersey: Prentice-Hall.

Forza, C. 2002. 'Survey Research in Operations Management: A Process Perspective', *International Journal of Operations and Production Management*, 22(2): 152-194.

Foster, M. 2002. 'Predictive Accuracy as an Achievable Goal of Science', *Philosophy of Science*, 69(3): S124-S134.

Foster, M. and Sober, E. 1994. 'How to tell when Simpler, more Unified, or less Ad-hoc theories will provide more Accurate Predictions', *British Journal for the Philosophy of Science*, 45(1): 1-35

Fox, S. and Duggan, M. 2012. 'Mobile Health 2012', *Pew Internet & American Life Project*, Washington, DC.

Freeman, K. and Mubichi, F. 2017. 'ICT use by smallholder farmers in rural Mozambique: a case study of two villages in central Mozambique' *Journal of Rural Social Sciences*, 32(2): 1-19.

Guba, E.G. and Lincoln, Y.S. 1994. 'Competing paradigms in qualitative research'. In: Denzin, N.K. and Lincoln, Y.S. Eds. *Handbook of Qualitative Research*, 1st ed. Thousand Oaks, CA: Sage. 105-117.

Ganesh, J., Kumar, V. & Subramaniam, V. 1997. 'Learning Effect on Multinational Diffusion of Consumer durables: An Exploratory Investigation', *Journal of the Academy of Marketing Science*, 25(3): 214-228.

Garau, C. 2012. 'A Life-Stage Analysis of Consumer Loyalty Profile: Comparing Generation X and Millennial Consumers', *Journal of Consumer Marketing*, 24(2): 103-113.

Gartner 2014. '*Telecommunications Product Definition'*, [online]. Stamford, CT: Gartner Inc. Available from <http://www.gartner.com/it-glossary/telecommunications-services>, [Accessed: 23 March 2014].

Geert-Hofstede 2018. *Hofstede Centre – South Africa'*, [online]. Helsinki, Finland: Hofstede-Insights Available from <http://geert-hofstede.com/south-africa.html>, [Accessed: 12 May 2018]

Gerber, J. 2017. *SA to miss digital migration deadline again*, [online] Johannesburg: News 24. 2 May. Available from <https://www.news24.com/SouthAfrica/News/sa-

to-miss-digital-migration-deadline-again-20170502>, [Accessed: 28th December 2017]

Geroski, P.A. 2000. 'Models of Technology Diffusion', *Reseach Policy,* 29(4-5): 603-625.

Gerpott, T.J. 2010. 'Communication behaviors and perceptions of mobile internet adopters', *info*, 12(4): 54–73.

Geissler, M. 2006. Alighning Technology with Culture: Connecting Information and Communication Technology Adoption to Cultural Dimensions, Doctor of Philosophy Thesis, Capella University: Minneapolis.

Gibbs, G.R. 2007. *Analyzing Qualitative Data*, In: U. Fick Ed. *The Sage Qualitative Research Kit*. London UK: Sage.

Ghosh, R.K. 2017. *Wireless Networking and Mobile Data Management*, Springer: Heidelberg Germany.

Glaser, B.G. and Strauss, A. 1967. *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine.

Gong, W., Stump, R.L. & Li, Z.G. 2014. 'Global use and access of social networking web sites: a national culture perspective', *Journal of Research in Interactive Marketing*, 8(1): 37-55.

Google Scholar Citations 2019. Citations: *Perceived usefulness, perceived ease of use, and user acceptance of information technology in the MIS Quarterly Journal*, [online]. Google Scholar Citations 23rd July 2019. Available from <https://scholar.google.com/citations?user=rKH2D8MAAAAJ&hl=en> [Accessed: 23 July 2019].

Goswami, S. 2017. 'Are customers ready to use mobile technology for banking transactions? An investigation', *Journal of Internet Banking and Commerce*, 22(S8): 1-13.

Greene, J.C., Caracelli, V.J. & Graham, W.F. 1989. 'Towards a Conceptual Framework for Mixed Methods Evaluation Designs', *Educational Evaluation and Policy Analysis* 11(3): 255-274.

Greenstein, S. and Spiller, P. 1995. 'Modern telecommunications Infrastructure and Economic Activity: An Empirical Investigation', *Industrial and Corporate Change*, 4(4): 647-665.

GSM Association 2014. 'Leveraging telco data for predictive credit scorecards in mobile money: An Interview with Telenor', [online]. London: GSM Association. Available from <https://www.gsma.com/mobilefordevelopment/programme/mobile-money/leveraging-telco-data-for-predictive-credit-scorecards-in-mobile-money-an-interview-with-telenor/>, [Accessed: 28 January 2018].

GSM Association 2015. 'The Impact of the Internet of Things', [online]. London: GSM Association. Available from <https://www.gsma.com/newsroom/wp-content/uploads/15625-Connected-Living-Report.pdf>, [Accessed: 28 January 2018].

GSM Association 2018. *'History of GSA and GMSA'*, [online]. London: GSM Association. Available from <https://www.gsma.com/aboutus/history>, [Accessed: 28 January 2018]

GSM Association 2018a. '*The Mobile Economy 2018'*, [Online]. London: GSM Association. Available from < https://www.gsma.com/mobileeconomy/>, [Accessed 23 March 2018].

GSM Association Intelligence 2018b. '*South Africa Dashboard'*, [online]. London: GSM Association. Available from <https://www.gsmaintelligence.com/markets/3788/dashboard/> [Accessed: 17 September 2018].

Guest, G. 2012. 'Describing Mixed Methods Research: An Alternative to Typologies', *Journal of Mixed Methods Research*, 7(2): 141-151.

Harman, B. H. 1976. *Modern factor analysis* (3rd ed., rev.). Chicago: University of Chicago Press.

Harrison, D.A., Mykytyn, P.P. & Riemenschneider, C.K. 1997. 'Executive Decisions about Adoption of Information Technology in Small Business: Theory and Emperical Tests', *Information Systems Research*, 8(2): 171-195.

Hartwick, J. and Barki, H. 1994. ‘Explaining the Role of User Participation in Information Systems Use’, *Management Science*, 40(4): 440-465.

Haupt, P. 2017 ‘The SAARF Universal Living Standards Measure (SU-LSM™), Twelve Years of Continuous Development’, *The South African Audience Research Foundation*, [online] Available from <http://www.saarf.co.za/lsm/lsm-article.asp>, [Accessed: 16 November 2017].

Hayes A.F. 2013. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression Based Approach*. New York: Guilford Press.

Hayes A.F. 2013a. *Process Macro Version 2.16.3,* [online]. Available from <http://processmacro.org/download.html>, [Accessed 17 July 2017].

Hayes, N. 1997. ‘Theory-led thematic analysis: social identification in small companies’. In: N. Hayes ed., *Doing Qualitative Analysis in Psychology*. Hove, UK: Psychology Press.

Helmer, O. and Rescher, N. 1959. ‘On the epistomology of the Inexact Sciences’, *Management Science*, 6(1): 25-52.

Hempel, C. and Oppenheim, P. 1948. ‘Studies in the logic of Explaination’, *Philosophy of Science*, 15:25-52.

Hodge, J. 2005. ‘Tariff structures and access substitution of mobile cellular for fixed line in South Africa’, *Telecommunications Policy*, 29(7): 493-505.

Hofstede, G. (1991). *Cultures and organizations: Software of the mind*. London: McGraw-Hill.

Hofstede, G. and Bond, M.H. 1988. ‘The Confucius connection: From cultural roots to economic growth’, *Organizational Dynamics*, 16(4): 5-21.

Hoehle, H., Zhang, X. & Venkatesh, V. 2015. ‘An espoused cultural perspective to understand continued intention to use mobile applications: a four-country study of mobile social media application usability’, *European Journal of Information Systems*, 24(3) Special Issue: 337-359.

Holloway, I. and Todres, L. (2003). ‘The status of method: flexibility, consistency and coherence’, *Qualitative Research*, 3(3): 345-357.

Hong, S-J. and Tam, K.Y. 2006. ‘Understanding the adoption of multipurpose information appliances: the case of mobile data services’, *Information Systems Research*, 17(2): 162-179.

Hong, S-J., Thong, J.Y., Moon, J-Y. & Tam, K-Y. 2008. ‘Understanding the behavior of mobile data services consumers’, *Information Systems Frontiers*, 10(4): 431-445.

Hoogeveen, J.G. and Özler, B. 2005. ‘Not Separate, Not Equal: Poverty and Inequality in Post-Apartheid South Africa’, *William Davidson Institute* Working Paper Number 739; 1-40.

Horrigan, J. B. 2008. ‘Mobile access to data and information, ‘*Pew Internet & American Life Project*, [online]. Available from <www.pewinternet.org/Reports/2008/Mobile-Access-to-Data-and-Information.aspx> [Accessed: 16 July 2018].

Horwitz, R.B. 2014. ‘South African Telecommunications: History and Prospects’, [online]. Johannesburg: MyBroadband. 14 March. Available from <https://mybroadband.co.za/forum/threads/south-african-telecommunications-history-and-prospects.603320/>, [Accessed: 18 September 2018].

Horwitz R.B. and Currie, W. 2007. ‘Another Instance Where Privatization Trumped Liberalization: The Politics of Telecommunications Reform in South Africa - A Ten-year Retrospective’, *Telecommunications Policy*, 31(8-9): 445–462.

Howcroft, B., Hamilton, R. & Hewer, P. 2002. ‘Consumer attitude and usage and adoption of home-based banking in the United Kingdom’*, International Journal of Bank Marketing*, 20(2/3): 111-121.

Huang, M-H. 2005. ‘Web Performance Scale’, *Information and Management,* 42(6): 841-852.

Hudson, A. 2010. ‘Measuring the impact of cultural diversity on desired mobile reference services’, *Reference Services Review*, 38(2): 299-308.

Hung, C.L. and Chou, J.C.L. 2014. ‘Examining the cultural moderation on the acceptance of mobile commerce’, *International Journal of Innovation and Technology Management,* 11(2): 1–19.

Hutchinson, A. 2018. ‘Instagram Now Has a Billion Monthly Active Users’, [online] New Yory, NY: Social Media Today, 21 June. Available from < https://www.socialmediatoday.com/news/instagram-now-has-a-billion-monthly-active-users/526188/>, [Accessed: 13 September 2018].

Hutchinson, S. R. 2004. ‘Survey Research’. In: de Marrais, K. & Lapan, S.D. Eds. *Foundations for research: Methods of inquiry in education and the social sciences.* Mahwah, New Jersey: Lawrence Erlbaum and Associates.

Independent Communications Authority of South Africa (ICASA) 2016. ‘*Quality of Services Report Limpopo 2016_17 Q1’*, [online]. Johannesburg: ICASA. Available from <https://www.icasa.org.za/legislation-and-regulations/retail-tariffs-report-quarter-4-2017> [Accessed: 17 November 2017].

Independent Communications Authority of South Africa (ICASA) 2016a. ‘*An analysis of standard prepaid retail voice and data tariffs notified to ICASA1 for the period 01 April 2015 to 29 February 2016,’* [online]. Johannesburg: ICASA. Available from <https://www.icasa.org.za/legislation-and-regulations/prepaid-retail-voice-and-data-tariffs-report>, [Accessed: 17 November 2017].

Independent Communications Authority of South Africa (ICASA) 2017. ‘*Limpopo Mobile Data Networks: Quality of Service Report 2017/2018 Quarter 3*’, [online]. Johannesburg: ICASA Available from <https://www.icasa.org.za/uploads/files/Quality-of-Service-Report-Limpopo-Mobile-Data-Services-2017-2018-Q3.pdf> [Accessed: 28 January 2018]

Independent Communications Authority of South Africa (ICASA) 2018. *‘3rd Report on the state of the ICT sector in South Africa, 31st March 2018*’, [online]. Johannesburg: ICASA. Available from <https://www.icasa.org.za/uploads/files/State-of-ICT-Sector-Report-March-2018.pdf>, [Accessed: 6 October 2018].

Independent Communications Authority of South Africa (ICASA) 2018a. ‘*Bi-Annual Report on the Analysis Of Tariff. Notifications Submitted To Icasa For The Period. 01 July 2017 to 31 December 2017’*, [online]. Johannesburg: ICASA. Available from <https://www.icasa.org.za/legislation-and-regulations/retail-tariffs-report-quarter-4-2017>, [Accessed: 6 October 2018].

Informa Media and Telecom: WCIS+ 2012. *'Global Mobile Forecasts 2010'*, [online]. London. Informa Media and Telecom: WCIS+. Accessed from <http://www.wcisplus.com:80/wcisplus/report/GlobalMobileForecasts>, [Accessed: 12 April 2012].

International Business Machines (IBM) 2018. '*The IBM PC's Debut: At The Beginning'*, [online]. Armonk, NY: IBM. Available from <https://www-03.ibm.com/ibm/history/exhibits/pc25/pc25_intro.html>, [Accessed: 7 February 2018].

International Telecommunication Union 2015. '*IMT traffic estimates for the years 2020 to 2030*'. Geneva: International Telecommunication Union. Report ITU-R M.2370-0

International Telecommunication Union 2017. '*Measuring the Information Society 2017, Volumes 1 and 2'*. Geneva: International Telecommunication Union.

International Telecommunication Union 2018. '*History of the ITU'*, [online]. Geneva: International Telecommunication Union. Available from <http://itu.int/go/OverviewITUsHistoryArticle>, [Accessed: 6 February 2018].

Islam, M. 2017 'Capturing consumer attitude toward mobile advertising: an empirical investigation among different national cultures', *Journal of Internet Banking and Commerce*, 22(3): 1-22.

Islam, T. and Meade, N. 1996. 'Forecasting the Development of the Market for Business Telephones in the UK', *Journal of Operational Research Society*, 47(7): 906-918.

Izogo, E.E., Nnaemeka, O.C., Onuoha, O.A. & Ezema, K.S. 2012. 'Impact of Demographic Variables on Consumers' Adoption of E-banking in Nigeria: An Empirical Investigation', *European Journal of Business and Management*, 4(17): 27-39.

Jäckle, A., Roberts, C. & Lynn, P. 2006. 'Telephone versus Face-to-Face Interviewing: Mode Effects on Data Quality and Likely Causes'. *Report on Phase II of the ESS-Gallup Mixed Mode Methodology Project,* ISER Working Paper 2006-41. Colchester: University of Essex.

Jacobs, G., and Smit, E.V.D.M. 2010. ‘Materialism and indebtedness of low income consumers: Evidence from South Africa's largest credit granting catalogue retailer’, *South African Journal of Business Management*, 41(4): 11-33.

Jain, D., Mahajan, V. & Muller, E. 1991. ‘Innovation Diffusion in the Preserve of Supply Restrictions’, *Marketing Science*, 10(1): 83-90.

Javed, M. and Siddiqui, A.T. 2017. ‘Transformation of Mobile Communication Network from 1G to 4G and 5G*’, International Journal of Advanced Research in Computer Science*, 8(3): 193-197.

Jeanjean, F. 2014. ‘Forecasting the fiber penetration based on copper access regulation’, *Info*, 16(1): 17-31.

Jiménez, N. and San-Martín, S. 2017. ‘Attitude toward m-advertising and m-repurchase’, *European Research on Management and Business Economics,* 23(1): 96-102

Johnson, R. B., Onwuegbuzie, A. J. & Turner, L. A. 2007. ‘Toward a Definition of Mixed Methods Research’, *Journal of Mixed Methods Research*, 1(2): 112-133.

Jones, M. and Marsden G. 2005. *Mobile Interaction Design*. Hoboken, NJ: John Wiley and Sons

Juwaheer, T.D., Pudaruth S. & Ramdin P. 2012. ‘Factors influencing the adoption of internet banking: a case study of commercial banks in Mauritius’, *World Journal of Science, Technology and Sustainable Development*, 9(3): 204-234.

Kaiser, H. F. 1974. ‘An index of factor simplicity’ *Psychometrika* 39(1): 31–36.

Kaplan, A. M. and Haenlein, M. 2010. ‘Users of the world, unite! The challenges and opportunities of Social Media’, *Business Horizons*, 53(1): 59-68.

Kapurubandara, M. and Lawson, R. 2008, ‘Availability of e-commerce support for SMEs in developing countries’, *The International Journal on Advances in ICT for Emerging Regions*, 1(1): 3-11.

Karahanna, E., Straub, D.W. & Chervany, N. 1999. ‘Information Technology Adoption Across Time: A Cross-sectional Comparison of Pre-adoption and Post-adoption Beliefs’, *MIS Quarterly*, 23(2): 183-213.

Karjaluoto, H., Mattila, M. & Pento, T. 2002. ‘Factors underlying attitude formation towards online banking in Finland’, *International Journal of Bank Marketing*, 20(6): 261-272.

Kenya, Communications Authority 2011. ‘*Quarterly Sector Statistics Report, 2nd Quarter October-December 2010/2011’*, [online]. Nairobi: Kenya, Communications Authority. Available from <https://ca.go.ke/wp-content/uploads/2018/02/sector-Statistics-Report-Q2-2010-11.pdf>, [Accessed: 16 July 2018].

Ketola, R. 2002. Integrating usability with concurrent engineering in mobile phone development, Doctoral Thesis, University of Tampere:Tampere.

Khan, W. 2017. ‘Factors Affecting Adoption of Mobile Based Internet Banking in Emerging Market: A Study of the Indian Consumers’ Observation’*, Journal of Internet Banking and Commerce*, 22(S7): 1-11.

Khare, A., Khare, A. & Singh, S. 2012. ‘Attracting shoppers to shop online - Challenges and opportunities for the Indian retail sector’, *Journal of Internet Commerce,* 11(2): 161-185.

Khedhaouria, A., Beldi, A. & Belbaly, N. 2013. ‘The moderating effect of gender on continuance intention for mobile Internet services (MIS)’. *Systèmes D’information et Management*, 18(3): 117-137

King, N. 2003. ‘Using Templates in the Thematic Analysis of Text’. In: Cassell, C. and Symon, G. Eds. *Essential Guide to Qualitative Methods in Organizational Research*. London: Sage.

Kirunda-Kivenjinja, A. 1995. ‘Telecom Risks, Telecom Futures’, Telecom 95, *7th World Telecommunications Forum, Strategies Summit Speaker’s Papers*: Vol. 1, *Breaking Down Barriers Towards the Global Information Society* (Session 16-2). Geneva: ITU

Kleijnen, M, Wetzels, M. & DeRuyter, K. 2004. ‘Consumer Acceptance of Wireless Finance’, *Journal of Financial Services Marketing*, 8(3): 206-217.

Koloseni, D. and Mandari, H. 2017. ‘Why mobile money users keep increasing? Investigating the continuance usage of mobile money services in Tanzania’, *Journal of International Technology and Information Management*, 26(2): 117-143.

Konopka, M.N. 2013. ‘Web 2.0: Between Pragmatics and Theory’, *Horizons of Politics*, 4(9): 135-150.

Kotzé, T. 2011. ‘*Theme 3: What is Research*?’*. Course Notes for EBW 801*. Pretoria: University of Pretoria: 1-15.

Krishnan, T.V., Bass, F.M. & Kumar, V. 2000. ‘Impact of a Later Entrant on the Diffusion of a New Product/Service’, *Journal of Marketing Research*, 37(2): 269-278.

Krosnick, J.A. 1991. ‘Response Strategies for Coping with the Cognitive Demands of Attitude Measures in Surveys’, *Applied Cognitive Psychology*, 5(3): 213–36.

Kuo, Y-F. and Yen, S.N. 2009. ‘Towards an understanding of the behavioral intention to use 3G mobile value-added services’, *Computers in Human Behavior*, 25(1): 103-110.

Kuo, Y-F., Wu, C-M. & Deng, W-J. 2009. ‘The relationships among service quality, perceived value,customer satisfaction, and post-purchase intention in mobile value-added services’, *Computers in Human Behavior*, 25(4): 887-96.

Kwon, H.S. and Chidambaram, L. 2000. ‘A Test of the Technology Acceptance Model: The Case of Cellular Telephoneadoption’, In: *Proceedings of the 33rd Hawaii International Conference on System Sciences.* Hawaii 2000, IEEE Computer Society,1-10.

Ktoridou, D., Epaminonda, E. & Kaufmann, H.R. 2008. ‘Technological challenges and consumer perceptions of the use of Mobile Marketing: Evidence from Cyprus’, *International Journal of Mobile Marketing*, 3(2): 34-43.

Laforet, S. and Li, X. 2005. ‘Consumers’ attitudes towards online and mobile banking in China’*, International Journal of Bank Marketing*, 23(5): 362-380

Lakoff, G., and Johnson, M. 1980. *Metaphors we live by*. Chicago: University of Chicago Press.

Lasch, K.E., Marquis, P., Vigneux, M., Abetz, L., Arnould, B., Bayliss, M., Crawford, B. & Rosa, K. 2010. ‘PRO development: rigorous qualitative research as the crucial foundation’, *Quality of Life Research*, 19(8): 1087-1096.

Laukkanen, T. and Cruz, P. 2012. ‘Cultural, Individual and Device-Specific Antecedents on Mobile Banking Adoption: A Cross-National Study’ In: *HICSS '12 Proceedings of the 45th Hawaii International Conference on System Sciences. Hawaii 4-7 January, 2012:* IEEE Computer Society. 3170-3179.

Laukkanen, T. and Pasanen, M. 2008. ‘Mobile banking innovators and early adopters: How they differ from other online users?’, *Journal of Financial Services Marketing*, 13(2): 86-94.

Lee, E. and Han, S. 2015. ‘Determinants of adoption of mobile health services’, *Information Review*, 39(4): 556-573.

Lee, H-H. and Lee, S-E. 2007. ‘Mobile commerce: an analysis of key success factors’, *Journal of Shopping Center Research*, 14(2): 29-62.

Lee, H-H. & Lee, S-E, 2010. ‘Internet vs mobile services: comparisons of gender and ethnicity’, *Journal of Research in Interactive Marketing*, 4(4): 346 – 375.

Lee, I., Choi, B., Kim, J. & Hong, S.J. 2007. ‘Culture-technology fit: effects of cultural characteristics on the post-adoption beliefs of mobile internet users’, *International Journal of Electronic Commerce*, 11(4): 11-51.

Lee, S.H., Levendis, J. & Gutierrez, L. 2009. ‘Telecommunications and Economic Growth: An Empirical Analysis of Sub-Saharan Africa’, [online]. Amsterdam: *Social Science Research Network*, 26 October 26. Available from <http://ssrn.com/abstract=1567703>, [Accessed: 17 March 2014].

Lee, W.J., Kim, T.U. & Chung, J. 2002. ‘User Acceptance of the Mobile Internet’, In: *Proceedings of the First International Conference on Mobile Business, Athens, Greece, July 8-9, 2002*. Informs

Leedy, P.D. and Ormrod, J.E. 2010. *Practical Research: Planning and Design*. Saddle River, New Jersey: Pearson Education Inc.

Leff, N. 1984. ‘Externalities, Information Costs, and Social Benefit-Cost Analysis for Economic Development: An Example from Telecommunications’*, Economic Development and Cultural Change,* 32(2): 255-276.

Leidner D.E. and Kayworth, T. 2006. ‘Review: a Review of Culture in Information Systems Research: Toward a Theory of Information Technology Culture Conflict’, *MIS Quarterly*, 30(2): 357-399.

Leiner, B.M, Cerf, V.G., Clark, D.D., Kahn, R.E., Kleinrock, L., Lynch, D.C., Postel, J., Roberts, L.G. & Wolf, S. 2009. ‘A brief history of the Internet’, ACM SIGCOMM *Computer Communication Review*, 39(5): 22-31

Legris, P., Ingham, J. & Collerette, P. 2003. ‘Why do people use information technology? A critical review of the technology acceptance model’, *Information Management,* 40(3):191–204.

Leyton, D., Pino, J.A. & Ochoa, S.F. 2015. EBTAM: technology acceptance in e-Business Environments’, *Information Systems E-Business Management*, 13(2): 211–234.

Li, W. and McQueen, R.J. 2008. ‘Barriers to mobile commerce adoption: an analysis framework for a country-level perspective’, *International Journal of Mobile Communications*, 6(2): 231-257.

Lim, J., Nam, C., Kim, S., Rhee, H., Lee, E. & Lee, H. 2012. ‘Forecasting 3G mobile subscription in China: A study based on stochastic frontier analysis and a Bass diffusion model’, *Telecommunications Policy*, 36(10-11): 858–871.

Lin, F. and Wu, J. 2004. ‘An Empirical study of End-user Computing Acceptance Factors in Small and Medium Enterprises in Taiwan: Analyzed by Structural Equation Modeling’, *Journal of Computer Information Systems*, 44(3): 98-108.

Liu, C.L., Sinkovics, R.R., Pezderka, N. & Haghirian, P. 2012. ‘Determinants of Consumer Perceptions toward Mobile advertising - A comparison between Japan and Austria’, *Journal of Interactive Marketing* 26(1): 21-32.

Loken, B. 1983. ‘The Theory of Reasoned Action: Examination of the Sufficiency Assumption for a Television Viewing Behavior’, *Advances in Consumer Research* Volume 10: 100-105.

Luthans, F. and Avolio, B. 2009. ‘The "point" of positive organisational behviour’, *Journal of Organizational Behavior*, 30(2): 291-307.

Lyons, M.H., Lynch, T. & Skelton, S. 1995. ‘Modelling Competition in Telecommunications Markets’, *European Transactions in Telecommunications,* 6(4): 407-414.

MacKenzie, S.B. and Podsakoff , P.M. 2012. ‘Common Method Bias in Marketing: Causes, Mechanisms, and Procedural Remedies’, *Journal of Retailing*, 88(4): 542–555

Mahajan, V., Muller, E. and Bass, F. M. 1990. ‘New Product Diffusion Models in Marketing: A Review and Directions for Research’, *Journal of Marketing*, 54(1): 1-26.

Mahande, R.D., Susanto, A. & Surjono, H.D. 2017. ‘The Dynamics of Mobile Learning Utilization in Vocational Education: Frame Model Perspective Review’, *TOJET : The Turkish Online Journal of Educational Technology*, 16(4): 65-76.

Maree, K. 2010. *First steps in Research*. Pretoria: Van Schaik Publishers.

Margaret, M. and Ngoma, M.F. ‘Socio-demographic factors influencing adoption of internet banking in Zimbabwe’, *Journal of Sustainable Development in Africa*, 15(6): 145-154.

Markland, M.J., Rempel, H.G. & Bridges, L. 2017. ‘Mobile Website Use and Advanced Researchers: Understanding Library Users at a University Marine Sciences Branch Campus’*, Information Technology and Libraries*, 36(4): 7-23.

Mason, J. 2002. *Qualitative Researching*. London: Sage

Mathieson, K. 1991. ‘Predicting Users Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behaviour’, *Information Systems Research*, 2(3): 173-191.

Matilla, M. 2001. Essay on Customers in the Dawn of Interactive Banking*,* Doctoral Dissertation, Jyvaskyla Studies in Business and Economics, University of Jyvaskyla: Finland.

May, J.D. 2012. ‘Digital and Other Poverties: Exploring the Connection in Four East African Countries’, *Information Technologies and International Development*, 8(2): 30-50.

Mazan, A. 2017. 'Investigating maturity of mobile commerce adoption: a qualitative study', *Journal of Internet Banking and Commerce*, 22(3): 1-24

Mbarika, V.W.A. 2000. Telecommunications Stakeholders' Perceptions of Strategies to Overcome Teledensity Growth Obstacles of Africa's Least Developed Countries, Thesis for Doctor of Philosophy, Auburn University: Auburn Alabama

Mbarika, V.W.A., Meso, P.N. & Musa, P.F. 2004. 'A Disconnect in Stakeholders' Perceptions from Emerging Realities of teledensity Growth in Africa's Least Developed Countries', *Journal of Global Information Management*, 12(3): 1-20

Mcleod, D. 2017. '*We have run out of spectrum: Vodacom'*, [online]. Johannesburg: Techcentral, 1 August. Available from <https://techcentral.co.za/run-spectrum-vodacom/76040/> [Accessed: 26 February 2018]

Mcleod, D. 2018. '*Ramaphosa 'Must Scrap Monopoly WOAN' Idea'*, [online]. Johannesburg: Techcentral, 18 February. Available from <https://techcentral.co.za/ramaphosa-must-scrap-monopoly-woan-idea/79669/> [Accessed: 26 February 2018].

McMahon, M and Pospisil, R. 2005. 'Laptops for a digital lifestyle: Millennial students and wireless mobile technologies', In: *Ascilite Conference Balance, Fidelity, Mobility: maintaining the momentum? Conference Brisbane 4-7 December 2005* Australasian Society for Computers in Learning in Tertiary Education.

Meso, P.N., Musa, P.F. & Mbarika, V.W.A. 2005. 'Towards a model of consumer use of mobile information and communication technology in LDC's. The case of sub-Saharan Africa', *Journal of Information Systems,* 15(2): 119-146.

Mobile Telecommunications Network 2017. '*MTN Group Limited. Financial results for the year ended 31 December 2016'*, Johannesburg: Mobile Telephone Networks.

Mobile Telecommunications Network 2018. '*Our Company History'*, [online]. Johannesburg: Mobile Telephone Networks. Available from <https://www.mtn.com/en/mtn-group/about-us/our-story/Pages/history.aspx>, [Accessed: 13 September 2018].

Mohr, P., Fourie, L. & Associates 1995. *Economics for South African students*. Pretoria: JL Van Schaik.

Moore, G.C. and Benbasat, I. 1991. ‘Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation’, *Informations Systems Research*, 2(3): 192-222.

Moorthy, K., Ling, C.S., Fatt, Y.W., Yee, C.M., Yin, E.C.K., Yee, K.S. & Wei, L.K. 2017. ‘Barriers of Mobile Commerce Adoption Intention: Perceptions of Generation X in Malaysia’, *Journal of Theoretical and Applied Electronic Commerce Research*, 12(2): 37-53.

Morgan, S. and Govender, K. 2017. ‘Exploring customer loyalty in the South African mobile telecommunications sector’, *Cogent Business and Management*, 4: 1-16

Morris, M.G. and Venkatesh, V. 2000. ‘Age Differences in Technology Adoption decisions: Implications for a Changing workforce’, *Personnel Psychology*, 53(2): 375-403.

Morse, J.M. 1995. ‘The significance of saturation’, *Qualitative Health Research,* 5(2): 147–149.

Motorola, 2010. ‘*Long Term Evolution (LTE): A Technical Overview*’. Chicago, Illinois: Motorola.

Motwani, B. 2016. ‘An Empirical Study on the Influence of Gender on Mobile Banking Services’, *International Journal of Knowledge Management and Practices*, 4(2): 1-9.

Muller, R. 2012. ‘*Vodacom launches LTE in South Africa’*, [online]. Johannesburg: MyBroadband, 10 October. Available from <https://mybroadband.co.za/news/cellular/61756-vodacom-launches-lte-in-south-africa.html>, [Accessed: 28 January 2018]

Municipalities of South Africa 2018. ‘Municipalities of South Africa/ demographics’, [online]. Available at <https://municipalities.co.za/demographic/7/buffalo-city-metropolitan-municipality>, [Accessed: 21 January 2019]

Mutula, S.M. 2007. ‘Digital Divide and Economic Development: Case Study of Sub-Saharan Africa’, *The Electronic Library*, 26(4): 468-489.

MyBroadband 2012. '*100% Broadband Penetration in SA by 2020: DoC'*, [online]. Johannesburg: MyBroadband, 31 July. Available from <http://mybroadband.co.za/news/broadband/30550-100-broadband-penetration-in-sa-by-2020-doc.html> [Accessed: 14 February 2014].

MyBroadband 2012a. '*MTN LTE launched*', [online]. Johannesburg: Mybroadband, 30 November. Available from <https://mybroadband.co.za/news/broadband/65938-mtn-lte-launched.html>, [Accessed: 28 January 2018].

MyBroadband 2014. '*Great South African inventions'*, [online]. Johannesburg: MyBroadband, 26 March. Available from <https://mybroadband.co.za/news/technology/99208-great-south-african-inventions.html>, [Accessed: 26 January 2018].

MyBroadband 2015. '*What 1GB of mobile data in SA can buy you elsewhere'*, [online]. Johannesburg: Mybroadband, 24 February. Available from <https://mybroadband.co.za/news/cellular/119434-what-1gb-of-mobile-data-in-sa-can-buy-you-elsewhere.html>, [Accessed: 28 January 2018].

MyBroadband 2016. '*This is why South African mobile broadband is so slow and expensive*', [online]. Johannesburg: Mybroadband 6 February. Available from <https://mybroadband.co.za/news/broadband/154030-this-is-why-south-african-mobile-broadband-is-so-slow-and-expensive.html>, [Accessed: 28 January 2018].

MyBroadband 2017. '*South Africa is 10 years behind on spectrum*', [online]. Johannesburg: Mybroadband, 22 May. Available from <https://mybroadband.co.za/news/cellular/210852-south-africa-is-10-years-behind-on-spectrum.html> [Accessed 4 November 2017].

MyBroadband 2017a. '*The plan to merge ICASA, .zaDNA, and USAASA'*, [online]. Johannesburg: Mybroadband,10 October. Available from <https://mybroadband.co.za/news/government/232639-the-plan-to-merge-icasa-zadna-and-usaasa.html>, [Accessed: 28 January 2018].

Nair, M., Han, G-S., Lee, H., Goon, P. & Muda, R. 2012. ‘Antecedents to Mobile Phone Diffusion in a Developing Economy: The Case of Malaysia’, *International Journal of Management,* 29(1) Part 2: 205-227

Nakata, C. and Weidner, K. 2012. ‘Enhancing new product adoption at the base of the pyramid: a contextualized model’, *Journal of Product Innovation Management*, *29*(1): 21-32

Narula, S.A. and Arora, S. 2010 ‘Identifying stakeholders' needs and constraints in adoption of ICT services in rural areas: the case of India’, *Social Responsibility Journal*, 6(2): 222-236

Newton, H. 1997. *Newton’s Telecom Dictionary*, 12th Ed. New York: Flatiron Publishing Inc

New Zealand, Statistics New Zealand 2017. ‘*Household Expenditure Statistics: Year ended June 2016*’, [online]. Wellington, New Zealand: Statistics New Zealand, 2017. Available from <http://archive.stats.govt.nz/browse_for_stats/people_and_communities/Households/HouseholdExpenditureStatistics_HOTPYeJun16/Commentary.aspx>, [Accessed: 28 February 2018].

Nguyen, N.A. 2016. ‘A Cross-Cultural Study on e-Government Services Delivery’ *The Electronic Journal Information Systems Evaluation*, 19(2): 121-134.

Norum, P.S. 2003. ‘Examination of Generational Differences in Household Appareil Expenditure’, *Family and Consumer Research Journal*, 32(1): 52-57.

Novak, J.D. & Cañas, A.J. 2008. ‘The Theory Underlying Concept Maps and How to Construct and Use Them’, Technical Report IHMC CmapTools 2006-01 Rev 01-2008, *Florida Institute for Human and Machine Cognition*, 2008. Available from <http://cmap.ihmc.us/docs/pdf/TheoryUnderlyingConceptMaps.pdf>, [Accessed: 30 July 2017].

Novak, J.D. and Musonda, D. (1991). ‘A twelve-year longitudinal study of science concept learning’. *American Educational Research Journal*, 28(1): 117-153.

Nunnally, J.O. (1978). *Psychometric theory*. New York: McGraw-Hill.

Nyika, A. No date. '*Mixed Methods'*, [online], Pretoria: University of Pretoria. Available from <https://www.up.ac.za/media/shared/624/mixed-methods-abridged-for-website.zp119930.pdf>, [Accessed: 12 May 2018].

Nysveen, H., Pedersen, P.E. & Thorbjornsen, H. 2005. 'Intentions to use mobile services: antecedents and cross-service comparisons', *Journal of the Academy of Marketing Science*, 33(2): 330-346.

Odoom, R. 2016. 'Brand-building efforts in high and low performing small and medium-sized enterprises (SMEs)', *Journal of Small Business and Enterprise Development*, 23(4): 1229-1246.

Olivier, M.S. 2009. *Information Technology research: a practical guide to computer science infomatics*, 3rd Ed. Pretoria: Van Schaik

Oluwatayo, I.B. 2014. 'Information and Communication Technologies as Drivers of Growth: Experience from Selected Small-Scale Businesses in Rural Southwest Nigeria'. *Spanish Journal of Rural Development,* 5(2): 65–76.

Onwuegbuzie, A.J. and Johnson, R.B. 2006. 'Validity Issue in Mixed Research', *Research in Schools*, 13(1); 48-63.

Opdenakker, R. 2006. 'Advantages and Disadvantages of Four Interview Techniques in Qualitative Research', *Forum: Qualitative Social Research* 7(4), art 11: 1-13.

Opler, M.E. 1945. 'Themes as dynamic forces in culture', *American Journal of Sociology,* 5:198–206.

Organisation for Economic Co-Operation and Development, (OECD) 2005. *Guide to Measuring the Information Society*. Paris: OECD Publishing. Document DSTI/ICCP/IIS(2005)6.

Organisation for Economic Co-Operation and Development, (OECD) 2007. '*Working Party on Indicators for the Information Society: Information Economy - Sector definitions based on the International Standard Industry (ISIC 4)*'. Paris: OECD Publishing. Document DSTI/ICCP/IIS(2006)2/FINAL.

Organisation for Economic Co-Operation and Development, (OECD) 2007a. '*International Standard Industry Classification (ISIC) Revision 4'.* Paris: OECD Publishing.

Organisation for Economic Co-Operation and Development, (OECD) 2010. '*Wireless Broadband Indicator Methodology*', Paris: OECD Publishing. OECD Digital Economy Papers, No. 169.

Pagani, M. 2004. 'Determinants of Adoption of Third Generation Mobile Multimedia Services', *Journal of Interactive Marketing*, 18(3): 46-59.

Pallant, J. 2011. *SPSS SURVIVAL MANUAL: A step by step guide to data analysis using SPSS*, 4th ed. Crows Nest: Allen & Unwin

Parisot, A.H. 1997. 'Distance education as a catalyst for changing teaching in the community college: Implications for institutional policy' *New Directions for Community Colleges*, 99: 5-13.

Park, J.K., Yang, S.J. & Lehto, X. 2007. 'Adoption of Mobile Technologies for Chinese Consumers', *Journal of Electronic Commerce Research*, 8(3): 196-206.

Parker, P.M. 1994. 'Aggregate Diffusion forecasting Models in Marketing: A Critical Review', *International Journal of Forecasting*, 10(20): 353-380.

Patton, M.Q. 2015. *Qualitative evaluation and research methods*, 4th ed. Newbury Park, CA: Sage.

Pedersen, E. 2005. 'Adoption of Mobile Internet Services: An Exploratory Study of Mobile Commerce Early Adopters', *Journal of Organizational Computing and Electronic Commerce*, 15(3): 203-222.

Phonthanukitithaworn, C., Sellitto, C. & Fong, M. 2015. 'User Intentions to Adopt Mobile Payment Services: A Study of Early Adopters in Thailand', *Journal of Internet Banking and Commerce*, 20(1): 1-29.

Pisciotta, A.A. 1992. 'Telecommunications Reforms: Options, Models, and Global Challenges', *Communications Magazine IEEE*, 32(11): 28-31.

Plouffe, C.R., Hulland, J.S. & Vandenbosch, M. 2001. 'Research Report: Richness versus Parsimony in Modelling Technology Adoption Decisions – Understanding Merchant Adoption of a Smart Card-based Payment System', *Information Systems Research*, 12(2): 208-222.

Podsakoff, P.M., MacKenzie, S.B., Lee, J-Y. & Podsakoff, N.P. 2003. 'Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies', *Journal of Applied Psychology*, 88(5): 879–903.

Podsakoff, P.M., MacKenzie, S.B. & Podsakoff, N.P. 2012. 'Sources of method bias in social science research and recommendations on how to control it', *Annual Review of Psychology*, 63(1): 539-569.

Ponterotto, J.G. 2005. 'Qualitative Research in Counseling Psychology: A Primer on Research Paradigms and Philosophy of Science', *Journal of Counseling Psychology*, 52(2): 126-136.

Prertorius, L. 2019. 'SPECIAL REPORT Are we being overcharged for data? How SA stacks up against 9 peer countries', [online]. Johannesburg: Fin24 16 January. Available from <https://www.fin24.com/Companies/ICT/special-report-are-we-being-overcharged-for-data-how-sa-stacks-up-against-9-peer-countries-20190116-2>, [Accessed on 21 January 2019]

Prieger, J.E. 2015. 'The broadband digital divide and the benefits of mobile broadband for minorities', *Journal of Economic Inequality,* 13(3): 373-400.

Prokaza, J. 2018. '*How does a smartphone SIM card work? The technology behind SIM cards explained'* [online], London: BT 20 April. Available at <https://home.bt.com/tech-gadgets/phones-tablets/how-does-a-smartphone-sim-card-work-the-technology-behind-sim-cards-explained-11363967555573>, [Accessed: 28 May 2018]

Ragosa, D. 1980. 'Comparing nonparallel regression lines', *Psychological Bulletin,* 88(2): 307–321.

Rahman, M.M. 2015. 'Opportunities and Challenges of M-commerce Adoption in Bangladesh: An Empirical Study', *Journal of Internet Banking and Commerce*, 20(3): 1-23

Raida, R.E. and Néji, B. 2013. ‘The Adoption of the E-banking: Validation of the Technology Acceptance Model’, *Technology and Investment*, 4(3): 197-203.

Rainie, L. 2010. ‘Networked individuals: how they are reshaping social life and learning environments’, [online]. *Pew Research Centre’s Internet & American Life Project*. Available at <http://www.pewinternet.org/2010/04/14/networked-individuals-how-they-are-reshaping-social-life-and-learning-environments/>, [Accessed: 17 November 2017].

Reichardt, C.S. and Rallis, S.F. 1994. ‘The relationship between the qualitative and quantitative research traditions’. In: Reichardt, C.S. and Rallis, S.F. eds., *New directions for program evaluation*, No. 61, pp. 5-11. San Francisco, CA: Jossey-Bass.

Republic of South Africa, 1996. ‘Telecommunications Act’, Act 103 of 1996. Issued 12 November 1996. Cape Town: Government Printer.

Republic of South Africa, 2005. ‘Electronic Communications Act’, Act 36 of 2005. Issued 6 April 2006. Cape Town: Government Printer.

Republic of South Africa, 2013. ‘*Connect South Africa: Creating Opportunities, Ensuring Inclusion*’. Government Gazette No. 37119. Issued on 6 December 2013. Cape Town: Government Printer.

Research ICT Africa 2015. ‘*Value for Money Index’*, [online]. Available from <http://researchictafrica.net/2015/02/25/value-for-money-index-2014/> [Accessed: 6 November 2017].

Research ICT Africa 2016. ‘*UPDATE: State of prepaid market in South Africa Submission to the Parliament of South Africa on* “The Cost to Communicate in South Africa’, [online]. Available from <https://researchictafrica.net/polbrf/Research_ICT_Africa_Policy_Briefs/2016_Policy_Brief_4_South_Africa_Cost_to_Communicate.pdf>, [Accessed: 21 November 2017].

Research ICT Africa 2017. '*South African data prices static for two years but consumers not flocking to cheapest product offering'*. Research Policy Brief no.3 2017, [online] Available from <http://www.researchictafrica.net/polbrf/Research_ICT_Africa_Policy_Briefs/2017_Policy%20Brief%203_South%20Africa.pdf>, [Accessed: 6 November 2017].

Reuters 2017. 'South African cabinet to review plan to merge state-owned telecom firms', [online]. Reuters, 5 September 2017. Available from <https://www.reuters.com/article/safrica-broadband/south-african-cabinet-to-review-plan-to-merge-state-owned-telecom-firms-idUSL8N1LM21D>, [Accessed: 28 January 2018].

Riquelme, H.E. and Rios, R.E. 2010. 'The moderating effect of gender in the adoption of mobile banking', *International Journal of Bank Marketing*, 28(5): 328-341.

Roberts, K.J. and Pick J.B. 2004. 'Technology Factors in Corporate Adoption of Mobile Cell Phones: A Case Study Analysis', In: *Proceedings of the 37th Hawaii International Conference on System Sciences. Hawaii 5-8 January, 2004:* IEEE Computer Society. 1-10.

Robson, C. 2002. '*Real World Research: A Resource for Social Scientists and Practitioner-Researchers',* 2nd ed. Oxford: Blackwell Publishers.

Rondan-Cataluña, F.J., Arenas-Gaitán J. & Ramírez-Correa, P.E. 2015. 'A Comparison of the Different Versions of Popular Technology Acceptance Models. A Non-linear perspective', *Kybernetes,* 44(5): 788-805.

Rogers, E.M. 1983. *Diffusion of Innovations*. 3rd Ed'. New York: Free Press.

Rogers, E.M. 2003. *Diffusion of Innovations*. 5th Ed'. New York: Free Press.

Rogers, E.M. and Shoemaker, F.F. 1971. *Communication of Innovations: A Cross-Cultural Approach*. New York: Free Press.

Roy, S. 2017. 'App Adoption and Switching Behavior: Applying the Extended TAM In Smartphone App Usage', *JISTEM - Journal of Information Systems and Technology Management*, 14(2): 239-261.

Ryan, G.W. and Bernard, H.R. 2003. ‘Techniques to Identify Themes’, *Field Methods*, 15(1): 85-109.

Safaricom 2011. ‘*Safaricom Annual Report and Group Accounts for Year ended 31 March 2011*’, Nairobi: Safaricom.

Sahin, I. 2006. ‘Detailed review of Rogers’ Diffusion of Innovations Theory and Educational Technology-Related Studies based on Rogers’ Theory’, *The Turkish Online Journal of Educational Technology*, 5(2): 14-23.

Saif Almuraqab N. and Jasimuddin S. 2017. ‘Factors that Influence End-Users' Adoption of Smart Government Services in the UAE: A Conceptual Framework’, *The Electronic Journal Information Systems Evaluation*, 20(1): 11-23.

SALDRU, South African Labour and Development Research Unit 2018. ‘Income Comparison Tool’, [online]. Available from <https://www.saldru.uct.ac.za/income-comparison-tool/>, [Accessed: 18 July 2018].

Sánchez-Prieto, J.C., Olmos-Migueláñez, S. & García-Peñalvo, F.J. 2017. ‘Motivation and innovation: Acceptance of mobile technologies in teachers in training’, *Iberoamerican Magazine of Distance Education*, 20(2): 273-292.

Sarfaraz, J. 2017. ‘Unified theory of acceptance and use of technology (UTAUT) model-Mobile banking’, *Journal of Internet Banking and Commerce*, 22(3): 1-20.

Saunders, M., Lewis, P. & Thornhill, A. 2009. *Research Methods for Business Students*. 5th ed. London: Pearson Education Limited.

Saunders, R.J. 1982. Telecommunications in Developing Countries: Constraints on Development’, In: Jussawal, M. and Lamberton, D.M. eds. *Communication economics and Development*. Honalulu: The East-West Centre.

Saunders, R.J., Warford, J. & Wellinius, R. 1983. ‘*Telecommunications and Economic Development*’, The World Bank, Washington DC: The World Bank.

Schaie, K.W. 1965. ‘A general model for the study of developmental problems’. *Psychological Bulletin*, 64(2): 92-107.

Schewe, C.D., Meredith G.E. & Noble, S.M. 2000. ‘Defining moments: Segmenting by cohorts’ *Marketing Management,* 9(3): 48-53.

Schumpeter, J.A. 2002. 'The economy as a whole: seventh chapter of the theory of economic development', *Industry and Innovation*, 9(1-2): 93-145.

Schwandt, T.A. 2001. *The Sage Dictionary of Qualitative Inquiry*, 3rd ed. California: Sage.

Schwartz, S.H. 1999. 'A Theory of Cultural Values and Some Implications for Work', *Applied Psychology: An International Review*, 48(1): 23–47.

Schwartz, S.H. 2006. 'A Theory of Cultural Value Orientations: Explication and Applications', *Comparative Sociology*, 5(2-3): 137-182.

Schwartz, S.H. 2012. 'An Overview of the Schwartz Theory of Basic Values', *Online Readings in Psychology and Culture,* 2(1).

Scott, J. 2000. 'Is it a different world to when you were growing up? Generational effects on social representations and child-rearing values', *British Journal of Sociology*, 51(2): 355-376.

Selvabaskar, S., Prasanna Sivagami, K.G. & Aishwarya, S. 2017. 'Consumer Perception and Attitude towards the Usage of M-Health Applications', *Research Journal of Pharmacy and Technology*, 10(8): 2567-2572.

Shapshak, T.D. 2005. *MTN Launches 3G*, [online]. Johannesburg: Mail and Guardian, 1 July. Available at <https://mg.co.za/article/2005-07-01-mtn-launches-3g>, [Accessed: 28 January 2018].

Sharma, R. and Mishra, R. 2014. 'A Review of Evolution of Theories and Models of Technology Adoption', *Indore Management Journal*, 6(2): 17-29.

Shaughnessy, J.J., and Zechmeister, E.B. (1997). *Research Methods in Psychology*. 4th ed. New York: McGraw-Hill.

Shepard, S. 2005. *Telecommunications Crash Course*, 2nd ed. New York, NY: McGraw-Hill/Osborne.

Shih, K-H. and Kang, S. 2017. 'Silicon Storefronts: Exploring the Evolution of M-Commerce's Effect on Service Industries', *Journal of Accounting, Finance & Management Strategy,* 12(2): 65-96

Shirazi, F. and Iqbal, A. 2017. ‘Community clouds within M-commerce: a privacy by design perspective’, *Journal of Cloud Computing*, 6(1): 1-12.

Shmueli, G. 2010. ‘To Explain or To Predict?’ [online]. Amsterdam: *Social Science Research Network, Statistical Science,* May 24, 2010. Available at: <http://ssrn.com/abstract=1351252>, [Accessed: 12 February 2014]

Sihare, S.R. 2017. ‘Role of m-Banking for Indian Rural Consumers, its Adaptation Strategies, and Challenges: Consumer Behavior Analysis’, *International Journal of Information Engineering and Electronic Business*, 9(6): 35-42.

Simon, H.A. 2001. ‘Science Seeks Parsimony, not Simplicity: Searching for Pattern in Phenomena’, In: Zellner, A., Keuzenkamp, M. & McAleer, M. eds. *Simplicity, Inference and Modeling: Keeping it Sophisticatedly Simple*. Cambridge: Cambridge University Press.

Simon, H.A. and Sebastian, K.H. 1987. ‘Diffusion and advertising: The German telephone campaign’*, Management Science*, 33(4): 451-466.

Slevitch, L. 2011. Qualitative and quantitative methodologies compared: ontological and epistemological perspectives, ‘*Journal of Quality Assurance in Hospitality and Tourism*’, 12(1): 73-81.

Smith, M.D 2008. ‘Stochastic frontier models with dependent error components’, *Econometrics Journal,* 11(1): 172–192.

Smith, J. and Noble, H. 2014. ‘Bias in research’, *Evidence Based Nursing*, 17(4): 100-101.

Snape, D. and Spencer, L. 2003. ‘*Qualitative research practice: A guide for social science students and researchers’*, London: Sage Publications

Sobhanifard, Y., Kharazan M.A. & Alikhani, M.A. 2017. ‘Consumer based Modelling of Mobile Service Consumption using Explanatory Factor Analysis and Analytic Network Process’, *Journal of Internet Banking and Commerce*, 22(2): 1-20.

Sooryamoorthy, R. 2015. ‘Cell Phone Use and Youth Perceptions of Communication in South Africa’, In: Blair, S.L., Claster, P.N. & Claster, S.M, eds. *Technology and*

Youth: Growing Up in a Digital World. Book 19 Bradford, UK: Emerald Publishing. 73-103.

South African Advertising Research Foundation (SAARF) 2016. *SAARF AMPS Dec 2015*, Johannesburg: South African Advertising Research Foundation, [online], Available from <http://www.saarf.co.za/saarf/newsreleases.asp>, [Accessed: 23 May 2017].

South African Advertising Research Foundation (SAARF) 2017. '*SAARF LSM level Descriptors – AMPS 2015AB>pptx'*, Johannesburg: South African Advertising Research Foundation [online]. Available from <http://www.saarf.co.za/AMPS/technicalreports.asp>, [Accessed: 23 May 2017].

South Africa, Statistics South Africa 2012. '*Census 2011: Census in Brief'*, *Statistical Report* 03-01-41. Pretoria: Statistics South Africa.

South Africa, Statistics South Africa 2013. '*General Houshold Survey 2012', Statistical Release* P0318. Pretoria: Statistics South Africa.

South Africa, Statistics South Africa. 2017. *'Mid-year population estimates', Statistical Release* P0302. Pretoria: Statistics South Africa.

South Africa, Statistics South Africa 2017a. '*Information and Communication Technology satellite account for South Africa, 2013 and 2014, Statistical Report* 04-07-01. Pretoria: Statistics South Africa.

South Africa, Statistics South Africa 2017b. '*General Houshold Survey 2016', Statistical Release* P0318. Pretoria: Statistics South Africa.

South Africa, Statistics South Africa 2018. '*Quarterly Labour Force Survey Quarter 4: 2017', Statistical Release* P0211. Pretoria: Statistics South Africa

Spectrummonitoring.com. 2019. *Cellular standards GSM*. Netherlands: Spectrummonitoring.com. Available from <https://www.spectrummonitoring.com/frequencies/frequencies1.html#SouthAfrica>, [Accessed: 19 July 2019].

Srite, M. and Karahanna, E. 2006. 'The role of espoused national cultural values in technology acceptance', *MIS Quarterly*, 30(3): 679-704.

Stewart, A.J. and Healy, J.M. 1989. ‘Linking individual development and social changes’, *American Pyschologist*, 44(1): 30-42.

Strauss, A. and Coburn, J. 1998. Basics of Qualitative Research: Grounded Theory Procedures and Techniques, 2nd ed. Thousand Oaks, CA: Sage

Suki, N.M., Ramayah, T. & Ly, K.K. 2012. ‘Empirical investigation on factors influencing the behavioural intention to use Facebook’, *Universal Access in the Information Society*, 11(2): 223–231

Sulaiman, A, Jaafar N.I. & Mohezar, S. 2007. ‘An overview of mobile banking adoption among the urban community’, *International Journal of Mobile Communications,* 5(2): 157-168.

Summers, J. 2013. *The Airtel minutes factory in Africa 3 years on: is it the promised market slayer?* [online]. London: *Africantelecomsnews.com*. 17 June. Available from <http://www.blog.africantelecomsnews.com/2013/06/the-airtel-minute-factory-3-years-on.html>, [Accessed: 16 July 2018].

Suoranta, M. and Mattila, M. 2004. ‘Mobile banking and consumer behaviour: New insights into the diffusion pattern’, *Journal of Financial Services Marketing*, 8(4): 354-366.

Sykes, T.A., Venkatesh, V. & Gosain, S. 2009. ‘Model of Acceptance with Peer Support: A Social Network Perspective to Understand Employees' System Use’, *MIS Quarterly*, 33(2): 371-393.

Tashakkori, A. 2006. ‘Growing Pains? Agreements, disagreements, and New Directions in Conceptulizing Mixed Methods’, *Keynote address presented at the 2nd Annual Mixed Methods Conference*, July 2006. Humerton School of Health Studies, Cambridge, UK.

Tashakkori, A. and Teddlie, C. 1998. *Mixed Methodology: Combing Qualitative and Quantitative Approaches.* Thousand Oaks CA: Sage

Taylor, L.D. 1994. *Telecommunications Demand in Theory and Practice*, Dordrecht: Kluwer Academic.

Taylor, S. and Todd, P.A. 1995. ‘Understanding Information Technology Usage: A Test of Competing Models’, *Information Systems Research*, 6(4): 144-176.

Techcentral 2016. *Free Wi-Fi: a tale of two cities*, [online]. Johannesburg: Techcentral 23 June. Available from <https://techcentral.co.za/wi-fi-a-tale-of-two-cities/66288/> [Accessed: 28 January 2018].

Telkom 2002. *Annual Report Business Year 2002*. Pretoria: Telkom.

Telkom 2017. *Telkom_Annual_Results_Booklet_WP_2017_Final*, Pretoria: Telkom.

Temple, S. 2017. ‘Vintage Mobiles: Samsung SCH-R900 – The world's first LTE Mobile’. *History of GSM: Birth of the mobile revolution*, [online]. United Kingdom: GSM History.com. Available from <http://www.gsmhistory.com/vintage-mobiles/>, [Accessed: 28 December 2017].

Temple, S. 2018. ‘History of GSM: Birth of the mobile revolution’, [online]. United Kingdom: GSM History.com. Available from <http://www.gsmhistory.com/gsm_2g//>, [Accessed: 20 January 2018].

Teo, T.S.H. and Pok, S.H. 2003. ‘Adoption of WAP Enabled Mobile Phones among Internet Users’, *Omega: The International Journal of Management Sciences*, 31(6): 483-498.

Terre Blanche, M., Durrheim, K. & Painter, D. 2006. *Research in Practice: Applied Methods for the Social Sciences*. 2nd ed. Cape Town: University of Cape Town Press.

Thompson, R.L., Higgins, C.A. & Howell, J.M. 1991. ‘Personnel Computing: Toward a Conceptual Model of Utilization’, *MIS Quarterly*, 15(1): 124-143.

Thompson, R.L., Higgins, C.A. & Howell, J.M. 1994. ‘Influence of Experience Personnel Computer Utilization: Testing a Conceptual Model’, *Journal of Management Information Systems*, 11(1): 167-187.

Tinsley, H.E.A. and Tinsley, D.J. 1987. ‘Uses of Factor Analysis in Counseling Psychology Research’, *Journal of Counseling Psychology*, 34(4): 414-424

Tisdell, C. 1981. *Science and Technology Policy: Priorities of Governments*. London: Chapman & Hall.

Tipper, D. no date. ‘First Generation Cellular’, [online]. University of Pittsburgh, Graduate Program in Telecommunications and Networking, Material for 2720. Pittsburgh: University of Pittsburgh. Available from <http://www.pitt.edu/~dtipper/2720/2720_Slides5.pdf>, [Accessed: 12 January 2018].

Tornatzky, L.G. and Klein, K.J. 1982. ‘Innovation Characteristics and Innovation Adoption-Implementation: A Meta-Analysis of Findings’, *IEEE Transactions on Engineering Management*, 29(1): 28-45.

Torrance, H. 2012. ‘Triangulation, Respondent Validation, and Democratic Participation in Mixed Methods Research’, *Journal of Mixed Methods Research*, 6(2): 111-123

Triandis, H.C. 1977*. Interpersonnel Behaviour. Monterey*, CA: Brooke/Cole

Truter, I. 2007. ‘An overview of the Living Standards Measurement’, SA *Pharmaceutical Journal*, 74(9): 52-54

Turban, E., King, D. & Lee, J.K. 2006. *Electronic Commerce: A Managerial Perspective*. 4th ed. Upper Saddle River, New Jersey: Prentice Hall.

Tutorialspoint, no date. ‘Telecom Billing - Pre-Paid vs Post-Paid’, [online]. Hyderabad, India: Tutorials Point Available from <https://www.tutorialspoint.com/telecom-billing/prepaid-vs-postpaid.htm>, [Accessed: 28 January 2018]

Twenge, J.M. and Campbell, S.M. 2008. ‘Generational differences in psychological traits and their impact on the workplace’, *Journal of Managerial Psychology*, 23(8): 862-877

Twenge, J.M, Cambell, S.M., Hoffman, B.J. & Lance C.E, 2010. ‘Generational Differences in Work Values: Leisure and Extrinsic Values Increasing, Social and Values Decreasing,’ *Journal of Management,* 36(5): 1117-1142.

United Kingdom, Office of National Statistics United Kingdom 2016. ‘*Family spending in the UK: Financial year ending March 2016’*, [online]. Newport, UK: UK Statistics Authority. Available from <https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/expenditure/bulletins/familyspendingintheuk/financialyearendingmarch2016>, [Accessed: 28 February 2018].

United Nations 1999. *Trade and Development Report, 1999, United Nations United Nations Conference on Trade and Development Geneva*. Geneva: United Nations

University of California 2010. 'Determining the sample size', [online]. Berkley, CA: University of California. Available from <www.unc.edu/~rls/s151-2010/class23.pdf>, [Accessed: 20 October 2014]

Udo, G., Bagchi, K.K. & Kirs, P.J. 2008. 'Diffusion of ICT in Developing Countries: A Qualitative Differential Analysis of Four Nations', *Journal of Global Information Management*, 11(1): 6-27.

Urbaczewski, A., Wells, J. & Sarker, S. 2002. 'Exploring Cultural differences as a means of understanding the Global Mobile Internet: A theoretical basis and program of Research', In: *Proceedings of the 35th Hawaii International Conference on System Sciences. Hawaii 7-10 January, 2002:* IEEE Computer Society. 654-663.

Vagias, W.M. 2006. 'Likert-type scale response anchors'. *Clemson International Institute for Tourism & Research Development*, Department of Parks, Recreation and Tourism Management: Clemson University.

Vallerand, R.J. 1997. 'Toward a Hierarchical Model of Intrinsic and Extrinsic Motivation', In Zanna M. ed., *Advances in Experimental Social Psychology* (29), New York: Academic Press, 271-360

Vallie, Z. 2018. *Cell C enters multi-billion-rand deal to roam on MTN's network*, [online]. Johannesburg: Business Report, 30 May. Available from <https://www.iol.co.za/business-report/companies/cell-c-enters-multi-billion-rand-deal-to-roam-on-mtns-network-15232207>, [Accessed: 31 July 2018].

Van Biljon, J. 2006. Modelling the Factors that Influence Mobile Phone Adoption. Doctor of Philosophy Thesis, University of South Africa, Pretoria.

Van Dijck, J. 2013. *The Culture of Connectivity: A Critical History of Social Media*. Oxford: Oxford University Press.

Van Zyl, G. 2015. *Blue Label to acquire 35% of Cell C*, [online]. Johannesburg: Fin24, 10 December. Available from <https://www.fin24.com/Tech/Companies/blue-label-to-acquire-35-of-cell-c-20151210>, [Accessed: 28 January 2018].

Van Zyl, G. 2016. *Why Vodacom M-Pesa has flopped in SA*, [online]. Johannesburg: Fin24, 9 May. Available from <https://www.fin24.com/Tech/Companies/why-vodacom-m-pesa-has-flopped-in-sa-20160509>, [Accessed: 23 July 2018].

Venkatesh, V. 2000. 'Determinants of perceived ease of use: integrating control, intrinsic motivation and emotion into the technology acceptance model', *Information Systems Research*, 11(4): 342-365.

Venkatesh, V. and Bala, H. 2008. 'Technology acceptance model 3 and a research agenda on interventions', *Decision Sciences*, 39(2): 273-315.

Venkatesh, V. and Davis, F.D. 1996. 'A model of the antecedents of perceived ease of use: development and test', *Decision Sciences*, 27(3): 451-481.

Venkatesh, V. and Davis, F.D. 2000. 'A Theoretical Extension of the Technology Acceptance Model: Four longitudinal Field Studies', *Management Science*, 45(2): 342-365.

Venkatesh, V. and Morris, M.G. 2000. 'Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior', *MIS Quarterly*, 24(1): 115-39.

Venkatesh, V., Morris, M.G., Davis, G.B. & Davis, F.D. 2003. 'User Acceptance of Information Technology: Toward a Unified Theory'*. MIS Quarterly*, 27(3): 425-478.

Venkatesh, V., Thong, J.Y.L. & Xu, X. 2012. 'Consumer acceptance and use of information Technology: extending the unified theory of acceptance and use of technology', *MIS Quarterly*, 36(1): 157-178.

Venkatesh, V. and Zhang, X. 2010. 'Unified Theory of Acceptance of Technology: US vs. China', *Journal of Global Information Technology Management*, 13(1): 5-27.

Verhees, B., van Kuijk, K. & Simonse, L. 2017. 'Care Model Design for E-Health: Integration of Point-of-Care Testing at Dutch General Practices', *International Journal of Environmental Research and Public Health*, 15(4): 1-16.

Vermesan, O., Friess, P., Guillemin, P., Sundmaeker, H., Eisenhauer, M., Moessner, K., Le Gall, F. & Cousin, P. 2013*. Internet of Things Strategic Research and Innovation Agenda*. In: Vermesan, O. and Friess, P. eds. '*Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems*'. Aalborg: River Publishers.

Viswanathan, M., Sridharan, S. & Ritchie, R. 2010. 'Understanding consumption and entrepreneurship in subsistence marketplaces', *Journal of Business Research*, 63(6): 570-581.

Vodacom 2017. '*Vodacom Group Preliminary Results for the year ending 2017'*. Johannesburg: Vodacom Group Ltd.

Vodacom 2017a. '*Vodacom Interim results for 6 months ending 30 September 2017*'. Johannesburg: Vodacom Group Ltd.

Vodacom 2018. '*Vodacom coverage maps'*, [online]. Johannesburg: Vodacom Group Ltd. Available from <http://www.vodacom.co.za/vodacom/coverage-map> [Accessed: 26 February 2018].

Vodacom 2018a. '*Vodacom Fact Sheet as at 31 March 2018'*, [online]. Johannesburg: Vodacom Group Ltd. Available from <http://www.vodacom.com/pdf/feedback/factsheet-31032018.pdf>, [Accessed: 17 September 2018].

Warner, R.E. 2008. *Applied Statistics from Bivariate through Multivariate Techniques*, CA: Sage.

Webster, J. and Martocchio, J.J. 1992. 'Microcomputer playfulness: Development of a measure with workplace implications'. *MIS Quarterly*, 16(2): 201–226.

Wechuli, N.A., Franklin, W. & Jotham, W. 2017. 'User Perceived Secure Mobile Banking Service Provision Framework', *International Journal of Computer Engineering And Information Technology*, 9(10): 225–232.

Weidner, K.L., Rosa, J.A. & Viswanathan, M. 2010. 'Marketing to subsistence consumers: Lessons from practice', *Journal of Business Research*, 63(6): 559-569.

Weiss, A.S. 2013. 'Exploring News Apps and Location-Based Services on the Smartphone', *Journalism and Mass Communication Quarterly* 90(3): 435–456.

Wellinius, B. 1989. 'The Impact of Modern Telecommunications'*, IEEE Technology and Social Magazine*, 8(4): 3-6

Wengraf, T. 2001. *Qualitative research interviewing*. London: Sage

Williams, R.M.Jr. (1968). '*Values'*. In Sills E. ed., *International Encyclopedia of the Social Sciences*. New York: Macmillan. 283-287

Wills, A. 2016. *Interrogating the Cell C Subscriber Numbers*, [online]. Pretoria: Africa Analysis, 20 October. Available from <https://africaanalysis.co.za/tag/cell-c/>, [Accessed: 28 January 2018].

Wisely, D. 2007. 'Cellular mobile — the generation game', *BT Technology Journal,* 25(2): 27-41

Worku, T. 2010. 'Electronic-banking in Ethiopia: practices, opportunities and challenges', *Journal of Internet Banking and Commerce*, 15(2): 2-8.

World Bank 2014. '*World Bank DataBase GINI Index'*. [Online] New York. World Bank. Available from <http://data.worldbank.org/indicator/SI.POV.GINI>, [Accessed 10 March 2014].

World Bank 2017. *World Bank DataBase South Africa Country Data,* [online]. New York: World Bank. Accessed from: <http://databank.worldbank.org/data/Views/Reports/ReportWidgetCustom.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=ZAF>, [Accessed: 20 November 2017].

Yadav, P. 2017. 'Active Determinants for Adoption of Mobile Wallet', *i-manager's Journal on Management*, 12(1): 7-14.

Yang, K. and Jolly, L.D, 2008. 'Age cohort analysis in adoption of mobile data service: gen Xer's versus baby boomers', *Journal of Consumer Marketing*, 25(5): 272-280.

Yatrakis, G. 1972. 'Determinants of the Demand for International Telecommunications', *Telecommunications Journal*, 39(12): 732-746.

Yeganeh, H. 2011. ‘A generic conceptualization of the cultural distance index: Application to Schwartz’s and Hofstede’s frameworks’, *Journal of Strategy and Management,* 4(4): 325-346.

Young, A.M. and Hinesly M.D. 2012. ‘Identifying Millennials’ Key Influencers from Early Childhood: Insights into Current Consumer Preferences’, *Journal of Consumer Marketing*, 29(2): 146-155.

Yu, C. 2012. ‘Factors Affecting Individuals to Adopt Mobile Banking: Empirical Evidence from the UTAUT Model’, *Journal of Electronic Commerce Research*, 13(2): 104-121.

Yuan, Y-H., Tsai, S-B, Dai, C-Y., Chen, H-M., Chen, W-F., Wu, C-H., Li, G. & Wang, J. 2017. ‘An empirical research on relationships between subjective judgement, technology acceptance tendency and knowledge transfer’, *PLoS ONE* 12(9): [Online] Available from <https://doi.org/10.1371/journal.pone.0183994>, [Accessed: 12 April 2018].

Zaimović, T. 2015. ‘Mobile carrier selection in a post-conflict environment – the primacy of ethnicity over conventional network effects’, *South East European Journal of Economics and Business*, 10(2): 55-68.

Zaidi, S.K.R., Henderson, C.D. & Gupta, G. 2017. ‘The moderating effect of culture on e-filing taxes: evidence from India’, *Journal of Accounting in Emerging Economies*, 7(1): 134-152.

Zhao, F. 2011. ‘Impact of national culture on e-government development: a global study’, *Internet Research*, 21(3): 362-380.

Zhao, F., Wallis, J. & Singh, M. 2015. ‘E-government development and the digital economy: a reciprocal relationship’, *Internet Research*, 25(5): 734-766.

Zigurs, I. and Buckland, B.K. 1989. ‘A theory of task/technology fit and group support systems effectiveness’. *MIS Quarterly*, 22(3): 313–316.

Zohrabi, M. 2013. ‘Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings’, *Theory and Practice in Language Studies*, 3(2): 254-262.

LIST OF ABBREVIATIONS

.zaDNA	South African Domain Name Authority
1G	1st Generation Mobile Telecommunications Network
2G	2nd Generation Mobile Telecommunications Network (GSM network)
3G	3rd Generation Mobile Telecommunications Network
4G	4th Generation Mobile Telecommunications Network (LTE network)
A	Attitude towards Use
ADSL	Asynchronous Digital Subscriber Line
AMPS	Advanced Mobile Phone System
ANOVA	one-way Analysis of Variance
ARIMA	Auto Regressive Integrated Moving Average
ARMA	Autoregressive Moving Average Statistical Model
ARPANET	Advanced Research Projects Agency Network
ARPU	Average Revenue Per Month (Mobile subscribers monthly spend)
BMI	Business Monitor International
BOP	Bottom of the Pyramid
CAGR	Compound Annual Growth Rate
CARLA	Centre for Advanced Research on Language Acquisition
CERN	European Organization for Nuclear Research
CFA	Confirmatory Factor Analysis
DAPRA	Defence Advanced Research Projects Agency

DTPB	Decomposed Theory of Planned Behaviour
DTPS	Department of Telecommunications and Postal Services
EDGE	Enhanced Data rates for GSM Evolution
EFA	Exploratory Factor Analysis
EGPRS	Enhanced General Packet Radio Services (UMTS Network)
EGTI	International Telecommunications Union Expert Group on Telecommunication/ICT Indicators
ERP	Enterprise Resource Planning
EU	*Estimated Utility*
EUSA	*Estimate Usability*
GDP	Gross Domestic Product
GNI p.c.	Gross National Income per Capita
GPRS	General Packet Radio Services
GPS	Global Positioning System
GSM	Global System for Mobile Communications (2nd Generation mobile network)
GSMA	GSM Association
HCFE	Household Final Consumption Expenditure
HSPA	High Speed Packet Access
IBM	International Business Machines
ICASA	Independent Communications Authority of South Africa
ICT	Information and Communication Technology
IDI	ICT Development Index
IDT	Innovation Diffusion Theory

IDV	Individualism/Collectivism (Hofstede Culture Dimension)
IMF	International Monetary Fund
IMF	International Monetary Fund
IP	Internet Protocol
IPB	ICT Price Basket
ITU	International Telecommunications Union
IU	Intention to Use
IU	Behaviour Intention to Use
KMO	Kaiser-Meyer-Olkin Measure of Sampling Adequacy
LAN	Local Area Networks
LSM	Living Standards Measures
LTE	Long Term Evolution (4th Generation mobile network)
LTO	Long- vs. Short-Term Orientation (Hofstede Culture Dimension)
MAPS	Model of Acceptance with Peer Support
MAS	Masculinity/Femininity (Hofstede Culture Dimension)
MB	Mega Bytes of Data (Amount of data transferred)
Mbps	Megabits per second (Speed of a data connection, 10^6 bits of data transferred per second)
MM	Motivation Model
MOP	Middle of the Pyramid
MOPTAM	Mobile Phone Technology Adoption Model
MOSPMT	*Mobile Service Provider Marketing Tactics*
MOSPMT_A	*Mobile Service Provider Marketing Tactics Construct A*

MOSPMT_B	*Mobile Service Provider Marketing Tactics Construct B*
MPCU	Model of Personal Computer Utilisation
MTN	Mobile Telephone Networks
MVNO	Mobile Virtual Network Operator
NTT	Nippon Telegraph and Telephone
OECD	Organisation for Economic Co-operation and Development
OFDM	Orthogonal Frequency-Division Multiplexing
PAF	Principal Axis Factoring
PCI	Perceived Characteristics of Innovating Framework
PDI	Power Distance (Hofstede Culture Dimension)
PEU	*Perceived Ease of Use*
PEU_A	*Perceived Ease of Use Construct A*
PEU_B	*Perceived Ease of Use Construct B*
POTS	Plain old Telephone Service
PPP	Purchase Price Parity
PU	*Perceived Usefulness*
PU_A	*Perceived Usefulness Construct A*
PU_B	*Perceived Usefulness Construct B*
RIA	Research ICT Africa
SAARF	South African Advertising Research Foundation
SCT	Social Cognitive Theory
SEM	Statistical Equation Modelling
SIC	Standard Industry Classification

SIM	Subscriber Identification Module
SMC	Squared Multiple Correlation
SPAV	*Social Pressure and Aspirational Value*
SPAV_A	*Social Pressure and Aspirational Value Construct A*
SPAV_B	*Social Pressure and Aspirational Value Construct B*
TAM	Technology Acceptance Model
TCP/IP	Transmission Control Protocol/Internet Protocol
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UAI	Uncertainty Avoidance (Hofstede Culture Dimension)
UMTS	Universal Mobile Telecommunications System (3rd Generation mobile network)
USAASA	Universal Service Access Agency
UTAUT	Universal Theory of Acceptance and Use of Technology Model
VNI	Cisco Virtual Networking Index
VoIP	Voice over Internet Protocol
WAN	Wide Area Networks
WCDMA	Wide-band Code Division Multiple Access
WiFi	radio wireless local area networking of devices based on the IEEE 802.11 standards

APPENDIX 1

Ethics Letter of Approval

PHASE 1

Graduate School of Business Leadership, University of South Africa, PO Box 392, Unisa, 0003, South Africa
Cnr Janadel and Alexandra Avenues, Midrand, 1685, Tel: +27 11 652 0000, Fax: +27 11 652 0299
E-mail: sbl@unisa.ac.za Website: www.unisa.ac.za/sbl

SCHOOL OF BUSINESS LEADERSHIP
RESEARCH ETHICS REVIEW COMMITTEE (GSBL CRERC)

06 May 2016

Ref #: 2015_SBL/DBL_028_FA
Name of applicant: Mr N Smith
Student #: 5282578

Dear Mr Smith

Decision: Ethics Approval

Student: Mr N Smith, neil@krafttech.com, 082 785 6098

Supervisor: Prof P Venter, ventep@unisa.ac.za, 011 652 0346

Project Title: The development of segmented model to determine the adoption of a new service or product in the South African telecommunications market.

Qualification: Doctorate in Business Leadership (DBL)

Thank you for applying for research ethics clearance, SBL Research Ethics Review Committee reviewed your application in compliance with the Unisa Policy on Research Ethics.

Outcome of the SBL Research Committee:
Approval is granted for the duration of the first phase of the Project

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the SBL Research Ethics Review Committee on the 05/05/2016.

The proposed research may now commence with the proviso that:

1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the SBL Research Ethics Review Committee.

45 Building leaders who go beyond

SBL GRADUATE SCHOOL OF BUSINESS LEADERSHIP UNISA

Graduate School of Business Leadership, University of South Africa, PO Box 392, Unisa, 0003, South Africa
Cnr Janadel and Alexandra Avenues, Midrand, 1685, Tel: +27 11 652 0000, Fax: +27 11 652 0299
E-mail: sbl@unisa.ac.za Website: www.unisa.ac.za/sbl

3) An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.
4) The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.

Kind regards

11/5/2016

Prof R Ramphal
Chairperson: SBL Research Ethics Committee
011 – 652 0363 or ramphrr@unisa.ac.za

Dr R Mokate
CEO and Executive Director: Graduate School of Business Leadership
011- 652 0256/mokatrd@unisa.ac.za

45 years Building leaders who go beyond

SBL
GRADUATE SCHOOL OF BUSINESS LEADERSHIP
UNISA

Phase 2

Graduate School of Business Leadership, University of South Africa, PO Box 392, Unisa, 0003, South Africa
Cnr Janadel and Alexandra Avenues, Midrand, 1685, Tel: +27 11 652 0000, Fax: +27 11 652 0299
E-mail: sbl@unisa.ac.za Website: www.unisa.ac.za/sbl

SCHOOL OF BUSINESS LEADERSHIP

RESEARCH ETHICS REVIEW COMMITTEE (GSBL CRERC)

18 July 2017

Ref #: 2017_SBL_DBL_028_FA
Name of applicant: Mr N Smith
Student #: 5282578

Dear Mr Smith

Decision: Ethics Approval

Student: Mr N Smith, neil@krafttech.com, 082 785 6098

Supervisor: Prof P Venter, ventep@unisa.ac.za, 011 652 0346

Project Title: The development of segmented model to determine the adoption of new service or product in the South African telecommunication market

Qualification: Doctorate in Business Leadership (DBL)

Expiry Date: July 2021

Thank you for applying for research ethics clearance, SBL Research Ethics Review Committee reviewed your application in compliance with the Unisa Policy on Research Ethics.

Outcome of the SBL Research Committee:
Approval is granted for the duration of the Project

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the SBL Research Ethics Review Committee on the 18/07/2017.

The proposed research may now commence with the proviso that:

1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2) Any adverse circumstance arising in the undertaking of the research project that is

45 Building leaders who go beyond

SBL GRADUATE SCHOOL OF BUSINESS LEADERSHIP UNISA

Graduate School of Business Leadership, University of South Africa, PO Box 392, Unisa, 0003, South Africa
Cnr Janadel and Alexandra Avenues, Midrand, 1685, Tel: +27 11 652 0000, Fax: +27 11 652 0299
E-mail: sbl@unisa.ac.za Website: www.unisa.ac.za/sbl

relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the SBL Research Ethics Review Committee.

3) An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.
4) The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.

Kind regards,

18/07/2017

Prof R Ramphal
Chairperson: SBL Research Ethics Committee
011 – 652 0363 or ramphrr@unisa.ac.za

21/7/2017
Dr R Mokate
CEO and Executive Director: Graduate School of Business Leadership
011- 652 0256/mokatrd@unisa.ac.za

45 years Building leaders who go beyond

SBL GRADUATE SCHOOL OF BUSINESS LEADERSHIP UNISA

APPENDIX 2

Letter of Informed Consent

Graduate School of Business Leadership, University of South Africa PO Box 392 Unisa 0003 South Africa
Cnr Smuts and First Avenue Midrand 1685 Tel: +27 11 652 0000 Fax: +27 11 652 0299
Email: sbl@unisa.ac.za Website: www.sblunisa.ac.za

Informed consent for participation in the academic research project,

The Development of a Segmented Model to Determine the Adoption of a New Service in the South African Telecommunications Market

Dear XXXXX,

You are herewith invited to participate in an academic research study conducted by Neil Smith, a student in the Doctor of Business Leadership at UNISA's Graduate School of Business Leadership (SBL).

The purpose of the study is to investigate what are the various adoption factors for a telecommunication service or product in the South African market and how they vary in different segments. The factors determined will then be tested and weighted for the various segments via a market survey. The data collected will then be used to develop a predictive model which can be used to determine the possible adoption of a new product or service with each of the segments.

All your answers will be treated as confidential, and you will not be identified in any of the research reports emanating from this research.

Your participation in this study is very important to us. You may however choose not to participate and you may also withdraw from the study at any time without any negative consequences.

We would like to conduct a one hour interview with you to determine the following:

- What are the key adoption factors or inhibitors to the adoption of a telecommunications service in the South African telecommunications market?
- Suggest a possible segmentation model based on publically available data and how do these factors vary in the various segments?

The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.

Please contact my supervisor, Professor P. Venter, e-mail: ventep@unisa.ac.za, tel: 0824166801 if you have any questions or comments regarding the study. Please sign the attached to indicate your willingness to participate in the study.

Yours sincerely

Neil Wesley Smith

Graduate School of Business Leadership, University of South Africa PO Box 392 Unisa 0003 South Africa
Cnr Smuts and First Avenue Midrand 1685 Tel: +27 11 652 0000 Fax: +27 11 652 0299
Email: sbl@unisa.ac.za Website: www.sblunisa.ac.za

I, XXXXXXXX, herewith give my consent to participate in the study titled ***"The Development of a Segmented Model to Determine the Adoption of a New Service in the South African Telecommunications Market."***
I have read the letter and understand my rights with regard to participating in the research.

______________________________ ______________________

Respondent's signature **Date**

APPENDIX 3

Interview Discussion Document

Outline of Discussion with regard to Phase 1 of the Doctoral Thesis
"A Framework to Determine the Adoption of New Services in the South African Telecommunications Market"

Aims of the discussion:
There will be three aims of this discussion:

Aim 1: To reduce the number of possible factors or drivers of adoption of a mobile telecommunications service from 50+ to the most important 5 to10.

Aim 2: To suggest a possible segmentation of mobile subscribers

Aim 3: To suggest how the adoption factors may vary according to the various segments

Questions to be discussed.

1) What do you think are the most important drivers for the adoption of services in the South African telecommunications market, (A minimum of 5, but if you think they are more please elaborate)?
2) Can you add justification for your choices and rate them in terms of importance?
3) In this outline I have added a series of the more important types of models used for the adoption of ICT. If we examine them would you add or change any of your drivers?
4) Do you think that there would be any differences in these drivers if the following was to happen:
   a. Free WiFi Hotspots with adequate bandwidth and download speeds were made available to the general population as well as devices?
   b. The government made a major push to rollout e-services, (government, health education)?
5) If you had to segment the South African Telecommunications market into a maximum of six different segments how would you do it?
   a. Why do you choose to do it that way?
   b. What are the main characteristics of each segment?
6) How do you think the drivers identified earlier vary in each segment?
   a. Will it change the importance, if so how, or
   b. Will it only be the magnitude that varies across the segments?

Interview Details:

Type: Semi-structured interviews using the above 6 questions

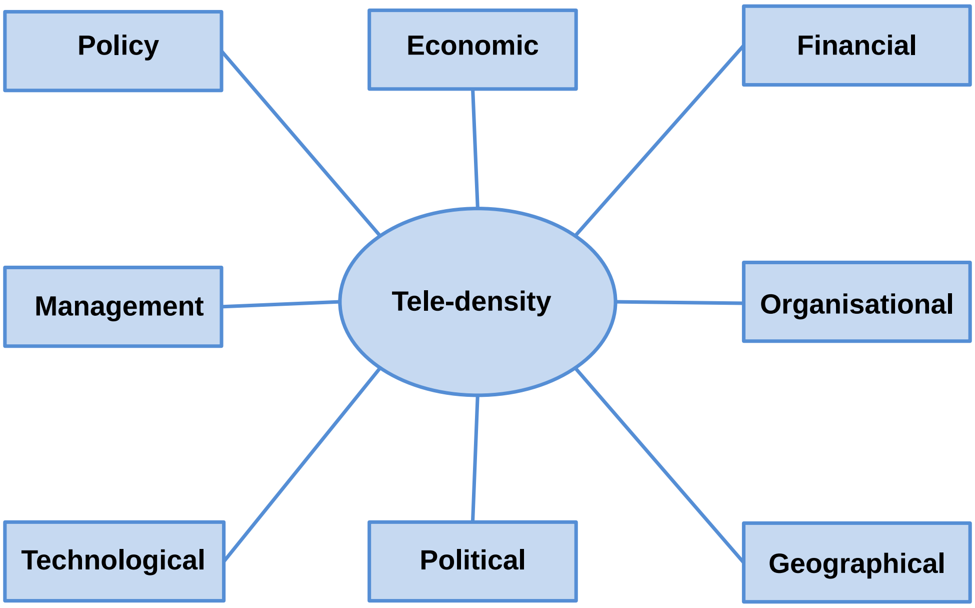
Duration: Maximum one hour

Recording: As this is a formal research methodology all interviews will be recorded and transcribed in order for them to be analysed fully

Anonymity: The anonymity of the participant will be observed in that at no time will the participants name be disclosed to anybody other than the researchers or any of the information given be directly attributed to the participant. The only data released will be the analysed results of all the interviews.

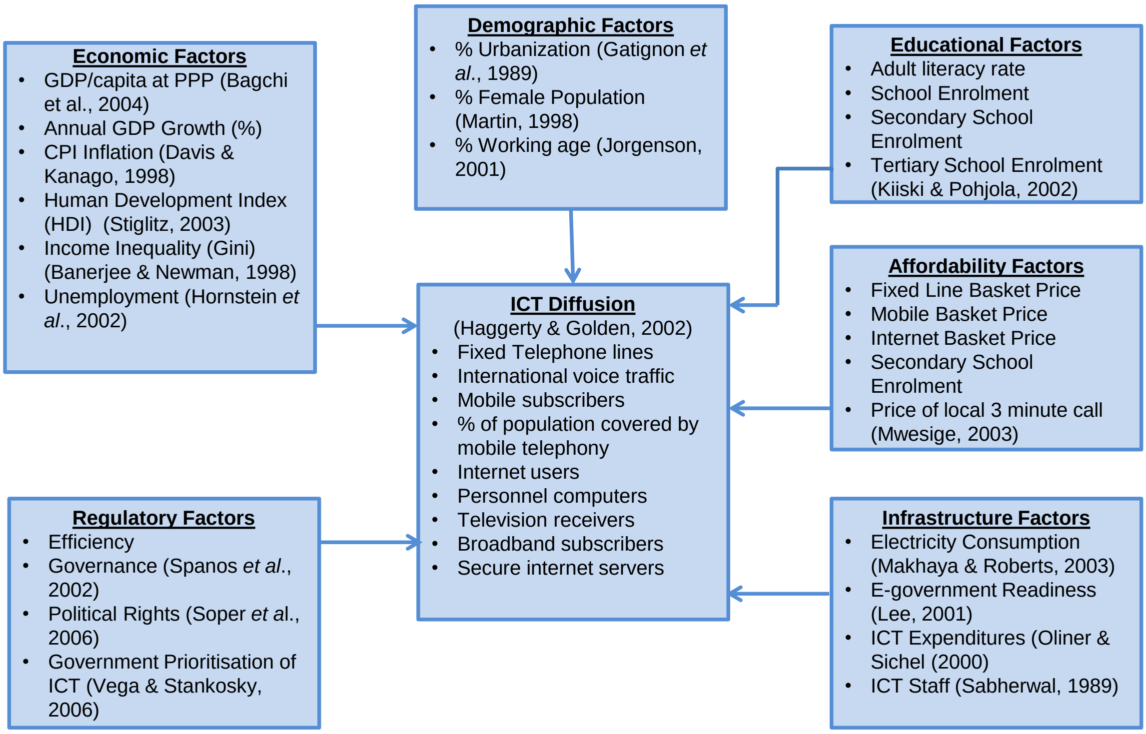
The following is a list of models which I have found in literature that highlight the various factors which influence the adoption of ICT. They are here to help with question 3.

1) Mbarika's (2000) modified Bernt and Weiss Framework

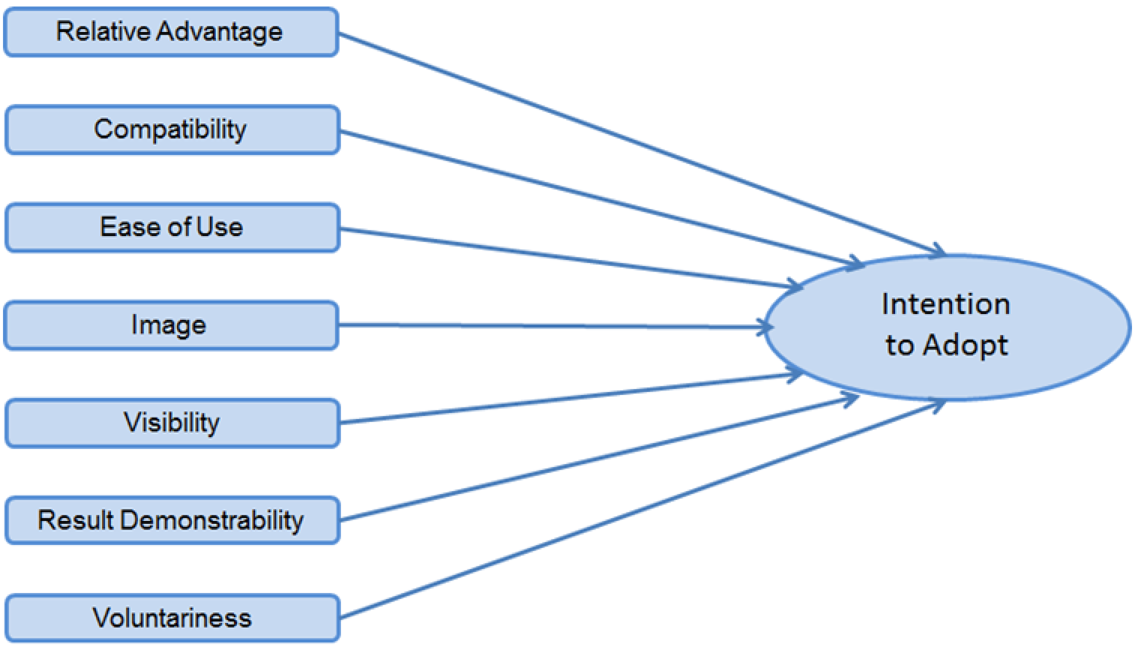


- **Organisational**: Issues in this category included:
  - Government monopoly vs competition
  - Deregulation
  - Privatisation
- **Financial**: Issues here included:
  - Availability of funding
  - Poor financial infrastructure
  - Low GNI per capita
- **Technological:** Issues in this category were:
  - Purchase and maintenance of equipment
  - Old, technologically out-dated equipment with limited spare parts
  - Lack of technical skills to run and maintain the equipment
  - Lack of a supporting infrastructure such as roads and electricity
- **Geographical:** The major factors here involve:
  - The fact that there is no incentive to roll-out the required infrastructure in rural areas due to the poverty there.
  - Government's lack of a universal access policy.

2) ICT Diffusion Model of Udo, Bagchi and Kirs, (2008)



3) Perceived characteristics of Innovation (PCI) model Moore & Benbasat (1991)



Seven general attributes of innovations that had been consistently shown to influence adoption. These attributes are:

- **Relative Advantage**: *'the degree to which an innovation is perceived as being better than its precursor';* (Moore and Benbasat, 1991:195)
- **Compatibility**: *'the degree to which innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adaptors';* (Moore and Benbasat, 1991:195)
- **Ease of Use**: *'the degree to which an innovation is perceived as being difficult to use';* (Moore and Benbasat, 1991:195)
- **Image**: '*the degree to which use of an innovation is perceived to enhance one's image or status in one's social system'* (Moore and Benbasat, 1991:195)
- **Visibility**: *'the degree to which one can see others using the system in the organisation'* (Venkatesh et al, 2003:431)
- **Results Demonstrability**: *'the tangibility of the results of using the innovation, including their observability and communicability'* (Moore and Benbasat, 1991:203)
- **Voluntariness of Use**: *'the degree to which use of the innovation is perceived as being voluntary, or of free will'* (Moore and Benbasat, 1991:195)

4) The Social Cognitive Theory (SCT) (Bandura, 1986)

As applied by Compeau and Higgins, (1995) to the utilisation of computers.

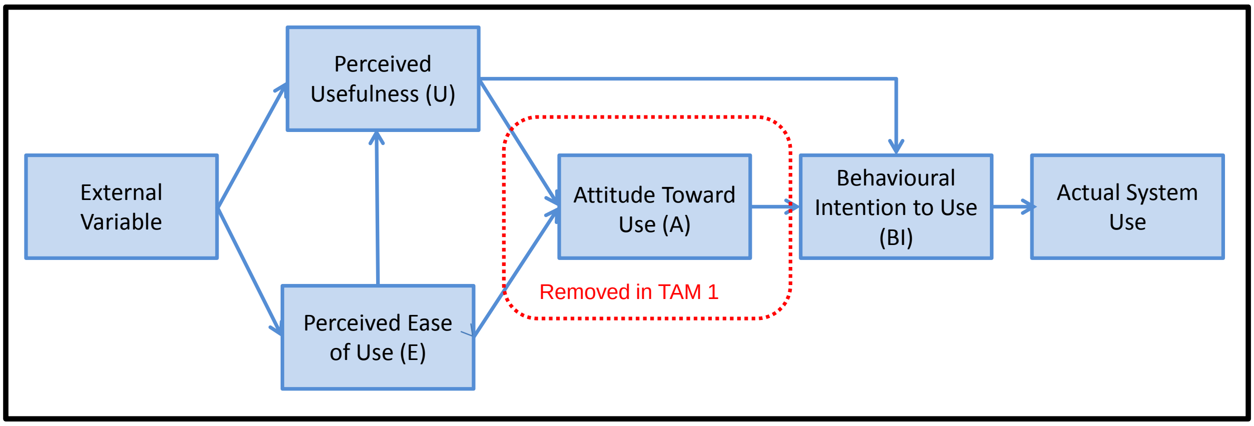
- **Outcome Expectations – Performance**: the performance expectations are job-related outcomes (Compeau and Higgins, 1995),
- **Outcome Expectations – Personnel:** the personnel expectations deal with a sense of accomplishment and individual esteem (Compeau and Higgins, 1995),
- **Self-efficacy**: One's personnel judgement on their ability to use a technology to achieve a specific task (Venkatesh et al., 2003),
- **Affect**: An individual's liking for the task (Venkatesh et al., 2003),
- **Anxiety**: The emotional or anxious reactions to performing the task (Venkatesh et al., 2003).

5) Technology Acceptance Model Davis (1986, 1989)

The TAM uses two core concepts:

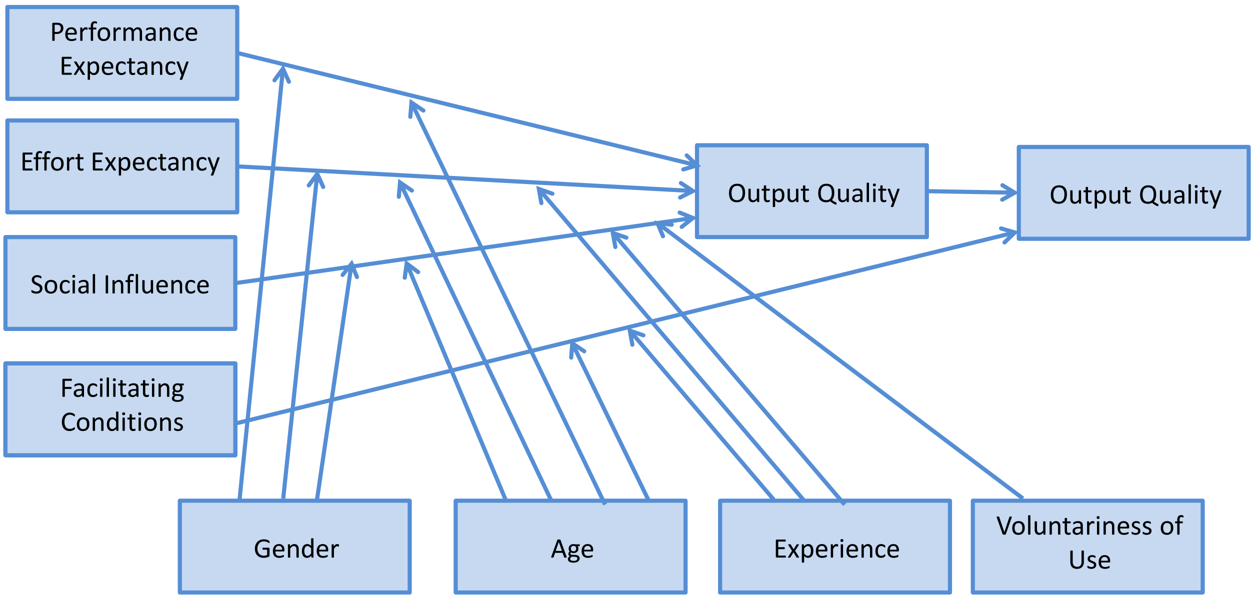
- **Perceived Usefulness:** *'the degree to which a person believes that using a particular system would enhance his or her job performance'* (Davis 1989:320),

- **Perceived Ease of Use:** *'the degree to which a person believes that using a particular system would be free of effort'* (Davis 1989:320).



(Source: Davis et al, 1989)

6) **Unified Theory of Acceptance and Use of Technology (UTAUT) Model Venkatesh, Morris, Davis G. and Davis F. (Venkatesh et al, 2003)**



(Source: Venkatesh et al. 2003)

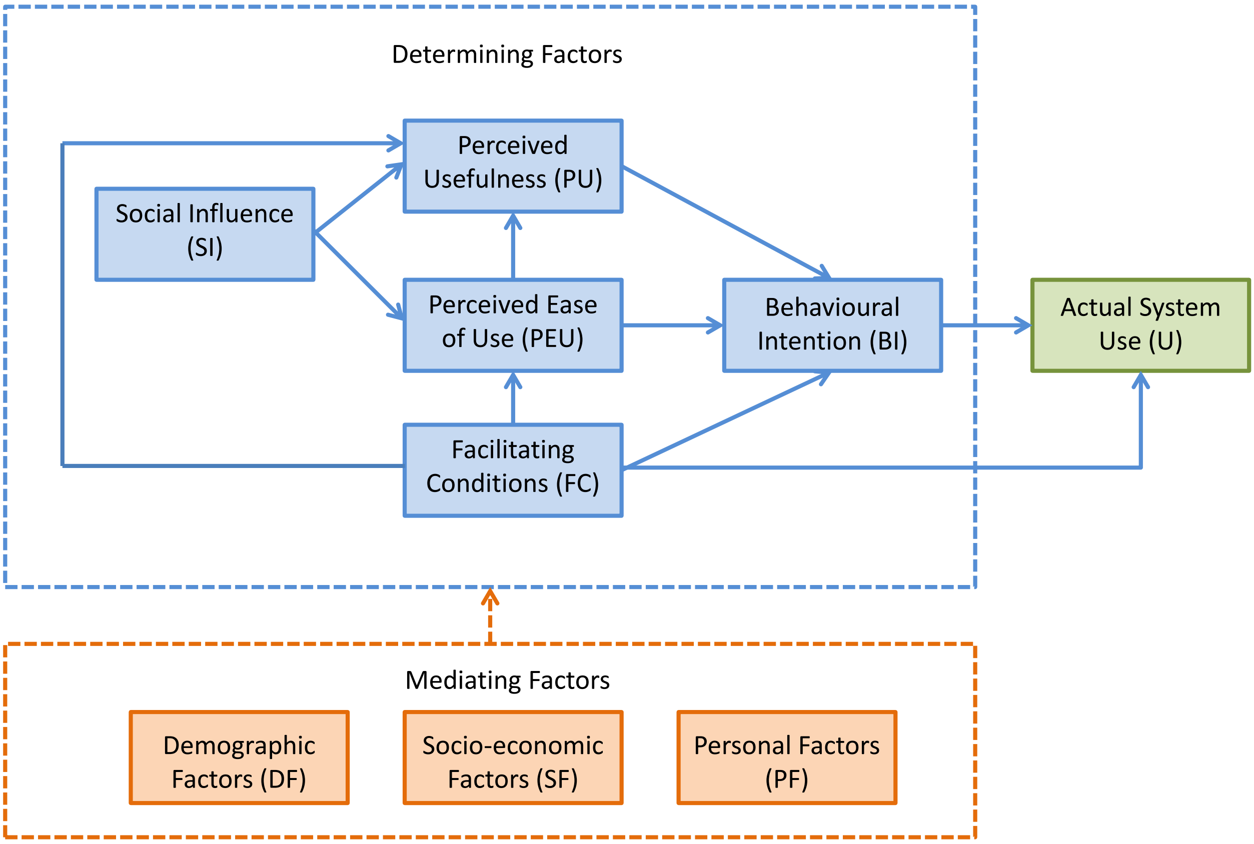
Using the results gained from the above they determined that seven constructs were significant direct determinants of intention or usage in one or more of the models. They determined that four would play a significant role as direct determinants of user acceptance and usage behaviour. They also determined that there were four important moderators. They combined them and postulated a theoretical model called the 'Unified Theory of Acceptance and Use of Technology (UTAUT)'.

7) Final MOPTAM Model

They deduced two factors which had special significance for mobile phones, namely;

- Social factors influence mobile phone adoption and thus control is required for social and cultural (peer group) influence (Pedersen, 2005 and Teo and Pok, 2003).
- Infrastructure factors play a significant role in mobile phone adoption and therefore must be taken into account (Kleijnen et al., 2004).

Van Biljon and Kotzé proposed the MOPTAM model. They tested the model on 59 undergraduate university students from a South African university and hence it is valid within the South African context.



(Source: Van Biljon and Kotzé, 2007)

APPENDIX 4

Final Questionnaire

Adoption of New Services or Products in the South African Telecommunications Market

Dear Sir/Madam.

We are conducting a survey on behalf of Mr Neil Smith, a doctoral student at the UNISA School of Business Leadership.

Mr Smith is currently completing a doctoral thesis entitled *"A Framework for Determining the Adoption of New Services in the South African Mobile Telecommunications Market"*. This survey is the public component of that research.

Before I ask you whether you would be willing to participate, I would like to please take note of the following:

1. This survey is confidential and all results will only be reported in an aggregated form. However, what we will request is your name and cell phone number as this is how we will keep the responses of different people separate.
2. Your participation in this study is voluntary. You are under no obligation to complete survey. There is no penalty or loss of benefit for non-participating. You are also allowed to withdraw at any time of the survey without giving explanation.
3. The survey should take no more than 15 minutes of your time. Are you willing to participate?

Before I ask whether you wish to take part in the survey, I would like to ask some qualifying questions.

To qualify the respondent must answer they must answer the following:

Question	Question	Yes	No	Qualify
Q1	Are you 18 years or older?	1	2	**If NO close**
Q2	Do you use data services either by mobile data or via a WiFi Hotspot?	1	2	**If NO close**
Q3	Is this your personal phone	1	2	**If YES Personal Continue, If NO ASK Q4**
Q4	or is it a business phone?	1	2	**If NO, Q3 Personal Continue** **If YES ask Q4b**
Q4b	If it is a business phone. ASK can you use it for personal use as well?	1	2	**If NO close**

As you meet the qualifying criteria I would like to formally ask you the following question:

Do you, agree to take part in this survey?

YES

Sign ………………………….

Kindly complete the following questions as objectively and honestly as possible. There is no right or wrong answers, but your opinions are what really matters.

Section 2: Demographic information

1. What is your **Gender**:

Male (1)	Female (2)

2. How **old are you**:……………………….years

3. In what **type of region** do you live?

Region	**Description**	**Code**
Urban	City, formal town, informal area close to town	1
Rural	Farm, village or tribal area	2

3b Province in which the questionnaire was completed **(field agent to Complete)**

Province	Code
Gauteng	1
Western Cape	2
KZN	3

4. What is your **highest academic level**?

Level	**Code**
Completed Primary school: Grades 1-7	1
Completed Secondary school: Grade 8-12	2
Achieved Matric	3
Post Matric Certificate or Diploma	4
Post Matric Undergraduate Degree	5
Post Matric Postgraduate Degree	6

1.4b: Ethnicity (**field agent to Complete)**

Black	1
Coloured	2
Indian	3
White	4

5a What is your **average Monthly income?**

Amount	**Code**
Nothing	**1**
R1- R1,000 pm	**2**
R1,001- R2,500	**3**
R2,501-R5,000	**4**
R5,001-R7,500	**5**
R7,501-R10,000	**6**
R10,000-R15,000	**7**
R15,001-R20,000	**8**
More than R20,000 Meer as R20,000	**9**

5b LSM

DO YOU HAVE IN YOUR HOUSEHOLD...	YES	No
	76	
Tap water in your house or on your property	6	
Hot running water from a geyser	9	
Flush toilet inside or outside	5	
Built-in kitchen sink	7	
Home telephone (Telkom line)	5	
3 or more cellphones in household (working)	8	
2 cellphones in household (working)	6	
More than 1 radio (excl car radio)		14
Hi-fi/music centre	3	
TV set	6	
M-Net or DStv Subscription	7	
Video Cassette recorder (VCR)	5	
DVD player	5	
Fridge (including combined fridge/freezer)	6	
Deep freezer (free standing)	5	
Microwave oven	6	
Floor polisher or vacuum cleaner	7	
Personal computer or laptop	15	
Washing machine	8	
Tumble dryer	8	
Dishwashing machine	8	
Electric stove	8	
Home theatre system	5	
Motor vehicle in household	8	
A domestic worker		12
Home security service	7	
2. QUESTION : DO YOU ...../		
Live in a house/cluster house/town house (not a flat/township matchbox home/RDP house /traditional hut/room in backyard or shack)	6	
Live in one of these cities: Alberton, Benoni, Boksburg, Johannesburg, Kempton Park, Pretoria, Soweto, Vanderbijlpark, Vereeniging, Bloemfontein, Welkom, Durban, Pietermaritzburg, East London, Port Elizabeth, Cape Town	4	
Live in any rural area **not** in Gauteng Province or Western Cape Province		6

3. **NOW ADD UP THE TOTAL SCORE FROM BOTH THE "YES" AND "NO" COLUMNS. *REMEMBER TO ADD THE 76 ON TOP FOR 'YES'***

4. **SUBTRACT THE "NO" TOTAL FROM THE "YES" TOTAL. YES minus No =**

5. **CHECK THIS TOTAL SCORE AGAINST THE FOLLOWING TABLE TO DETERMINE WHICH LSM GROUP THE RESPONDENT FALLS INTO.**

From	To	LSM GROUP	
0	44	01	
45	55	02	
56	67	03	CLOSE
68	83	04	
84	103	05	
104	136	06	
137	156	07	
157	173	08	
174	198	09	CONTINUE
199	249	10	

Section 3: Communications technology Attitudes and Skills

6. Do you **own or have access** to the following:

	Own		Have Access	
	Yes	**No**	**Yes**	**No**
Personal Computer (PC) (Laptop or Desk)	1	2	1	2
Smartphone	1	2	1	2
Tablet or any other computing device that can access the Internet	1	2	1	2
Gaming station with Internet Access	1	2	1	2
Router, or Computer Modem/Stick	1	2	1	2
Any other computing device that can access the Internet	1	2	1	2

7. Which of the following technologies do you **access the internet**:

Access Method	**At Home Yes = 1, No = 2**	**Other times /places Yes = 1, No = 2**
Fixed Line, ADSL or Fibre, (Router and WiFi)		
Mobile - using a smartphone or tablet		
Mobile – using a network supplied router or modem/stick		
Free WiFi – Commercial or municipality		

8. How would you best describe your **Level of computer Skills?**

	Code
No competence – I have never used a computer	1
Slight competence – I have used it a few times but need help to do the simplest tasks	2
Somewhat competent – I cope with simple tasks	3
Moderate competence – I am competent with most things but sometimes need help with more advanced tasks	4
Extremely competent – I do specialist tasks and learn new skills by myself and people come to me for help	5

9. How would you best describe your **Level of internet Skills?**

	Code
No competence – I have never used the internet	1
Slight competence – I have used it a few times but need help to do the simplest tasks	2
Somewhat competent – I can do simple repetitive tasks, enter addresses and bookmarks	3
Moderate competence – I am competent with most things but sometimes need help with more advanced tasks	4
Extremely competent– I do specialist tasks and learn new skills by myself and people come to me for help. I can program and maintain a website by myself	5

10. How would you best describe your **level of competence** with regard to your **current mobile device and all its features**

	Code
No competence – I just know the basic functions	1
Slight competence – I know the basics, can use a few pre-loaded apps and customise my device	2
Somewhat competent – I know the basics and can find, download and install different apps on my device	3
Moderate competence – I am competent with most things but sometimes need help with more advanced tasks	4
Extremely competent – I know all the functions and features on my phone and can carry out advanced tasks	5

11. How would you best describe your **Attitude towards the changing communication technology?**
(We define communication technology as the devices, gadgets and methodologies that are used to deliver our digital communications and media.)
Please choose the most appropriate statement.

	Code
I am happy with my existing level of communication devices	1
I wait and see what others are doing and get their help	2
I don't actively follow new technology but will investigate anything I see that could add something of value to me	3
I actively keep myself up to date with the latest technologies and will constantly search for them to provide value	4
I am always investigating new technology and striving to acquire it	5

12. How do you perceive the behaviour of Mobile Network Operators? Please answer the following questions using the 5 point scale below.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

	WRITE IN NUMBER
a) Operators keep mobile prices higher than necessary to maximise their profits	
b) Operators can influence the how and when you use your mobile device by manipulating prices	
c) Operators can influence the how and when you use your mobile device with promotions	
d) If the Operators want you to use a specific product or service they do it with promotions and pricing	
e) The Operators can prevent you using a specific product or service by refusing to give you help with it	
f) Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	
g) Operators can control what you use on your phone by controlling download speeds and managing the traffic through the network	

Section 4: Mobile Voice and Data Usage

13. Can you give more detail about what **Mobile Devices** you use in **(Ranked in order of usage starting with the most used).** Can you also give me the brand for easier identification

Explanation of Device Types
1. Feature Phone: - Voice calls and messaging only 2. Smart Phone: – Internet enabled 3. Tablet 4. Internet connection device: Router, Computer Modem/Stick, Game console

13.1 **FOR EACH DEVICE ASK**: What services do you use – voice data or both, do you use DEVICE for private, business or both Is the payment method for DEVICE Prepaid, contract or contract with top Up. Do you pay for DEVICE yourself, business or other family member

13.2 Reason for Choice of Operator
1. It is the cheapest to use 2. It is the network my family and friends use 3. It is the best for network coverage 4. It supplies the best technical service, in terms of dropped calls and call clarity 5. I have no choice, chosen by somebody else for me (Employer, guardian, etc) 6. I am loyal to the network operator

DEVICES USED IN ORDER MOST OFTEN	**Device Type**	**Services Used**	**Usage Type**	Payment **Type**	**Payment by**	**Network Operator**	**Reason for Choice of Operator**
	1. Feature Phone 2. Smartphone 3. Tablet 4. Internet connection device	1. Voice 2. Data 3. Both	1. Private 2. Business 3. Both	1. Prepaid 2. Contract 3. Contract with "Top Up"	1. Yourself 2. Business 3. Other family member	1. Vodacom 2. MTN 3. CellC 4. Telkom (8ta) 5. Other	**See Table above**
Device #1 Brand:							
Device #2 Brand:							
Device #3 Brand:							
Device #4 Brand:							

14. What is your average spend per month for mobile services

R.........(INSERT) per month

15. Using the 5 point scale below please rate the following statements with regard to mobile voice and data prices

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

	Q15 WRITE IN NUMBER
a) If mobile voice prices were to drop I would make more calls	
b) If mobile voice prices were to drop it would not make much difference to me as I make as many calls as I need to	
c) If mobile data prices were to drop significantly I would make buy more data and spend more time online	
d) If mobile data prices were to drop significantly it would not make much difference as I have adequate data to do what I want	

16. What Applications do you use on your mobile device(s)? READ OUT

Application	Explanation	Yes	No
Voice Services	Normal voice	1	2
Alternative Data based Communication Apps	VoIP (Skype, Whatsapp Voice, Face Time, WeChat etc.)	1	2
Messaging	SMS	1	2
USSD Services,	(Eg. Please Call Me, Balance check)	1	2
Instant Messaging	WhatsApp, MiXIT or similar	1	2
e-mail	Any provider	1	2
General Internet Searching and Usage		1	2
Camera	Just to take Photographs	1	2
	Take photographs and send them to others	1	2
Download and purchase	Ring Tones, Music, Games,	1	2
Financial Services (Banking)	Internet banking	1	2
Entertainment, listening to	Music, both purchased over the net or pre- loaded from own music collection	1	2
Gaming	Downloads/installed games	1	2
	Live Streaming of multi-user games	1	2
Audio streaming	Radio	1	2
Video streaming	TV , DSTV, Netflix, ShowMax, etc.	1	2
Social Networks	Facebook, Twitter, etc	1	2
E-commerce /shopping on line	Eg. Takealot	1	2
Other Applications as and when required	Eg. Weather, Google Maps, Waze	1	2
Specific Work Applications		1	2

17. On average much mobile data do you use per month?

	Code
Zero to 250MB	1
251MB to 500MB	2
501MB to 1GB	3
1GB to 2GB	4
2GB to 5GB	5
More than 5GB	6

18. How long do you make use of your phone per day (calling, searching, entertainment, social media, etc.)

	Code
0 to 60 minutes	1
1 to 2 hours	2
2 to 3 hours	3
3 to 4 hours	4
> 4 hours	5

19. Taking the amount of time you spend on your phone per day, what is the breakdown between use of your phone during the day (6 am to 6pm) versus night (6pm to 6 am)?

% Time spent during the day (6am to 6 pm)	
% of time spent at night (6pm to 6am)	

20. How much importance do you place on using your phone (for both voice and data) at off-peak times (night) versus using it all day as required?

	Code
Not important at all	1
Somewhat important	2
Neutral	3
Important	4
Extremely important	5

21. How easy is it for you to find a particular application, download, install and use it?

	Code
Very Difficult	1
Difficult	2
Neutral	3
Easy	4
Very Easy	5

22. Do you make use of a data based Voice or Video calling applications **on your mobile device** (Skype, Face Time, Whatsapp Voice, WeChat, etc)

	Code
YES	1
NO	2

Section 5: Attitudes to Applications

23. Can you answer the following questions with regard to data based Voice or Video calling applications (Skype, Face Time, Whatsapp Voice, WeChat, etc), using the 5 point rating scale below.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

a) I do not know much about them	
b) I know about them but do not know how to use them	
c) They are difficult to set up	
d) I don't know anybody who uses them, so cannot use them myself	
e) Network Operators discourage people using them	
f) They are more difficult to use than normal voice	
g) I am happy to use them as they are cheaper to use	
h) There is no support for them if you have problems	
i) The quality is poor so I use normal voice	
j) They are not good for my image as they make me appear poor	
k) I use them as all my friends use them	
l) They use up too much data	
m) They allow me to video conference when face-to-face meetings are not possible	

24. If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.

	Code
Extremely Unlikely	1
Unlikely	2
Neutral	3
Likely	4
Extremely Likely	5

25. Do you use Free WiFi Hotspots, offered in public areas

YES	(1)
NO	(2)

26. Please answer the following questions with regard to free WiFi Hotspots using the 7 point rating scale below?

1	2	3	4	5	6	7
Strongly disagree	Disagree	Somewhat Disagree	Neither agree nor disagree	Somewhat Agree	Agree	Strongly Agree

a) I do not know much about Free WiFi Hotspots	
b) I know about them but do not know how to use them	
c) They are difficult to set up	
d) I don't know anybody who uses them, so don't use them myself	
e) Network Operators discourage people using them	
f) They are more difficult to use than normal data services	
g) I am happy to use them as they are allow me to save data	
h) There is no support for them if you have problems	
i) The data speed is generally so poor so I use normal data	
j) Using them is good for my image as it shows that I am technically literate	
k) I use them as all my friends use them	
l) I don't use them for data security issues	
m) I use them as they allow me to save money	

27. If your Network Provider was to make it much easier to use Free WiFi Hotspots by preloading them on your phone or by pushing you an App that will make them easy to use, how likely are to use them?

	Code
Extremely Unlikely	1
Unlikely	2
Neutral	3
Likely	4
Extremely Likely	5

APPENDIX 5

Variation on Moderating Factors against Framework Constructs

Moderating Factor: Demographic-Age:

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	**[Q12.1]** Operators keep mobile prices higher than necessary to maximise their profits	0.013	0.063	0.007	0.002	0.083	18-24 with 35-44	18-24 with 35-44
	[Q12.2] Operators can influence the how and when you use your mobile device by manipulating prices	0.125	0.161	0.050	0.030	0.140	18-24 with 35-44	18-24 with 35-44
	[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.001	0.159	0.235	0.234	0.002		
	[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.049	0.793	0.355	0.299	0.050		
Social Pressure and Aspirational Value (SPAV)	**[Q23.11]** Data based Voice or Video calling applications: I use them as all my friends use them	0.001	0.000	0.000	0.000	0.227	45+ with All	45+ with All
	[Q26.10] Free WiFi hotspots: Using them is good for my image as it shows that I am technically literate	0.005	0.053	0.182	0.218	0.120		
	[Q26.11] Free WiFi hotspots: I use them as all my friends use them	0.036	0.000	0.000	0.000	0.938	18-24 with 35-44 and 45+; 25-34 with 45+	18-24 with 35-44 and 45+; 25-34 with 45+
Perceived Ease of Use (PEU)	**[Q23.6]** Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.057	0.002	0.004	0.006	0.135	45+ with All	45+ with All
	[Q26.3] Free WiFi hotspots: They are difficult to set up	0.000	0.370	0.028	0.011	0.000	18-24 with 25-34; 35-44 with 45+	35-44 with 45+
	[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.015	0.898	0.237	0.207	0.009		
	[Q26.8] Free WiFi hotspots: There is no support for them if you have problems	0.000	0.079	0.087	0.108	0.005		

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Usefulness (PU)	**[Q23.7]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.146	0.016	0.031	0.017	0.101		18-24 with 25-34 and 45+
	[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.012	0.738	0.002	0.003	0.103		
	[Q26.7] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.000	18-24 with All; 45+ with All; 25-34 with All except 35-44	18-24 with All; 45+ with All; 25-34 with All except 35-44
	[Q26.13] Free WiFi hotspots: There is no support for them if you have problems	0.000	0.000	0.000	0.000	0.002	18-24 with 35-44; 45+ with All 25-34 with 45+;	18-24 with 35-44; 45+ with All 25-34 with 45+;
	[Q28.1] Download and use a new application: The application must be easy to download and install	0.001	0.022	0.036	0.071	0.006	25-34 with 45+	25-34 with 45+
	[Q28.3] Download and use a new application: The application must be easy to understand	0.032	0.685	0.917	0.895	1.000		
	[Q28.5] Download and use a new application: The application must be easy to learn	0.199	0.015	0.024	0.010	0.000	18-24 with 45+	18-24 with 45+
Intention to Use (IU)	**[Q24]** Data based Voice or Video calling applications: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.013	0.063	0.007	0.006	0.544	25-34 with 45+	25-34 with 45+
	[Q27] Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.003	0.000	0.000	0.001	0.026	45+ with All	45+ with All

(yellow)	Significant at the 0.05 level
(red)	Significant at the 0.01 level

Moderating Factor: Demographic-Location:

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	**[Q12.1]** Operators keep mobile prices higher than necessary to maximise their profits	0.000	0.004	0.003	0.021	0.001	KZN with All	KZN with All
	[Q12.2] Operators can influence the how and when you use your mobile device by manipulating prices	0.001	0.002	0.002	0.012	0.001	KZN with All	KZN with All
	[Q12.4] If the Operators want you to use a specific product or service they do it with promotions and pricing	0.019	0.675	0.052	0.028	0.004		
	[Q12.5] The Operators can prevent you using a specific product or service by refusing to give you help with it	0.064	0.047	0.138	0.127	0.657		
	[Q12.6] Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	0.015	0.021	0.068	0.068	0.994		
	[Q12.7] Operators can control what you use on your phone by controlling download speeds and managing the traffic through the network	0.048	0.247	0.480	0.530	0.070		
	[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.000	0.000	0.000	0.000	0.009	KZN with All	KZN with All
	[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.000	0.000	0.000	0.000	0.000	KZN with All	KZN with All
Social Pressure and Aspirational Value (SPAV)	**[Q23.4]** Data based Voice or Video calling applications: d) I don't know anybody who uses them, so cannot use them myself	0.000	0.000	0.000	0.000	0.000	Gauteng with All; Cape Town with All; KZN with All	All, except Cape Town and KZN
	[Q23.10] Data based Voice or Video calling applications: They are not good for my image as they make me appear poor	0.000	0.000	0.002	0.004	0.003	Gauteng with KZN	Gauteng with KZN
	[Q23.11] Data based Voice or Video calling applications: I use them as all my friends use them	0.009	0.361	0.088	0.057	0.017		Gauteng with Cape Town
	[Q26.4] Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.000	0.000	0.000	0.000	0.000	KZN with All	KZN with All
	[Q26.10] Free WiFi hotspots: Using them is good for my image as it shows that I am technically literate	0.005	0.053	0.000	0.000	0.001	Gauteng with Cape Town	Gauteng with Cape Town
	[Q26.11] Free WiFi hotspots: I use them as all my friends use them	0.000	0.000	0.000	0.000	0.021	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Ease of Use (PEU)	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.000	All	Gauteng with All
	[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.000	0.000	0.000	0.000	0.000	All	All
	[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.000	KZN with Cape Town and Gauteng	KZN with Cape Town and Gauteng
	[Q26.3] Free WiFi hotspots: They are difficult to set up	0.004	0.000	0.001	0.001	0.294	Gauteng with KZN	Gauteng with KZN
	[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.000	0.000	0.000	0.000	KZN with Cape Town and Gauteng	KZN with Cape Town and Gauteng
	[Q28.2] Download and use a new application: The application must be easy to download and install	0.001	0.003	0.009	0.011	0.026	Gauteng with KZN	Gauteng with KZN
	[Q28.4] Download and use a new application: The application must be easy to understand	0.001	0.001	0.002	0.001	0.013	Gauteng with KZN	Gauteng with KZN
	[Q28.6] Download and use a new application: The application must be easy to learn	0.000	0.047	0.028	0.004	0.002	Gauteng with Cape Town	Gauteng with Cape Town
	[Q28.9] Download and use a new application: The application must be flexible enough for me to do my specific task	0.002	0.002	0.001	0.001	0.015	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN
	[Q28.10] Download and use a new application: The application must be easy and quick to navigate around	0.000	0.000	0.000	0.000	0.091	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN
	[Q28.12] Download and use a new application: The application must not act in unexpected ways	0.000	0.000	0.000	0.000	0.135	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN
	[Q28.13] Download and use a new application: The application must make it easy for me to correct any errors I make	0.000	0.000	0.000	0.000	0.000	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Usefulness (PU)	**[Q23.7]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.001	0.022	0.013	0.017	0.054	KZN with Cape Town and Gauteng	KZN with Cape Town and Gauteng
	[Q23.9] Data based Voice or Video calling applications: They are difficult to set up	0.000	0.016	0.023	0.016	0.000	Gauteng with Cape Town	Gauteng with Cape Town
	[Q23.11] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.057	0.017	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN
	[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.000	0.656	KZN with Cape Town and Gauteng	KZN with Cape Town and Gauteng
	[Q26.7] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.057	0.001	0.000	0.001	Cape Town with Gauteng and KZN	Cape Town with Gauteng and KZN
	[Q26.9] Free WiFi hotspots: They are difficult to set up	0.004	0.016	0.053	0.027	0.002	Gauteng and KZN	Gauteng and KZN
	[Q26.12] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.000	0.000	0.000	0.000	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN
	[Q26.13] Free WiFi hotspots: There is no support for them if you have problems	0.000	0.063	0.000	0.000	0.000	Cape Town with Gauteng	Cape Town with Gauteng and KZN
	[Q28.1] Download and use a new application: The application must be easy to download and install	0.030	0.907	0.344	0.343	0.014		
	[Q28.3] Download and use a new application: The application must be easy to understand	0.024	0.111	0.126	0.126	0.250		
	[Q28.5] Download and use a new application: The application must be easy to learn	0.011	0.032	0.091	0.084	0.356		
	[Q28.7] Download and use a new application: The application must be flexible enough for me to do my specific task	0.008	0.752	0.053	0.014	0.000		
	[Q28.8] Download and use a new application: The application must be easy and quick to navigate around	0.001	0.136	0.005	0.001	0.000	Gauteng with Cape Town	Gauteng with Cape Town
	[Q28.11] Download and use a new application: The application must not act in unexpected ways	0.000	0.000	0.000	0.000	0.006	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN
	[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.000	0.000	0.000	0.000	0.000	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN
Intention to Use (IU)	**[Q27]** Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.000	0.000	0.000	0.000	0.000	Gauteng with Cape Town and KZN	Gauteng with Cape Town and KZN

(yellow)	Significant at the 0.05 level
(red)	Significant at the 0.01 level

Moderating Factor: Demographic-Maximum Academic Level:

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	**[Q12.4]** If the Operators want you to use a specific product or service they do it with promotions and pricing	0.055	0.006	0.035	0.119	0.039		
	[Q12.6] Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	0.114	0.054	0.010	0.006	0.046	SS with PMD	SS with PMD
	[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.000	0.019	0.032	0.033	0.534	UG with M	UG with M
	[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.064	0.005	0.000	0.000	0.000	UG with Matric and PMD	UG with Matric and PMD
Social Pressure and Aspirational Value (SPAV)	**[Q23.4]** Data based Voice or Video calling applications: d) I don't know anybody who uses them, so cannot use them myself	0.122	0.003	0.003	0.040	0.010	M with PMD and UG	M with PMD and UG
	[Q23.11] Data based Voice or Video calling applications: I use them as all my friends use them	0.152	0.076	0.035	0.051	0.742	M with UG	M with UG
	[Q26.4] Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.151	0.029	0.005	0.000	0.000	UG with M and PMD	UG with M and PMD
	[Q26.10] Free WiFi hotspots: Using them is good for my image as it shows that I am technically literate	0.042	0.000	0.000	0.000	0.025	PG with SS and M	PG with SS and M
	[Q26.11] Free WiFi hotspots: I use them as all my friends use them	0.000	0.000	0.000	0.000	0.088	SS with UG and PG; M with PMD, UG and PG	SS with UG and PG; M with PMD, UG and PG
Perceived Ease of Use (PEU)	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.008	0.000	0.000	0.000	0.005	M with PMD, UG and PG	M with PMD, UG and PG
	[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.183	0.005	0.049	0.041	0.296		
	[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.496	0.030	0.146	0.074	0.028		
	[Q26.3] Free WiFi hotspots: They are difficult to set up	0.368	0.008	0.022	0.011	0.019		PMD with PG
	[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.303	0.025	0.038	0.013	0.020		UG with Matric and Post Matric
	[Q28.2] Download and use a new application: The application must be easy to download and install	0.411	0.008	0.079	0.146	0.078		

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Ease of Use (PEU)	**[Q28.4]** Download and use a new application: The application must be easy to understand	0.125	0.000	0.004	0.007	0.049	M with PG	PG with SS and M
	[Q28.6] Download and use a new application: The application must be easy to learn	0.024	0.056	0.017	0.050	0.020	Matric with PG	
	[Q28.9] Download and use a new application: The application must be flexible enough for me to do my specific task	0.027	0.001	0.001	0.014	0.113	PG with M and PMD	PG with M and PMD
	[Q28.10] Download and use a new application: The application must be easy and quick to navigate around	0.000	0.000	0.000	0.000	0.001	PG with All; M with PMD	PG with All; M with PMD
	[Q28.12] Download and use a new application: The application must not act in unexpected ways	0.056	0.001	0.010	0.032	0.632	M with PG	M with PG
	[Q28.13] Download and use a new application: The application must make it easy for me to correct any errors I make	0.000	0.000	0.000	0.000	0.034	PG with All,	PG with M, PMD and UG,
Perceived Usefulness (PU)	**[Q23.9]** Data based Voice or Video calling applications: They are difficult to set up	0.004	0.001	0.007	0.002	0.004	PG with SS and M	PG with SS and M
	[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.032	0.002	0.014	0.029	0.001	SS with UG	
	[Q26.7] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.073	UG with SS, Matric and PMD; M with PG	UG with SS, M and PMD; PG with SSA and M
	[Q26.9] Free WiFi hotspots: They are difficult to set up	0.000	0.000	0.000	0.000	0.355	PG with All, SS with PMD	PG with All, SS with PMD
	[Q26.13] Free WiFi hotspots: There is no support for them if you have problems	0.474	0.015	0.058	0.076	0.313		
	[Q28.1] Download and use a new application: The application must be easy to download and install	0.047	0.676	0.209	0.492	0.014		
	[Q28.8] Download and use a new application: The application must be easy and quick to navigate around	0.001	0.004	0.000	0.000	0.024	PG with M, PMD and UG	PG with M, PMD and UG
	[Q28.11] Download and use a new application: The application must not act in unexpected ways	0.000	0.000	0.000	0.001	0.014	PG with M, PMD and UG	PG with M, PMD and UG
	[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.000	0.000	0.000	0.000	0.000	SS with PMD, UG and PG, M with PMD, UG and PG	SS with PMD, UG and PG, M with PMD, UG and PG
Intention to Use (IU)	**[Q24]** Data based Voice or Video calling applications: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.192	0.105	0.037	0.770	0.303	PG with M	PG with M
	[Q27] Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.001	0.000	0.000	0.000	0.001	PG with M and PMD	PG with M

(yellow)	Significant at the 0.05 level
(red)	Significant at the 0.01 level

Moderating Factor: Demographic-Ethnicity:

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	**[Q12.1]** Operators keep mobile prices higher than necessary to maximise their profits	0.017	0.007	0.037	0.049	0.824		
	[Q12.2] Operators can influence the how and when you use your mobile device by manipulating prices	0.000	0.047	0.128	0.124	0.001		
	[Q12.5] The Operators can prevent you using a specific product or service by refusing to give you help with it	0.000	0.036	0.123	0.580	0.005		
	[Q12.6] Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	0.000	0.003	0.027	0.013	0.013	White with Black	White with Black
	[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.011	0.307	0.102	0.048	0.133		
	[Q23.8] Data based voice or video calling applications: no support for them if you have problems	0.001	0.000	0.000	0.000	0.823	Asian with All, Black with White,	Asian with All, Black with White,
	[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.219	0.012	0.017	0.005	0.000		Black with Asian
Social Pressure and Aspirational Value (SPAV)	**[Q23.10]** Data based Voice or Video calling applications: They are not good for my image as they make me appear poor	0.169	0.035	0.135	0.039	0.001		
	[Q26.4] Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.057	0.006	0.027	0.012	0.000		Black with Asian and White
	[Q26.10] Free WiFi hotspots: Using them is good for my image as it shows that I am technically literate	0.002	0.305	0.134	0.108	0.027		
Perceived Ease of Use (PEU)	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.000	0.042	0.067	0.000	0.000		Asian with Black and Coloured
	[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.001	0.053	0.126	0.103	0.014		
	Q[23.6] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.029	0.007	0.020	0.017	0.000		Coloured and Black
	[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.157	0.002	0.009	0.008	0.000		Black with White
	[Q26.3] Free WiFi hotspots: They are difficult to set up	0.106	0.008	0.001	0.000	0.001	Black with Asian and White	Black with Asian and White
	[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.001	0.000	0.002	0.001	0.000	Black with White	Black with Asian and White
	[Q26.8] Free WiFi hotspots: There is no support for them if you have problems	0.000	0.001	0.000	0.000	0.339	Coloured with Asian and White; Black with Asian; White with Coloured	Asian with All; White with All
	[Q28.2] Download and use a new application: The application must be easy to download and install	0.026	0.907	0.037	0.058	0.401	Asian with Black and White	Asian with White

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Ease of Use (PEU)	**[Q28.4]** Download and use a new application: The application must be easy to understand	0.019	0.140	0.005	0.008	0.510	Asian with Black and White	Asian with Black and White
	[Q28.6] Download and use a new application: The application must be easy to learn	0.001	0.579	0.000	0.006	0.101	Asian with All	Asian with All
	[Q28.9] Download and use a new application: The application must be flexible enough for me to do my specific task	0.129	0.769	0.049	0.026	0.302	Asian with Black and White	Asian with Black and White
	[Q28.12]I Download and use a new application: The application must not act in unexpected ways	0.062	0.232	0.039	0.013	0.326	Asian with White	Asian with Coloured and White
	[Q28.13] Download and use a new application: The application must make it easy for me to correct any errors I make	0.001	0.914	0.005	0.002	0.367	Asian with All	Asian with All
Perceived Usefulness (PU)	**[Q23.9]** Data based Voice or Video calling applications: They are difficult to set up	0.121	0.070	0.019	0.029	0.505	Black with Asian	Black with Asian
	[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.002	0.005	0.017	0.002	0.000	Black with White	Black with White
	[Q26.9] Free WiFi hotspots: They are difficult to set up	0.022	0.200	0.010	0.026	0.404	Coloured with Asian and White	Coloured with White
	[Q26.12] Free WiFi hotspots: They are more difficult to use than normal data services	0.001	0.160	0.242	0.163	0.003		
	[Q26.13] Free WiFi hotspots: There is no support for them if you have problems	0.026	0.075	0.078	0.078	0.036		
	[Q28.1] Download and use a new application: The application must be easy to download and install	0.000	0.434	0.002	0.001	0.011	Asian with All	Asian with All
	[Q28.3] Download and use a new application: The application must be easy to understand	0.001	0.958	0.000	0.000	0.232	Asian with All	Asian with All
	[Q28.5] Download and use a new application: The application must be easy to learn	0.005	0.471	0.008	0.010	0.143	White with Coloured and Asian	White with Coloured and Asian
	[Q28.7] Download and use a new application: The application must be flexible enough for me to do my specific task	0.003	0.485	0.001	0.010	0.006	Asian with All	Asian with Coloured and White
	[Q28.8] Download and use a new application: The application must be easy and quick to navigate around	0.042	0.965	0.012	0.010	0.182	Asian with Black and White	Asian with All
	[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.000	0.003	0.133	0.113	0.001		
Intention to Use (IU)	**[Q24]** Data based Voice or Video calling applications: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.014	0.010	0.014	0.034	0.634	Black with Asian	
	[Q27] Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.251	0.027	0.086	0.127	0.952		

(yellow)	Significant at the 0.05 level
(red)	Significant at the 0.01 level

Moderating Factor: Socio-economic-Income Level:

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	**[Q12.6]**Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	0.098	0.030	0.021	0.023	0.017		
	[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.004	0.002	0.013	0.014	0.039		R5'0 with R10'0 and R20'0+
	[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.049	0.007	0.003	0.003	0.000	R5'0 with R10'0 and R20'0+	R5'0 with R10'0 and R20'0+
Social Pressure and Aspirational Value (SPAV)	**[Q23.4]** Data based Voice or Video calling applications: d) I don't know anybody who uses them, so cannot use them myself	0.061	0.052	0.039	0.039	0.221	R5'0-10'0 with R10'0-R20'0	R5'0-10'0 with R10'0-R20'0
	[Q23.11] Data based Voice or Video calling applications: I use them as all my friends use them	0.112	0.000	0.013	0.005	0.225	R0 with R20'0+	R0 with R20'0 and R20'0+
	[Q26.4] Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.031	0.018	0.045	0.042	0.001		
	[Q26.10] Free WiFi hotspots: Using them is good for my image as it shows that I am technically literate	0.002	0.000	0.003	0.006	0.481	R20'0+ with R0, R5'0 and R10'0	R20'0+ with R0, R5'0 and R10'0
	[Q26.11] Free WiFi hotspots: I use them as all my friends use them	0.000	0.000	0.000	0.000	0.874	R20'0 with R0, R5'0 and R10'0; R20'0+ with R0, R5'0 and R10'0	R20'0 with R0, R5'0 and R10'0; R20'0+ with R0, R5'0 and R10'0
Perceived Ease of Use (PEU)	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.031	0.086	0.000	0.000	0.005	R10'0 with R0, R20'0 and R20'0+	R10'0 with R0, R20'0 and R20'0+
	[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.013	0.023	0.037	0.038	0.028		10'0 with R20'0
	[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.073	0.008	0.014	0.031	0.001	R5'0 with R20'0	R5'0 with R20'0
	[Q26.3] Free WiFi hotspots: They are difficult to set up	0.035	0.018	0.022	0.028	0.058		
	[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.012	0.028	0.011	0.023	0.170	R5'0 with R20'0 and R20'0+	R5'0 with R20'0+
	[Q26.8] Free WiFi hotspots: There is no support for them if you have problems	0.026	0.217	0.241	0.241	0.494		
	[Q28.4] Download and use a new application: The application must be easy to understand	0.007	0.281	0.021	0.033	0.093		
	[Q28.6] Download and use a new application: The application must be easy to learn	0.001	0.312	0.011	0.002	0.005	R10'0 with R20'0+	R10'0 with R20'0+
	[Q28.10] Download and use a new application: The application must be easy and quick to navigate around	0.013	0.004	0.003	0.000	0.006	R5'0 with R20'0 and R20'0+	R5'0 with R20'0 and R20'0+
	[Q28.13] Download and use a new application: The application must make it easy for me to correct any errors I make	0.004	0.082	0.007	0.200	0.000	R10'0 with R20'0+	R10'0 with R20'0+

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Usefulness (PU)	**[Q23.7]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.197	0.035	0.203	0.161	0.313		
	[Q23.9] Data based Voice or Video calling applications: They are difficult to set up	0.162	0.005	0.015	0.024	0.882	R5'0 with R20'0 and R20'0+	R5'0 with R20'0 and R20'0+
	[Q23.12] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.041	0.010	0.037	0.038	0.028		
	[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.002	0.001	0.000	0.000	0.000	R5'0 with R20'0 and R20'0+	R20'0+ with R5'0, R10'0 and R20'0
	[Q26.7] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.107	R20'0+ with R0, R5'0 and R10'0; R20'0 with R0 and R5'0	R20'0+ with R0, R5'0 and R10'0; R20'0 with R0 and R5'0
	[Q26.9] Free WiFi hotspots: They are difficult to set up	0.055	0.022	0.010	0.007	0.019	R20'0+ with R5'0 and R10'0	R20'0+ with R5'0 and R10'0
	[Q26.13] Free WiFi hotspots: There is no support for them if you have problems	0.026	0.000	0.000	0.000	0.001	R0 with R10'0, R20'0 and R20'0+; R5'0 with R20'0+	R0 with All, R5'0 with R20'0+
	[Q28.8] Download and use a new application: The application must be easy and quick to navigate around	0.026	0.840	0.018	0.041	0.016	R1-R5'0 with R5'0-R10'0	
	[Q28.11] Download and use a new application: The application must not act in unexpected ways	0.120	0.008	0.039	0.050	0.211	R5'0-R10'0 with R20'0+	R5'0-R10'0 with R20'0+
	[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.001	0.000	0.000	0.000	0.000	R0 with R5'0, R10'0 and R20'0; R5'0 with R10'0, R20'0 and R20'0+; R10'0 with R20'0 and R20'0+	R0 with R5'0, R10'0 and R20'0; R5'0 with R10'0, R20'0 and R20'0+; -R10'0 with R20'0 and R20'0+
Intention to Use (IU)	**[Q27]** Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.000	0.000	0.000	0.000	0.002	R20'0+ with All	R20'0+ with All

(yellow)	Significant at the 0.05 level
(red)	Significant at the 0.01 level

Moderating Factor: Socio-economic-Living Standard Measures LSM:

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	**[Q12.1]** Operators keep mobile prices higher than necessary to maximise their profits	0.067	0.021	0.103	0.098	0.359		
	[Q12.2] Operators can influence the how and when you use your mobile device by manipulating prices	0.002	0.381	0.197	0.171	0.001		
	[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.011	0.001	0.005	0.005	0.120	LSM 7 with LSM 10	LSM 7 with LSM 10
	[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.106	0.001	0.007	0.009	0.009	LSM 10 With LSM 7 and LSM 8	LSM 10 With LSM 7 and LSM 8
Social Pressure and Aspirational Value (SPAV)	**[Q23.4]** Data based Voice or Video calling applications: d) I don't know anybody who uses them, so cannot use them myself	0.195	0.025	0.042	0.091	0.007		
	[Q26.4] Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.075	0.021	0.111	0.084	0.076		
	[Q26.10] Free WiFi hotspots: Using them is good for my image as it shows that I am technically literate	0.001	0.000	0.001	0.001	0.790	LSM 10 with LSM 7 and LSM 8	LSM 10 with LSM 7 and LSM 8
	[Q26.11] Free WiFi hotspots: I use them as all my friends use them	0.028	0.021	0.044	0.053	0.962	LSM 8 with LSM 10	LSM 8 with LSM 10
Perceived Ease of Use (PEU)	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.005	0.000	0.000	0.000	0.001	LSM 7 with All	LSM 7 with LSM 9 and LSM 10
	[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.145	0.003	0.022	0.016	0.104	LSM 7 with LSM 10	LSM & with LSM 10
	[Q23.6] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.054	0.003	0.011	0.011	0.631	LSM 7 with LSM 9	LSM 7 with LSM 9
	[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.009	0.000	0.000	0.001	0.007	LSM 7 with LSM 10	LSM 7 with LSM 10
	[Q26.3] Free WiFi hotspots: They are difficult to set up	0.001	0.000	0.000	0.000	0.018	LSM 7 with LSM 10	LSM 7 with LSM 10
	[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.056	0.005	0.012	0.009	0.055	LSM 10 with LSM 7 and LSM 8	LSM 10 with All
	[Q26.8] Free WiFi hotspots: There is no support for them if you have problems	0.352	0.015	0.041	0.001	0.790	LSM 8 with LSM 10	LSM 8 with LSM 10
	[Q28.10] Download and use a new application: The application must be easy and quick to navigate around	0.459	0.041	0.232	0.209	0.252		
	[Q28.12] Download and use a new application: The application must not act in unexpected ways	0.012	0.311	0.623	0.748	0.001		

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Usefulness (PU)	**[Q23.9]**Data based Voice or Video calling applications: They are difficult to set up	0.047	0.027	0.005	0.004	0.064	LSM 9 with LSM 7 and LSM 8	LSM 9 with LSM 7 and LSM 8
	[Q23.12] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.058	0.004	0.030	0.027	0.370	LSM 7 with LSM 10	LSM 7 with LSM 11
	[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.000	0.000	LSM 7 with LSM 9 and LSM 10; LSM 8 with LSM 10	LSM 7 with LSM 9 and LSM 10; LSM 8 with LSM 10
	[Q26.7] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.000	LSM 8 with LSM 9 and LSM 10; LSM 7 with LSM 10	LSM 8 with LSM 9 and LSM 10; LSM 7 with LSM 10
	[Q26.9] Free WiFi hotspots: They are difficult to set up	0.018	0.061	0.031	0.015	0.010	LSM 7 with LSM 9	LSM 7 with LSM 9
	[Q26.12] Free WiFi hotspots: They are more difficult to use than normal data services	0.007	0.003	0.016	0.012	0.085	LSM 7 with LSM 10	LSM 7 with LSM 10
	[Q26.13] Free WiFi hotspots: There is no support for them if you have problems	0.000	0.000	0.000	0.000	0.070	LSM 7 with LSM 10	LSM 7 with LSM 10
	[Q28.1] Download and use a new application: The application must be easy to download and install	0.016	0.121	0.346	0.440	0.008		
	[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.001	0.000	0.000	0.000	0.007	LSM 10 with All	LSM 10 with All
Intention to Use (IU)	**[Q27]** Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.006	0.000	0.000	0.000	0.011	LSM 10 with All	LSM 10 with All

Yellow	Significant at the 0.05 level
Red	Significant at the 0.01 level

Moderating Factor: Personal Factor-Technical Knowledge, Ability and Skills Construct: MOSPMT

Framework Construct	*Factor*	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	Question 8	**[Q12.6]** Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	0.067	0.020	0.034	0.055	0.310	Competent: Somewhat with Moderate	
		[Q12.7] Operators can control what you use on your phone by controlling download speeds and managing the traffic through the network	0.034	0.126	0.455	0.446	0.137		
		[Q23.8] Data based voice or video calling applications: no support for them if you have problems	0.045	0.074	0.048	0.028	0.271	Competent: Slight with Moderate	Competent: Slight with Moderate and Extreme
		[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.001	0.002	0.021	0.026	0.888		
	Question 9	**[Q12.5]** The Operators can prevent you using a specific product or service by refusing to give you help with it	0.066	0.001	0.009	0.008	0.036	Competent: Somewhat with Extremely	Competent: Somewhat with Moderate; Extreme with Somewhat and Moderate
		[Q12.6] Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	0.003	0.000	0.003	0.157	0.207	Competent: Somewhat with Moderate; Extreme with Somewhat and Moderate	Competent: Extreme with All
		[Q12.7] Operators can control what you use on your phone by controlling download speeds and managing the traffic through the network	0.000	0.060	0.081	0.149	0.127		
		[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.028	0.160	0.051	0.062	0.005	Competent: Somewhat with Moderate	Competent: Somewhat with Moderate
		[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.000	0.078	0.078	0.062	0.017		
	Question 10	**[Q12.2]** Operators can influence the how and when you use your mobile device by manipulating prices	0.021	0.219	0.025	0.048	0.316	Competent: Moderate with Extreme	Competent: Moderate with Extreme
		[Q12.6] Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	0.012	0.170	0.206	0.157	0.207		
		[Q12.7] Operators can control what you use on your phone by controlling download speeds and managing the traffic through the network	0.032	0.109	0.018	0.033	0.037	Competent: Somewhat with Moderate and Extreme	Competent: Somewhat with Moderate and Extreme
		[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.015	0.045	0.078	0.145	0.237		
	Question 21	**[Q12.1]** Operators keep mobile prices higher than necessary to maximise their profits	0.000	0.007	0.009	0.435	0.060	Very Difficult with Very Easy and Easy	
		[Q12.2] Operators can influence the how and when you use your mobile device by manipulating prices	0.000	0.000	0.004	0.156	0.300	Difficult with Very Easy	
		[Q12.3] Operators can influence the how and when you use your mobile device with promotions	0.006	0.016	0.117	0.259	0.524		
		[Q12.7] Operators can control what you use on your phone by controlling download speeds and managing the traffic through the network	0.260	0.039	0.094	N/A	0.088		
		[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.006	0.049	0.035	N/A	0.001	Neutral with Easy	Very Difficult with Neutral, Easy and Very Easy

Framework Construct	*Factor*	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	**Question 23.1**	**[Q12.1]** Operators keep mobile prices higher than necessary to maximise their profits	0.016	0.250	0.006	0.015	0.025	Agree with Strongly Agree	Agree with Disagree
		[Q12.7] Operators can control what you use on your phone by controlling download speeds and managing the traffic through the network	0.016	0.130	0.049	0.075	0.001		
		[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.000	0.000	0.000	0.000	0.009	Strongly Disagree with All; Disagree with Strongly Agree	Strongly Disagree with All; Disagree with Strongly Agree
		[Q23.8] Data based voice or video calling applications: no support for them if you have problems	0.000	0.000	0.000	0.000	0.003	Strongly Disagree with Agree and Strongly Agree	Strongly Disagree with Agree
		[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.000	0.000	0.000	0.000	0.014	Strongly Disagree with All; Disagree with Strongly Agree	Strongly Disagree with All; Disagree with Strongly Agree
	Question 26.1	**[Q12.2]** Operators can influence the how and when you use your mobile device by manipulating prices	0.004	0.453	0.092	0.008	0.054		
		[Q12.3] Operators can influence the how and when you use your mobile device with promotions	0.040	0.012	0.103	0.040	0.736		
		[Q12.4] If the Operators want you to use a specific product or service they do it with promotions and pricing	0.032	0.851	0.706	0.542	0.245		
		[Q12.6] Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	0.043	0.140	0.240	0.084	0.017		
		[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with Disagree, Somewhat Disagree and Strongly Agree	Strongly Disagree with Disagree, and Strongly Agree
		[Q23.8] Data based voice or video calling applications: no support for them if you have problems	0.000	0.000	0.002	0.004	0.008		
		[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with All; Disagree with Somewhat Agree, Agree and Strongly Agree	Strongly Disagree with All; Disagree with Strongly Agree

(yellow)	Significant at the 0.05 level
(red)	Significant at the 0.01 level

Moderating Factor: Personal Factor-Technical Knowledge, Ability and Skills Construct: SPAV

Framework Construct	*Factor*	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Social Pressure and Aspirational Value (SPAV)	Question 8	**[Q26.4]** Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.000	0.000	0.001	0.009	0.000	Competence: Slight with Moderate and Extreme	Competence: Slight with Extreme
	Question 9	**[Q26.4]** Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.028	0.000	0.003	0.017	0.001	Competence: Moderate with Extreme	Competence: Moderate with Extreme
	Question 10	**[Q23.4]** Data based Voice or Video calling applications: d) I don't know anybody who uses them, so cannot use them myself	0.001	0.084	0.140	0.186	0.366		
		[Q26.4] Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.000	0.000	0.000	0.001	0.001	Competence: Slight and Extreme with All; Moderate with All except Somewhat	Competence: Slight and Extreme with All; Moderate with All except Somewhat
	Question 21	**[Q23.4]** Data based Voice or Video calling applications: d) I don't know anybody who uses them, so cannot use them myself	0.021	0.076	0.040	0.190	0.022		
		[Q26.4] Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.005	0.000	0.002	0.122	0.018	Difficult with Very Easy	Neutral with Very Easy
	Question 23.1	**[Q23.4]** Data based Voice or Video calling applications: d) I don't know anybody who uses them, so cannot use them myself	0.000	0.000	0.000	0.000	0.000	Strongly Disagree, Disagree and Agree with All; Strongly Agree with All except Neither Agree or Disagree; Neither Agree or Disagree with All except Strongly Agree	Strongly Disagree, and Disagree with All

Framework Construct	Factor	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Social Pressure and Aspirational Value (SPAV)	Question 23.1	**[Q23.10]** Data based Voice or Video calling applications: They are not good for my image as they make me appear poor	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with All; Disagree with All except Agree	Strongly Disagree with All; Disagree with All except Agree
		[Q23.11] Data based Voice or Video calling applications: I use them as all my friends use them	0.000	0.001	0.000	0.000	0.002	Agree with Strongly Disagree and Disagree	Agree with Strongly Disagree and Disagree
		[Q26.4] Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with All but disagree	Strongly Disagree with All
		[Q26.10] Free WiFi hotspots: Using them is good for my image as it shows that I am technically literate	0.007	0.009	0.011	0.017	0.050	Strongly Disagree with Strongly Agree	
		[Q26.11] Free WiFi hotspots: I use them as all my friends use them	0.000	0.009	0.000	0.000	0.134	Strongly disagree with Disagree and Neither Agree Nor Disagree	Strongly disagree with Disagree and Neither Agree Nor Disagree
	Question 26.1	**[Q23.4]** Data based Voice or Video calling applications: d) I don't know anybody who uses them, so cannot use them myself	0.000	0.000	0.000	0.005	0.000	Strongly Disagree with Neither Agree nor Disagree and Somewhat Agree	
		[Q23.10] Data based Voice or Video calling applications: They are not good for my image as they make me appear poor	0.004	0.000	0.000	0.004	0.000	Strongly disagree with Neither Agree nor Disagree, Somewhat Agree and Strongly Agree	
		[Q23.11] Data based Voice or Video calling applications: I use them as all my friends use them	0.187	0.311	0.047	0.071	0.489	Disagree with Strongly Agree	
		[Q26.4] Free WiFi hotspots: I don't know anybody who uses them, so don't use them myself	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with All except Somewhat Disagree; Disagree with All except Somewhat Disagree; Somewhat Disagree with All except Strongly Disagree and Disagree; Neither Agree Nor Disagree with All except, Somewhat Agree, Agree and Strongly Agree	Strongly Disagree with All except Somewhat Disagree; Disagree with All except Somewhat Disagree; Somewhat Disagree with All except Strongly Disagree and Disagree; Neither Agree Nor Disagree with All except, Somewhat Agree, Agree and Strongly Agree
		[Q26.11] Free WiFi hotspots: I use them as all my friends use them	0.001	0.000	0.001	0.000	0.002	Agree with Strongly Disagree, Disagree and Neither Agree Nor Disagree	Agree with Strongly Disagree, Disagree and Neither Agree Nor Disagree; Strongly Agree with Neither Agree Nor Disagree

(yellow)	Significant at the 0.05 level
(red)	Significant at the 0.01 level

Moderating Factor: Personal Factor-Technical Knowledge, Ability and Skills Construct: PEU

Framework Construct	*Factor*	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Ease of Use (PEU)	Question 8	**[Q23.3]** Data based Voice or Video calling applications: They are difficult to set up	0.015	0.068	0.069	0.063	0.371		
		[Q23.6] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.022	0.000	0.001	0.003	0.094	Comptence: Slight with Moderate and Extreme	Comptence: Slight with Extreme
		[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.010	0.005	0.074	0.005	Comptence: Slight with All	
		[Q26.3] Free WiFi hotspots: They are difficult to set up	0.000	0.000	0.000	0.000	0.433	Comptence: Slight with Moderate and Extreme; Moderate with Extreme	Comptence: Slight with Moderate and Extreme; Moderate with Extreme
		[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.022	0.013	0.042	0.055	0.536		
	Question 9	**[Q23.3]** Data based Voice or Video calling applications: They are difficult to set up	0.004	0.009	0.008	0.005	0.318	Comptence: Slight with Moderate and Extreme	Comptence: Slight with Moderate and Extreme
		[Q23.6] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.001	0.000	0.000	0.000	0.220	Comptence: Slight with All	Comptence: Slight with All
		[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.002	0.014	0.050	0.206	0.004	Comptence: Slight with Extreme	
		[Q26.3] Free WiFi hotspots: They are difficult to set up	0.000	0.000	0.000	0.000	0.476	Comptence: Slight with Moderate and Extreme; Somewhat with Moderate and Extreme	Comptence: Slight with Moderate and Extreme; Somewhat with Moderate and Extreme
		[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.045	0.017	0.005	0.000	Comptence: Slight with Moderate	Comptence: Slight with Moderate and Extreme
		[Q28.6] Download and use a new application: The application must be easy to learn	0.671	0.296	0.057	0.000	0.001		Comptence: Slight with All
		[Q28.9] Download and use a new application: The application must be flexible enough for me to do my specific task	0.011	0.820	0.974	0.975	0.345		
		[Q28.13] Download and use a new application: The application must make it easy for me to correct any errors I make	0.035	0.517	0.624	0.614	0.345		
	Question 10	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.102	0.036	0.093	0.111	0.227		
		[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.000	0.023	0.009	0.020	0.325	Comptence: Slight with Moderate and Extreme	
		[Q23.6] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.004	0.000	0.000	0.036	Comptence: Slight with All	Comptence: Slight with All
		[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.006	0.096	0.380	0.453	0.548		
		[Q26.3] Free WiFi hotspots: They are difficult to set up	0.000	0.000	0.001	0.003	0.941	Comptence: Slight with All; Somewhat with Extreme	Comptence: Extreme with Slight and Somewhat
		[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.404	0.075	0.118	0.000		
		[Q28.12] Download and use a new application: The application must not act in unexpected ways	0.003	0.189	0.010	0.135	0.207	Comptence: Slight with Somewhat with Extreme	

Framework Construct	Factor	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Ease of Use (PEU)	Question 21	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.001	0.029	0.005	0.037	0.009		
		[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.000	0.000	0.000	0.100	0.156	Difficult with Easy and Very Easy; Neutral with Easy	Difficult with Easy and Very Easy; Neutral with Easy
		[Q23.6] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.279	0.005	0.017	0.106	0.641	Difficult with Easy and Very Easy;	Difficult with Easy and Very Easy;
		[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.011	0.005	0.161	0.003	Neutral with Easy	Neutral with Easy
		[Q26.3] Free WiFi hotspots: They are difficult to set up	0.001	0.018	0.047	N/A	0.009		Very Difficult with All
		[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.003	0.785	0.148	N/A	0.000		
		[Q26.8] Free WiFi hotspots: There is no support for them if you have problems	0.007	0.208	0.023	0.009	0.210		
		[Q28.2] Download and use a new application: The application must be easy to download and install	0.150	0.592	0.018	0.127	0.003	Easy with Very Easy	Easy with Difficult and Very Easy
		[Q28.4] Download and use a new application: The application must be easy to understand	0.047	0.173	0.024	0.128	0.046	Easy with Very Easy	Easy with Very Easy
		[Q28.6] Download and use a new application: The application must be easy to learn	0.095	0.162	0.007	N/A	0.023	Easy with Very Easy	Very Difficult with All; Easy with Very Easy
		[Q28.9] Download and use a new application: The application must be flexible enough for me to do my specific task	0.103	0.007	0.028	0.161	0.138		Easy with Very Easy
		[Q28.10] Download and use a new application: The application must be easy and quick to navigate around	0.033	0.118	0.030	0.129	0.939	Easy with Very Easy	Easy with Very Easy
		[Q28.12] Download and use a new application: The application must not act in unexpected ways	0.025	0.013	0.000	0.032	0.018	Easy with Very Easy	Easy with Very Easy
		[Q28.13] Download and use a new application: The application must make it easy for me to correct any errors I make	0.041	0.080	0.000	0.058	0.079	Easy with Very Easy	Easy with Very Easy
	Question 23.1	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with All; Disagree with Neither Agree nor Disagree	Strongly Disagree with All
		[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.000	0.000	0.000	0.000	0.000	Strongly Disagree and Disagree with All; Neither Agree nor Disagree with Strongly Agree	Strongly Disagree and Disagree with All
		[Q23.6] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.000	0.363	Strongly Disagree and Disagree with All; Disagree with Strongly Agree	Strongly Disagree and Disagree with All; Disagree with Strongly Agree
		[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with All except Disagree; Disagree with Strongly Agree	Strongly Disagree with All except Disagree; Disagree with Strongly Agree

Framework Construct	*Factor*	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Ease of Use (PEU)	**Question 23.1**	**[Q26.3]** Free WiFi hotspots: They are difficult to set up	0.000	0.000	0.000	0.000	0.054	Strongly Disagree with All except Disagree; Disagree with All except Strongly Disagree	Strongly Disagree with All except Disagree; Disagree with All except Strongly Disagree
		[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.000	0.000	0.000	0.011	Strongly Agree with All except Neither Difficult or Easy; Neither Difficult or Easy with Strongly Disagree	Strongly Agree with All except Neither Difficult or Easy; Neither Difficult or Easy with Strongly Disagree
		[Q26.8] Free WiFi hotspots: There is no support for them if you have problems	0.097	0.004	0.041	0.056	0.106		
		[Q28.2] Download and use a new application: The application must be easy to download and install	0.009	0.438	0.366	0.365	0.043		
		[Q28.4] Download and use a new application: The application must be easy to understand	0.017	0.032	0.015	0.001	0.000	Neither Agree nor Disagree with Strongly Disagree and Disagree	Neither Agree nor Disagree with Strongly Disagree and Disagree
		[Q28.10] Download and use a new application: The application must be easy and quick to navigate around	0.656	0.008	0.021	0.021	0.032		Strongly Disagree with Agree
		[Q28.13] Download and use a new application: The application must make it easy for me to correct any errors I make	0.275	0.145	0.022	0.021	0.414		Strongly Disagree with Disagree and Neither Agree Nor Disagree
	Question 26.1	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.000	0.001	0.000	0.013	0.000	Strongly Disagree with Somewhat Agree	
		[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with All except Disagree and Agree; Disagree with Strongly Agree	Somewhat Disagree, Somewhat Agree and Strongly Agree; Disagree with Strongly Agree
		[Q23.6] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.000	0.034	Strongly Disagree with Somewhat Agree, Agree and Strongly Agree; Strongly Agree with Disagree and Somewhat Disagree	Strongly Agree with Strongly Disagree, Disagree and Somewhat Disagree
		[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with All; Disagree with Neither Agree nor Disagree	Strongly Disagree with All; Disagree with All except Somewhat Disagree and Strongly Agree
		[Q26.3] Free WiFi hotspots: They are difficult to set up	0.000	0.000	0.000	0.000	0.002	Strongly Disagree and Disagree with All	Strongly Disagree and Disagree with All
		[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with All; Disagree with All except Somewhat Disagree and Neither Agree nor Disagree	Strongly Disagree with All; Disagree with All except Somewhat Disagree and Neither Agree nor Disagree
		[Q26.8] Free WiFi hotspots: There is no support for them if you have problems	0.000	0.000	0.000	0.000	0.002	Strongly Disagree with All except Neither Agree nor Disagree	Strongly Disagree with All
		[Q28.6] Download and use a new application: The application must be easy to learn	0.458	0.044	0.007	0.003	0.016	Disagree with Somewhat Agree	Disagree with Somewhat Agree and Strongly Agree
		[Q28.10] Download and use a new application: The application must be easy and quick to navigate around	0.603	0.054	0.079	0.006	0.003		Somewhat Agree with Strongly Disagree and Disagree
		[Q28.13] Download and use a new application: The application must make it easy for me to correct any errors I make	0.044	0.136	0.493	0.463	0.205		

Moderating Factor: Personal Factor-Technical Knowledge, Ability and Skills Construct PU:

Framework Construct	*Factor*	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Usefulness (PU)	Question 8	**[Q23.12]** Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.044	0.512	0.168	0.166	0.198		
		[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.000	0.012	Comptence: Slight and Somewhat with Moderate and Extreme	Comptence: Slight and Somewhat with Moderate and Extreme
	Question 9	**[Q23.7]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.032	0.123	0.325	0.358	0.186		
	Question 10	**[Q23.13]** Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.044	0.282	Comptence: Slight and Somewhat with Moderate and Extreme	Comptence: Slight and Somewhat with Moderate and Extreme
		[Q26.9] Free WiFi hotspots: They are difficult to set up	0.001	0.235	0.309	0.331	0.005		
		[Q26.12] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.850	0.261	0.154	0.048		
		[Q26.13] Free WiFi hotspots: There is no support for them if you have problems	0.014	0.136	0.205	0.198	0.214		
		[Q28.8] Download and use a new application: The application must be easy and quick to navigate around	0.001	0.383	0.569	0.638	0.305		
		[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.457	0.096	0.027	0.004	0.001		
	Question 21	**[Q23.9]** Data based Voice or Video calling applications: They are difficult to set up	0.000	0.052	0.027	N/A	0.089		Very difficult with All
		[Q23.12] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.003	0.000	0.000	0.009	0.546	Very Easy with Difficult and Neutral	Difficult with Easy and Very Easy; Neutral and Very Easy
		[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.046	0.220	0.026	0.046	0.917		
		[Q26.7] Free WiFi hotspots: I know about them but do not know how to use them	0.222	0.028	0.037	0.072	0.064		
		[Q26.12] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.132	0.002	N/A	0.004	Very Difficult with Easy and Very Easy	Very Difficult with Allk
		[Q28.1] Download and use a new application: The application must be easy to download and install	0.000	0.008	0.005	N/A	0.000	Easy with Very Easy	Easy with Very Easy; Very Difficult with All except Neutral

Framework Construct	Factor	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Usefulness (PU)	Question 21	**[Q28.3]** Download and use a new application: The application must be easy to understand	0.056	0.014	0.004	0.095	0.000	Very Easy with Neutral and Easy	Easy with Very Easy
		[Q28.5] Download and use a new application: The application must be easy to learn	0.000	0.013	0.000	0.294	0.000	Very Difficult with All	
		[Q28.7] Download and use a new application: The application must be flexible enough for me to do my specific task	0.162	0.085	0.011	0.139	0.002	Easy with Very Easy	Easy with Very Easy
		[Q28.8] Download and use a new application: The application must be easy and quick to navigate around	0.011	0.053	0.008	0.082	0.009	Easy with Very Easy	Easy with Very Easy
		[Q28.11] Download and use a new application: The application must not act in unexpected ways	0.242	0.078	0.016	0.128	0.201	Easy with Very Easy	Easy with Very Easy
		[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.624	0.172	0.044	0.180	0.197		
	Question 23.1	**[Q23.7]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.000	0.002	0.029	0.054	0.390	Strongly Agree with Strongly Disagree	
		[Q23.9] Data based Voice or Video calling applications: They are difficult to set up	0.000	0.000	0.000	0.000	0.004	Strongly Agree with All except Agree	Strongly Agree with All except Agree
		[Q23.12] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.000	0.004	Strongly Disagree with All; Disagree with All except Agree	Strongly Disagree with All; Disagree with All except Agree
		[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.002	0.000	Strongly Adisagree and Disagree with Agree and Strongly Agree	Agree with Strongly Disagree and Disagree
		[Q26.7] Free WiFi hotspots: I know about them but do not know how to use them	0.215	0.026	0.077	0.119	0.049		
		[Q26.9] Free WiFi hotspots: They are difficult to set up	0.014	0.312	0.053	0.036	0.084		Disagree with Strongly Agree
		[Q26.12] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.000	0.000	0.036	0.084	Strongly Agree with All except Neither Disagree Nor Agree; Neither Disagree Nor Agree with Disagree and Strongly Disagree	Strongly Agree with All except Neither Disagree Nor Agree; Neither Disagree Nor Agree with Disagree and Strongly Disagree
		[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.000	0.002	0.000	0.000	0.000	Neither Disagree Nor Agree with All; Strongly Disagree with Disagree	Neither Disagree Nor Agree with All; Strongly Disagree with Disagree

Framework Construct	Factor	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Usefulness (PU)	Question 26.1	**[Q23.9]** Data based Voice or Video calling applications: They are difficult to set up	0.040	0.006	0.157	0.069	0.158		
		[Q23.12] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.002	0.445	0.013	0.069	0.158	Strongly Disagree with Disagree	Strongly Disagree with Disagree and Neither Disagree nor Agree
		[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.000	0.000	0.000	0.000	Strongly Agree with Strongly Disagree and Disagree; Disagree with Somewhat Disagree	Strongly Agree with Strongly Disagree and Disagree; Disagree with Somewhat Disagree
		[Q26.7] Free WiFi hotspots: I know about them but do not know how to use them	0.000	0.000	0.000	0.000	0.002	Strongly Agree with Strongly Disagree, Disagree and Somewhat Disagree;	Strongly Agree with Strongly Disagree, Disagree and Somewhat Disagree; Neither Agree nor Disagree with Strongly Disagree and Disagree
		[Q26.9] Free WiFi hotspots: They are difficult to set up	0.000	0.007	0.008	0.006	0.000	Agree with Strongly Disagree	Agree with Strongly Disagree and Somewhat Disagree
		[Q26.12] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.000	0.000	0.000	0.000	Strongly Disagree with Disagree, Neither Disagree Nor Agree, Somewhat Agree and Strongly Agree	Strongly Disagree with Disagree, Neither Disagree Nor Agree and Somewhat Agree
		[Q26.13] Free WiFi hotspots: There is no support for them if you have problems	0.000	0.000	0.000	0.000	0.085	Strongly Disagree with Neither Disagree Nor Agree, Agree and Strongly Agree; Disagree with Agree and Strongly Agree	Strongly Disagree and Disagree with Neither Disagree Nor Agree, Agree and Strongly Agree;
		[Q28.8] Download and use a new application: The application must be easy and quick to navigate around	0.357	0.750	0.252	0.015	0.005		Somewhat Disagree with Strongly Disagree and Disagree
		[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.000	0.370	0.000	0.000	0.000	Somewhat Disagree with Strongly Disagree, Disagree, Gree and Strongly Agree; Strongly Disagree with Somewhat Disagree and Neither Disagree nor Agree	Somewhat Disagree with All except Neither Disagree Nor Agree; Neither Disagree Nor Agree with Strongly Disagree and Strongly Agree

Moderating Factor: Personal Factor-Technical Knowledge, Ability and Skills Construct IU:

Framework Construct	*Factor*	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
			Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Intention to Use (IU)	Question 8	**[Q24]** Data based Voice or Video calling applications: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.032	0.014	0.015	0.051	0.313	Competence: Slight with Moderate and Extreme	
		[Q27] Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.017	0.034	0.044	0.100	0.186	Competence: Somewhat with Extreme	Competence: Somewhat with Extreme
	Question 9	**[Q24]** Data based Voice or Video calling applications: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.007	0.000	0.006	0.018	0.167	Competence: Extreme with Slight and Somewhat	Competence: Extreme with Somewhat
		[Q27] Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.050	0.089	0.111	0.092	0.329		
	Question 10	**[Q24]** Data based Voice or Video calling applications: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.004	0.000	0.001	0.011	0.136	Competence: Slight with Extreme	Competence: Somewhat with Extreme
	Question 21	**[Q24]** Data based Voice or Video calling applications: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.000	0.000	0.000	0.004	0.002	Very Easy with All except Very Difficult; Easy with Difficult	Very Easy with All except Very Difficult; Easy with Difficult
		[Q27] Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.001	0.000	0.000	N/A	0.076	Very Easy with Neutral and Easy	Very Difficult with All; Very Easy with Neutral and Easy
	Question 23.1	**[Q24]** Data based Voice or Video calling applications: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.000	0.000	0.000	0.000	0.013	Strongly Disagree with All except Disagree; Disagree with All except Strongly Disagree	Strongly Disagree with All except Disagree; Disagree with All except Strongly Disagree and Strongly Agree
	Question 26.1	**[Q27]** Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.010	0.000	0.003	0.012	0.005	Strongly Disagree with Strongly Agree	

(yellow)	Significant at the 0.05 level
(red)	Significant at the 0.01 level

Moderating Factor: Personal Factor-Attitude to Technology:

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Mobile Service Provider Marketing Tactics (MOSPMT)	**[Q12.4]** If the Operators want you to use a specific product or service they do it with promotions and pricing	0.042	0.061	0.015	0.006	0.088		Wait and See what others are doing with Always Investigating New
	[Q12.5] The Operators can prevent you using a specific product or service by refusing to give you help with it	0.035	0.086	0.010	0.013	0.687	Wait and See what others are doing with Actively Keep up to Date	Wait and See what others are doing with Actively Keep up to Date
	[Q12.6] Operators deliberately try to prevent the usage of services, such Voice over IP (VoIP), as they are cheaper than the standard product	0.000	0.001	0.008	0.005	0.394	Wait and See what others are doing with Always Investigating New	Wait and See what others are doing with Always Investigating New
	[Q12.7] Operators can control what you use on your phone by controlling download speeds and managing the traffic through the network	0.037	0.094	0.012	0.011	0.056	Wait and See what others are doing with Actively Keep up to Date	Wait and See what others are doing with Actively Keep up to Date
	[Q23.5] Data based voice or video calling applications Network Operators discourage people using them	0.032	0.019	0.054	0.081	0.094	I am Happy with Existing with Actively keep myself up to date	
	[Q23.8] Data based voice or video calling applications: no support for them if you have problems	0.000	0.977	0.125	0.114	0.002		
	[Q26.5] Free WiFi hotspots: network operators discourage people using them	0.002	0.003	0.016	0.016	0.032		
Social Pressure and Aspirational Value (SPAV)	**[Q23.4]** Data based Voice or Video calling applications: d) I don't know anybody who uses them, so cannot use them myself	0.005	0.424	0.007	0.007	0.002	Actively keep mysely up to date with Always investigating new technology	Actively keep mysely up to date with Always investigating new technology
	[Q23.10] Data based Voice or Video calling applications: They are not good for my image as they make me appear poor	0.002	0.227	0.013	0.033	0.000	Actively keep mysely up to date with Always investigating new technology	Actively keep mysely up to date with Always investigating new technology
	[Q26.10] Free WiFi hotspots: Using them is good for my image as it shows that I am technically literate	0.000	0.003	0.001	0.000	0.000	Do Not actively follow technology with Actively follow technology and Always investigating new technology	Do Not actively follow technology with Actively follow technology and Always investigating new technology
	[Q26.11] Free WiFi hotspots: I use them as all my friends use them	0.006	0.156	0.009	0.007	0.003	Do Not actively follow technology with Always investigating new technology	Wait and See what others are doing with Do Not actively follow technology

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Ease of Use (PEU)	**[Q23.2]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.006	0.387	0.031	0.027	0.003		
	[Q23.3] Data based Voice or Video calling applications: They are difficult to set up	0.000	0.000	0.000	0.000	0.107	I am happy with existing technology with actively keep mysely up to date and always investigating new technology	
	[**Q23.6]** Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.508	0.047	0.154	0.066	0.190		
	[Q26.2] Free WiFi hotspots: I know about them but do not know how to use them	0.001	0.036	0.088	0.095	0.001		
	[Q26.3] Free WiFi hotspots: They are difficult to set up	0.036	0.001	0.019	0.030	0.679		
	[Q26.6] Free WiFi hotspots: They are more difficult to use than normal data services	0.001	0.001	0.000	0.002	0.000	I am happy with existing technology with do not actively follow technology and actively keep mysely up to date	I am happy with existing technology with actively keep mysely up to date
	[Q26.8] Free WiFi hotspots: There is no support for them if you have problems	0.010	0.365	0.891	0.920	0.005		
	[Q28.6] Download and use a new application: The application must be easy to learn	0.678	0.026	0.201	0.052	0.009		
	[Q28.10] Download and use a new application: The application must be easy and quick to navigate around	0.041	0.077	0.054	0.009	0.020	I am happy with existing technology with Do Not actively follow technology	I am happy with existing technology with Do Not actively follow technology and Actively keep mysely up to date
	[Q28.12] Download and use a new application: The application must not act in unexpected ways	0.000	0.105	0.001	0.000	0.001	I am happy with existing technology with Do Not actively follow technology and Actively keep mysely up to date	I am happy with existing technology with Do Not actively follow technology and Actively keep mysely up to date
	[Q28.13] Download and use a new application: The application must make it easy for me to correct any errors I make	0.001	0.039	0.000	0.000	0.001	Do Not actively follow technology with All except Actively keep mysely up to date; I am happy with existing technology and Actively keep mysely up to date	Do Not actively follow technology with All except Actively keep mysely up to date; I am happy with existing technology and Actively keep mysely up to date

Framework Construct	Question	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests: Pairwise variation	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Perceived Usefulness (PU)	**[Q23.7]** Data based Voice or Video calling applications: I know about them but do not know how to use them	0.076	0.018	0.040	0.440	0.714		
	[Q23.9] Data based Voice or Video calling applications: They are difficult to set up	0.059	0.783	0.121	0.108	0.032		
	[Q23.12] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.000	0.001	0.014	0.011	0.007	I am happy with existing technology with Actively keep mysely up to date and Always investigating new technology	I am happy with existing technology with Actively keep mysely up to date and Always investigating new technology
	[Q23.13] Data based Voice or Video calling applications: They are more difficult to use than normal voice	0.002	0.000	0.005	0.006	0.104	I am happy with existing technology with Always investigating new technology	Always investigating new technology with I am happy with existing technology and Do Not actively follow technology
	[Q26.9] Free WiFi hotspots: They are difficult to set up	0.013	0.075	0.325	0.206	0.000		
	[Q26.12] Free WiFi hotspots: They are more difficult to use than normal data services	0.000	0.879	0.271	0.053	0.001		
	[Q26.13] Free WiFi hotspots: There is no support for them if you have problems	0.045	0.692	0.512	0.564	0.062		
	[Q28.3] Download and use a new application: The application must be easy to understand	0.078	0.095	0.106	0.045	0.000		I am happy with existing technology and Do Not actively follow technology
	[Q28.7] Download and use a new application: The application must be flexible enough for me to do my specific task	0.541	0.020	0.185	0.134	0.002		
	[Q28.11] Download and use a new application: The application must not act in unexpected ways	0.018	0.121	0.043	0.018	0.003	I am happy with existing technology and Do Not actively follow technology	
	[Q28.14] Download and use a new application: The application must make it easy for me to correct any errors I make	0.000	0.000	0.000	0.000	0.000	I am happy with existing technology with All except Wait and See what others are doing; Wait and See what others are doing with All except I am happy with existing technology	I am happy with existing technology with All except Wait and See what others are doing; Wait and See what others are doing with All except I am happy with existing technology
Intention to Use (IU)	**[Q24]** Data based Voice or Video calling applications: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.001	0.000	0.002	0.001	0.120	Always investigating new technology with All except Actively keep mysely up to date	Always investigating new technology with Wait and See what others are doing and Do Not actively follow technology
	[Q27] Free WiFi: If the network operators were to preload and set them up on your device and encourage you to use them, how likely are you to adopt them.	0.007	0.238	0.009	0.008	0.007	Do Not actively follow technology with Always investigating new technology	Do Not actively follow technology with Always investigating new technology

(yellow)	Significant at the 0.05 level
(red)	Significant at the 0.01 level

APPENDIX 6

Correlation Matrices of Constructs

Correlation Matrix: Mobile Service Provider Marketing Tactics & Social Pressure and Aspirational Value

Mobile Service Provider Marketing Tactics (MOSPMT)			SOCIAL PRESSURE AND ASPIRATIONAL VALUE					
			[Q23.4] Data based voice or video calling applications: don't know anybody who uses them, can't use them myself	**[Q23.10]** Data based voice or video calling applications: not good to use for my image as they make me appear poor	**[Q23.11]** Data based voice or video calling applications: use them as all my friends use them	**[Q26.4]** Free wifi hotspots: don't know anybody who uses them, so don't use them myself	**[Q26.10]** Free wifi hotspots: using them is good for my general image as it shows am technically literate	**[Q26.11]** Free wifi hotspots: use them as all my friends use them
	[Q12.1] Operators keep mobile prices higher to maximise their profits	Pearson Correlation	-.131**	-0.041	0.023	-0.040	-.113*	-0.050
		Sig. (2-tailed)	0.009	0.410	0.644	0.420	0.024	0.315
	[Q12.2] Operators can influence how and when you use mobile device by manipulating prices	Pearson Correlation	-.104*	-0.079	0.026	-0.025	-0.017	-0.005
		Sig. (2-tailed)	0.038	0.116	0.598	0.624	0.741	0.923
	[Q12.3] Operators can influence how and when you use mobile device with promotions	Pearson Correlation	-0.009	-0.030	0.059	0.058	-0.009	0.017
		Sig. (2-tailed)	0.854	0.547	0.235	0.247	0.861	0.729
	[Q12.4] Operators want you to use specific product or service they do it with promotions	Pearson Correlation	-0.080	-.111*	.102*	-0.053	-0.021	0.033
		Sig. (2-tailed)	0.109	0.026	0.041	0.288	0.673	0.510
	[Q12.5] Operators can prevent you using specific product or service by refusing to give you help	Pearson Correlation	0.012	-0.029	0.016	-0.014	-0.066	-0.024
		Sig. (2-tailed)	0.808	0.567	0.743	0.783	0.189	0.634
	[Q12.6] Operators deliberately try to prevent the usage of services VoIP as they are cheaper than standard	Pearson Correlation	-0.035	0.009	0.021	0.057	-.098*	-0.078
		Sig. (2-tailed)	0.490	0.861	0.677	0.252	0.050	0.120

Mobile Service Provider Marketing Tactics (MOSPMT)			SOCIAL PRESSURE AND ASPIRATIONAL VALUE					
			[Q23.4] Data based voice or video calling applications: don't know anybody who uses them, can't use them myself	**[Q23.10]** Data based voice or video calling applications: not good to use for my image as they make me appear poor	**[Q23.11]** Data based voice or video calling applications: use them as all my friends use them	**[Q26.4]** Free wifi hotspots: don't know anybody who uses them, so don't use them myself	**[Q26.10]** Free wifi hotspots: using them is good for my general image as it shows am technically literate	**[Q26.11]** Free wifi hotspots: use them as all my friends use them
	[Q12.7] Operators can control what you use on your phone by controlling download speed and manage traffic through network	Pearson Correlation	-0.063	-0.017	0.053	0.030	-.145**	-0.074
		Sig. (2-tailed)	0.207	0.739	0.292	0.553	0.004	0.140
	[Q23.5] Data based voice or video calling applications: network operators discourage people using them	Pearson Correlation	.507**	.396**	0.017	.353**	.113*	.122*
		Sig. (2-tailed)	0.000	0.000	0.730	0.000	0.024	0.014
	[Q23.8] Data based voice or video calling applications: no support for them if you have problems	Pearson Correlation	.150**	.165**	-0.025	.165**	0.054	0.014
		Sig. (2-tailed)	0.003	0.001	0.620	0.001	0.286	0.775
	[Q26.5] Free wifi hotspots: network operators discourage people using them	Pearson Correlation	.304**	.287**	0.030	.587**	-0.039	-0.004
		Sig. (2-tailed)	0.000	0.000	0.548	0.000	0.433	0.936

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation Matrix: Mobile Service Provider Marketing Tactics & Perceived Usefulness

			Perceived Usefulness														
			[Q23.7] Data based voice or video calling applications: happy to use them as they are cheaper	**[Q23.9]** Data based voice or video calling applications: quality is poor so I use normal voice	**[Q23.12]** Data based voice or video calling applications: use up too much data	**[Q23.13]** Data based voice or video calling applications: they allow me to video conference when face to face meetings not possible	**[Q26.7]** Free wifi hotspots: happy to use as they allow me to save data	**[Q26.9]** Free wifi hotspots: data speed generally so poor so I use normal data	**[Q26.12]** Free wifi hotspots: don't use them for data security issues	**[Q26.13]** Free wifi hotspots: use them as they allow me to save money	**[Q28.1]** Download and use a new application agreement: must be useful	**[Q28.3]** Download and use a new application agreement: must do required function better or faster than similar app or method	**[Q28.5]** Download and use a new application agreement: must make it easier for me to accomplish a task	**[Q28.7]** Download and use a new application agreement: must save me time	**[Q28.8]** Download and use a new application agreement: must make me more effective	**[Q28.11]** Download and use a new application agreement: add value to me	**[Q28.14]** Download and use a new application agreement: greater control over some aspect of my life
Mobile Service Provider Marketing Tactics (MOSPMT)	**[Q12.1]** Operators keep mobile prices higher to maximise their profits	Pearson Correlation	0.052	-0.032	0.001	-0.043	0.089	.102*	-0.009	0.074	.122*	.130**	.116*	.121*	0.092	0.014	-.131**
		Sig. (2-tailed)	0.301	0.520	0.981	0.397	0.076	0.041	0.857	0.140	0.015	0.009	0.020	0.016	0.065	0.782	0.009
	[Q12.2] Operators can influence how and when you use mobile device by manipulating prices	Pearson Correlation	0.092	-0.016	-0.059	-0.014	0.085	0.065	-.100*	0.013	0.061	.195**	0.072	.123*	.150**	.106*	-.158**
		Sig. (2-tailed)	0.067	0.742	0.240	0.774	0.090	0.193	0.046	0.791	0.224	0.000	0.150	0.014	0.003	0.035	0.002
	[Q12.3] Operators can influence how and when you use mobile device with promotions	Pearson Correlation	.110*	0.000	-0.066	.101*	0.058	0.017	-.111*	0.009	0.044	.207**	.156**	.113*	.122*	.176**	-0.066
		Sig. (2-tailed)	0.028	1.000	0.190	0.043	0.248	0.734	0.027	0.851	0.378	0.000	0.002	0.024	0.014	0.000	0.190
	[Q12.4] Operators want you to use specific product or service they do it with promotions	Pearson Correlation	.181**	-0.017	-0.008	0.081	.149**	-0.039	-.118*	0.070	0.083	.216**	.116*	.216**	.152**	.180**	-0.016
		Sig. (2-tailed)	0.000	0.730	0.875	0.107	0.003	0.442	0.018	0.163	0.099	0.000	0.020	0.000	0.002	0.000	0.752
	[Q12.5] Operators can prevent you using specific product or service by refusing to give you help	Pearson Correlation	0.067	-0.037	-0.015	.146**	0.003	0.071	-0.027	0.012	-0.003	.101*	-0.018	0.066	0.046	.107*	-.161**
		Sig. (2-tailed)	0.179	0.464	0.767	0.003	0.949	0.157	0.595	0.812	0.953	0.044	0.717	0.188	0.359	0.032	0.001
	[Q12.6] Operators deliberately try to prevent the usage of services VoIP as they are cheaper than	Pearson Correlation	0.039	0.054	-0.097	.133**	-0.076	.144**	0.062	-0.074	0.046	.122*	0.059	0.060	0.072	0.081	-.181**
		Sig. (2-tailed)	0.437	0.284	0.052	0.008	0.131	0.004	0.214	0.140	0.357	0.015	0.241	0.232	0.148	0.105	0.000
	[Q12.7] Operators can control what you use on your phone by controlling download speed and manage traffic through network	Pearson Correlation	0.034	0.055	0.005	0.025	0.002	.151**	0.001	-0.019	.098*	.223**	.120*	.134**	0.084	0.066	-.134**
		Sig. (2-tailed)	0.502	0.273	0.921	0.616	0.973	0.002	0.988	0.706	0.049	0.000	0.016	0.007	0.094	0.191	0.007
	[Q23.5] Data based voice or video calling applications: network operators discourage people using	Pearson Correlation	-.168**	.126*	.379**	-.172**	0.001	0.097	.236**	0.064	-0.032	-0.031	0.004	-0.005	-0.025	0.053	.260**
		Sig. (2-tailed)	0.001	0.012	0.000	0.001	0.988	0.054	0.000	0.200	0.529	0.535	0.931	0.925	0.613	0.289	0.000
	[Q23.8] Data based voice or video calling applications: no support for them if you have problems	Pearson Correlation	-0.018	.327**	.138**	-.106*	0.043	.119*	0.012	-0.027	0.060	.119*	-0.001	.098*	.099*	.102*	-0.093
		Sig. (2-tailed)	0.721	0.000	0.006	0.034	0.387	0.017	0.817	0.588	0.234	0.017	0.987	0.050	0.048	0.041	0.063
	[Q26.5] Free wifi hotspots: network operators discourage people using them	Pearson Correlation	-.119*	.113*	.222**	-.171**	-.098*	.239**	.351**	-.117*	-0.042	-0.030	-0.045	-0.085	-.100*	-0.024	.242**
		Sig. (2-tailed)	0.018	0.024	0.000	0.001	0.049	0.000	0.000	0.019	0.402	0.555	0.374	0.089	0.046	0.628	0.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation Matrix: Mobile Service Provider Marketing Tactics & Perceived Ease of Use

			Perceived Ease Of Use													
			[Q23.2] Data based voice or video calling applications: know about them but do not know how to use	**[Q23.3]** Data based voice or video calling applications: difficult to set up	**[Q23.6]** Data based voice or video calling applications: more difficult to use than normal	**[Q26.2]** Free wifi hotspots: know about them but do not know how to use them	**[Q26.3]** Free wifi hotspots: difficult to set up	**[Q26.6]** Free wifi hotspots: more difficult to use then normal data services	**[Q26.8]** Free wifi hotspots: no support for them if you have problems	**[Q28.2]** Download and use a new application agreement: must be easy to download and install	**[Q28.4]** Download and use a new application agreement: easy to understand	**[Q28.6]** Download and use a new application agreement: easy to learn	**[Q28.9]** Download and use a new application agreement: must be flexible enough for me to do my specific task	**[v28.10]** Download and use a new application agreement: easy and quick to navigate around	**[Q28.12]** Download and use a new application agreement: must not act in unexpected ways	**[Q28.13]** Download and use a new application agreement: must make it easy for me to correct any errors I make
Mobile Service Provider Marketing Tactics (MOSPMT)	[v12.a] Operators keep mobile prices higher to maximise their profits	Pearson Correlation	-0.078	-0.061	-0.017	-0.022	0.014	-0.031	.109*	.171**	.108*	0.086	0.007	0.042	-0.005	-0.013
		Sig. (2-tailed)	0.118	0.220	0.737	0.667	0.787	0.536	0.029	0.001	0.030	0.087	0.897	0.398	0.913	0.798
	[v12.b] Operators can influence how and when you use mobile device by manipulating prices	Pearson Correlation	-.136**	-0.009	0.069	-0.052	0.067	-0.001	.155**	.174**	.137**	0.078	0.085	0.097	.165**	0.047
		Sig. (2-tailed)	0.007	0.853	0.166	0.304	0.182	0.977	0.002	0.000	0.006	0.117	0.088	0.051	0.001	0.351
	[v12.c] Operators can influence how and when you use mobile device with promotions	Pearson Correlation	0.045	-0.062	0.029	0.028	0.050	0.039	.122*	.108*	.117*	0.070	.138**	.111*	.157**	0.042
		Sig. (2-tailed)	0.373	0.217	0.568	0.571	0.316	0.433	0.014	0.030	0.020	0.165	0.006	0.027	0.002	0.399
	[v12.d] Operators want you to use specific product or service they do it with promotions	Pearson Correlation	-0.022	-0.056	-0.008	-0.037	-0.015	-0.016	0.080	.167**	.177**	.162**	.139**	.145**	.178**	.115*
		Sig. (2-tailed)	0.654	0.266	0.868	0.455	0.764	0.750	0.112	0.001	0.000	0.001	0.005	0.004	0.000	0.022
	[v12.e] Operators can prevent you using specific product or service by refusing to give you help	Pearson Correlation	-0.014	0.013	0.086	0.019	0.006	0.012	0.086	.138**	0.097	0.047	0.094	-0.050	0.047	0.046
		Sig. (2-tailed)	0.778	0.792	0.087	0.707	0.909	0.804	0.086	0.006	0.052	0.347	0.060	0.317	0.351	0.357
	[v12.f] Operators deliberately try to prevent the usage of services VoIP as they are cheaper than	Pearson Correlation	-0.021	0.033	0.069	0.014	0.056	0.056	0.084	.122*	.110*	0.044	0.071	-0.033	0.048	0.002
		Sig. (2-tailed)	0.675	0.508	0.167	0.780	0.260	0.265	0.092	0.015	0.028	0.383	0.155	0.505	0.336	0.961
	[v12.g] Operators can control what you use on your phone by controlling download speed and manage traffic through	Pearson Correlation	-0.033	-0.012	0.071	0.089	-0.026	0.021	0.096	.165**	.188**	.110*	0.032	0.086	0.069	0.055
		Sig. (2-tailed)	0.511	0.817	0.159	0.076	0.611	0.671	0.054	0.001	0.000	0.027	0.528	0.086	0.168	0.275
	[v23.e] Data based voice or video calling applications: network operators discourage	Pearson Correlation	.413**	.554**	.365**	.408**	.366**	.384**	.224**	.113*	0.053	0.008	-0.032	.123*	.113*	.129**
		Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024	0.289	0.870	0.524	0.014	0.024	0.010
	[v23.h] Data based voice or video calling applications: no support for them if you have	Pearson Correlation	.165**	.275**	.380**	.160**	.251**	.158**	.312**	.127*	.163**	.111*	0.042	0.082	.101*	.119*
		Sig. (2-tailed)	0.001	0.000	0.000	0.001	0.000	0.002	0.000	0.011	0.001	0.027	0.397	0.101	0.044	0.017
	[v26.e] Free wifi hotspots: network operators discourage people using them	Pearson Correlation	.285**	.428**	.249**	.503**	.502**	.615**	.293**	0.003	-0.013	-0.028	-0.037	0.035	0.044	0.051
		Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.946	0.800	0.577	0.460	0.484	0.380	0.311

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation Matrix: Social Pressure and Aspirational Value & Perceived Usefulness

			PERCEIVED USEFULNESS														
			[Q23.7] Data based voice or video calling applications: happy to use them as they are cheaper	**[Q23.9]** Data based voice or video calling applications: quality is poor so I use normal voice	**[Q23.12]** Data based voice or video calling applications: use up too much data	**[Q23.13]** Data based voice or video calling applications: they allow me to video conference when face to face meetings not possible	**[Q26.7]** Free wifi hotspots: happy to use as they allow me to save data	**[Q26.9]** Free wifi hotspots: data speed generally so poor so I use normal data	**[Q26.12]** Free wifi hotspots: don't use them for data security issues	**[Q26.13]** Free wifi hotspots: use them as they allow me to save money	**[Q28.1]** Download and use a new application agreement: must be useful	**[Q28.3]** Download and use a new application agreement: must do required function better or faster than similar app or method	**[Q28.5]** Download and use a new application agreement: must make it easier for me to accomplish a task	**[Q28.7]** Download and use a new application agreement: must save me time	**[Q28.8]** Download and use a new application agreement: must make me more effective	**[Q28.11]** Download and use a new application agreement: add value to me	**[Q28.14]** Download and use a new application agreement: greater control over some aspect of my life
SOCIAL PRESSURE AND ASPIRATIONAL VALUE	**[Q23.4]** Data based voice or video calling applications: don't know anybody who uses them, can't use them myself	Pearson Correlation	-.165**	.227**	.461**	-.156**	-0.019	0.073	.281**	0.068	-0.076	-0.010	0.017	-0.040	-0.016	0.064	.305**
		Sig. (2-tailed)	0.001	0.000	0.000	0.002	0.709	0.145	0.000	0.174	0.130	0.845	0.741	0.423	0.744	0.199	0.000
	[Q23.10] Data based voice or video calling applications: not good to use for my image as they make me appear poor	Pearson Correlation	-.204**	.304**	.304**	-0.045	-.147**	.208**	.367**	-0.062	-.107*	-0.030	0.027	-0.080	-0.030	-0.013	.184**
		Sig. (2-tailed)	0.000	0.000	0.000	0.368	0.003	0.000	0.000	0.214	0.032	0.550	0.587	0.109	0.545	0.792	0.000
	[Q23.11] Data based voice or video calling applications: use them as all my friends use them	Pearson Correlation	.251**	-.132**	0.000	.180**	.207**	-0.064	.158**	.177**	0.066	0.053	0.096	.101*	0.000	0.051	0.065
		Sig. (2-tailed)	0.000	0.008	0.993	0.000	0.000	0.201	0.002	0.000	0.188	0.290	0.056	0.043	0.997	0.312	0.193
	[Q26.4] Free wifi hotspots: don't know anybody who uses them, so don't use them myself	Pearson Correlation	-.137**	.169**	.110*	-.147**	-.241**	.184**	.262**	-.206**	-0.032	0.000	-0.006	-.113*	0.011	0.036	.140**
		Sig. (2-tailed)	0.006	0.001	0.028	0.003	0.000	0.000	0.000	0.000	0.523	0.996	0.904	0.024	0.825	0.476	0.005
	[Q26.10] Free wifi hotspots: using them is good for my general image as it shows am technically literate	Pearson Correlation	.104*	-.119*	0.092	0.004	.325**	-.202**	.123*	.322**	-0.045	-0.041	0.023	-0.010	0.062	0.097	.150**
		Sig. (2-tailed)	0.037	0.017	0.067	0.939	0.000	0.000	0.014	0.000	0.365	0.419	0.652	0.841	0.218	0.053	0.003
	[Q26.11] Free wifi hotspots: use them as all my friends use them	Pearson Correlation	0.070	-.128*	.189**	0.081	.357**	-.209**	.188**	.418**	-0.016	-0.025	0.061	0.020	0.069	.130**	.312**
		Sig. (2-tailed)	0.162	0.011	0.000	0.105	0.000	0.000	0.000	0.000	0.742	0.620	0.221	0.694	0.170	0.009	0.000

Correlation Matrix: Social Pressure and Aspirational Value & Perceived Ease of Use

			PERCEIVED EASE OF USE													
			[Q23.2] Data based voice or video calling applications: know about them but do not know how to use	**[Q23.3]** Data based voice or video calling applications: difficult to set up	**[Q23.6]** Data based voice or video calling applications: more difficult to use than normal	**[Q26.2]** Free wifi hotspots: know about them but do not know how to use them	**[Q26.3]** Free wifi hotspots: difficult to set up	**[Q26.6]** Free wifi hotspots: more difficult to use then normal data services	**[Q26.8]** Free wifi hotspots: no support for them if you have problems	**[Q28.2]** Download and use a new application agreement: must be easy to download and install	**[Q28.4]** Download and use a new application agreement: easy to understand	**[Q28.6]** Download and use a new application agreement: easy to learn	**[Q28.9]** Download and use a new application agreement: must be flexible enough for me to do my specific task	**[v28.10]** Download and use a new application agreement: easy and quick to navigate around	**[Q28.12]** Download and use a new application agreement: must not act in unexpected ways	**[Q28.13]** Download and use a new application agreement: must make it easy for me to correct any errors I make
SOCIAL PRESSURE AND ASPIRATIONAL VALUE	**[Q23.4]** Data based voice or video calling applications: don't know anybody who uses them, can't use them myself	Pearson Correlation	.554**	.641**	.323**	.360**	.291**	.251**	.121*	0.060	0.082	-0.049	0.084	.112*	.157**	.125*
		Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.015	0.234	0.101	0.330	0.092	0.025	0.002	0.013
	[Q23.10] Data based voice or video calling applications: not good to use for my image as they make me appear poor	Pearson Correlation	.456**	.489**	.354**	.373**	.367**	.335**	.125*	0.041	0.071	-0.024	0.015	0.076	.122*	0.083
		Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.419	0.158	0.634	0.767	0.128	0.014	0.098
	[Q23.11] Data based voice or video calling applications: use them as all my friends use them	Pearson Correlation	-0.034	-0.094	-.156**	0.096	0.029	0.009	-0.058	0.077	0.020	.126*	0.057	0.014	0.054	0.040
		Sig. (2-tailed)	0.496	0.061	0.002	0.054	0.558	0.863	0.250	0.125	0.695	0.012	0.258	0.785	0.284	0.425
	[Q26.4] Free wifi hotspots: don't know anybody who uses them, so don't use them myself	Pearson Correlation	.310**	.409**	.346**	.524**	.532**	.542**	.147**	0.020	0.028	-0.009	0.009	0.056	0.022	0.054
		Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.693	0.581	0.852	0.853	0.262	0.655	0.285
	[Q26.10] Free wifi hotspots: using them is good for my general image as it shows am technically literate	Pearson Correlation	.133**	.139**	.169**	-0.012	0.026	0.025	-0.063	-0.004	-0.017	0.027	0.032	.123*	.113*	.151**
		Sig. (2-tailed)	0.008	0.005	0.001	0.806	0.608	0.616	0.208	0.938	0.730	0.591	0.529	0.014	0.023	0.003
	[Q26.11] Free wifi hotspots: use them as all my friends use them	Pearson Correlation	.184**	.173**	0.063	-0.025	-0.042	-0.027	-0.066	0.061	0.032	0.028	0.079	0.095	.171**	.192**
		Sig. (2-tailed)	0.000	0.001	0.209	0.625	0.405	0.596	0.185	0.221	0.520	0.582	0.113	0.056	0.001	0.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation Matrix: Perceived Ease of Use & Perceived Usefulness

			PERCEIVED USEFULNESS														
			[Q23.7] Data based voice or video calling applications: happy to use them as they are cheaper	**[Q23.9]** Data based voice or video calling applications: quality is poor so I use normal voice	**[Q23.12]** Data based voice or video calling applications: use up too much data	**[Q23.13]** Data based voice or video calling applications: they allow me to video conference when face to face meetings not possible	**[Q26.7]** Free wifi hotspots: happy to use as they allow me to save data	**[Q26.9]** Free wifi hotspots: data speed generally so poor so I use normal data	**[Q26.12]** Free wifi hotspots: don't use them for data security issues	**[Q26.13]** Free wifi hotspots: use them as they allow me to save money	**[Q28.1]** Download and use a new application agreement: must be useful	**[Q28.3]** Download and use a new application agreement: must do required function better or faster than similar app or method	**[Q28.5]** Download and use a new application agreement: must make it easier for me to accomplish a task	**[Q28.7]** Download and use a new application agreement: must save me time	**[Q28.8]** Download and use a new application agreement: must make me more effective	**[Q28.11]** Download and use a new application agreement: add value to me	**[Q28.14]** Download and use a new application agreement: greater control over some aspect of my life
PERCEIVED EASE OF USE	**[Q23.2]** Data based voice or video calling applications: know about them but do not know how to use	Pearson Correlation	-.148**	.132**	.371**	-.156**	-0.017	-0.027	.262**	0.078	-0.038	0.066	0.078	0.008	0.060	.145**	.428**
		Sig. (2-tailed)	0.003	0.008	0.000	0.002	0.740	0.595	0.000	0.118	0.452	0.188	0.120	0.874	0.234	0.004	0.000
	[Q23.3] Data based voice or video calling applications: difficult to set up	Pearson Correlation	-.263**	.184**	.452**	-.282**	-0.044	.121*	.315**	0.008	-0.044	0.022	-0.006	-0.041	-0.029	0.057	.349**
		Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.377	0.015	0.000	0.880	0.378	0.661	0.910	0.410	0.562	0.255	0.000
	[Q23.6] Data based voice or video calling applications: more difficult to use than normal	Pearson Correlation	-0.061	.258**	.202**	-.190**	-0.042	0.090	.102*	-0.062	-0.090	-0.007	-0.005	-0.092	0.048	0.042	0.012
		Sig. (2-tailed)	0.222	0.000	0.000	0.000	0.405	0.073	0.041	0.217	0.073	0.895	0.917	0.067	0.339	0.402	0.818
	[Q26.2] Free wifi hotspots: know about them but do not know how to use them	Pearson Correlation	-0.085	0.070	.254**	-.167**	-.121*	.241**	.306**	-.144**	-0.001	0.024	0.060	0.028	0.022	0.080	.247**
		Sig. (2-tailed)	0.091	0.165	0.000	0.001	0.016	0.000	0.000	0.004	0.988	0.637	0.231	0.577	0.667	0.108	0.000
	[Q26.3] Free wifi hotspots: difficult to set up	Pearson Correlation	-.102*	.148**	.168**	-.261**	-.151**	.224**	.296**	-.199**	-0.078	-0.048	-0.006	0.007	0.000	0.040	.148**
		Sig. (2-tailed)	0.042	0.003	0.001	0.000	0.002	0.000	0.000	0.000	0.122	0.334	0.909	0.891	0.998	0.429	0.003
	[Q26.6] Free wifi hotspots: more difficult to use then normal data services	Pearson Correlation	-0.082	.112*	.150**	-.192**	-.129**	.260**	.245**	-.157**	-0.081	-0.039	-0.011	-0.095	-0.036	-0.020	.186**
		Sig. (2-tailed)	0.104	0.025	0.003	0.000	0.010	0.000	0.000	0.002	0.104	0.432	0.825	0.059	0.478	0.689	0.000
	[Q26.8] Free wifi hotspots: no support for them if you have problems	Pearson Correlation	-0.007	.099*	.121*	-.149**	0.094	.346**	.199**	-0.060	0.061	0.032	0.015	0.058	-0.001	0.078	0.012
		Sig. (2-tailed)	0.887	0.049	0.015	0.003	0.059	0.000	0.000	0.229	0.220	0.525	0.770	0.249	0.990	0.118	0.805

PERCEIVED EASE OF USE		PERCEIVED USEFULNESS														
		[Q23.7] Data based voice or video calling applications: happy to use them as they are cheaper	**[Q23.9]** Data based voice or video calling applications: quality is poor so I use normal voice	**[Q23.12]** Data based voice or video calling applications: use up too much data	**[Q23.13]** Data based voice or video calling applications: they allow me to video conference when face to face meetings not possible	**[Q26.7]** Free wifi hotspots: happy to use as they allow me to save data	**[Q26.9]** Free wifi hotspots: data speed generally so poor so I use normal data	**[Q26.12]** Free wifi hotspots: don't use them for data security issues	**[Q26.13]** Free wifi hotspots: use them as they allow me to save money	**[Q28.1]** Download and use a new application agreement: must be useful	**[Q28.3]** Download and use a new application agreement: must do required function better or faster than similar app or method	**[Q28.5]** Download and use a new application agreement: must make it easier for me to accomplish a task	**[Q28.7]** Download and use a new application agreement: must save me time	**[Q28.8]** Download and use a new application agreement: must make me more effective	**[Q28.11]** Download and use a new application agreement: add value to me	**[Q28.14]** Download and use a new application agreement: greater control over some aspect of my life
[Q28.2] Download and use a new application agreement: must be easy to download and install	Pearson Correlation	0.007	-0.057	-0.043	0.012	0.039	0.005	0.047	0.028	.527**	.545**	.390**	.473**	.392**	.323**	.108*
	Sig. (2-tailed)	0.892	0.252	0.392	0.818	0.441	0.926	0.352	0.574	0.000	0.000	0.000	0.000	0.000	0.000	0.031
[Q28.4] Download and use a new application agreement: easy to understand	Pearson Correlation	0.006	-0.001	-.145**	-0.092	-0.010	-0.075	-0.026	0.024	.496**	.628**	.441**	.433**	.464**	.325**	.148**
	Sig. (2-tailed)	0.911	0.983	0.004	0.065	0.848	0.134	0.610	0.626	0.000	0.000	0.000	0.000	0.000	0.000	0.003
[Q28.6] Download and use a new application agreement: easy to learn	Pearson Correlation	0.030	-.106*	-0.057	-0.068	0.033	-0.069	0.056	0.042	.494**	.403**	.530**	.564**	.358**	.491**	.155**
	Sig. (2-tailed)	0.545	0.034	0.252	0.173	0.512	0.167	0.261	0.401	0.000	0.000	0.000	0.000	0.000	0.000	0.002
[Q28.9] Download and use a new application agreement: must be flexible enough for me to do my specific task	Pearson Correlation	0.067	-0.042	-0.040	.105*	0.079	-0.062	0.041	0.004	.289**	.429**	.384**	.294**	.573**	.506**	.199**
	Sig. (2-tailed)	0.183	0.399	0.421	0.035	0.114	0.215	0.419	0.935	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[Q28.10] Download and use a new application agreement: easy and quick to navigate around	Pearson Correlation	0.037	-0.073	0.029	-.135**	0.026	-.103*	0.098	-0.024	.353**	.387**	.409**	.497**	.478**	.507**	.279**
	Sig. (2-tailed)	0.465	0.147	0.561	0.007	0.606	0.040	0.050	0.635	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[Q28.12] Download and use a new application agreement: must not act in unexpected ways	Pearson Correlation	0.084	-.120*	-0.052	0.013	0.005	-0.083	0.044	0.059	.394**	.459**	.427**	.457**	.450**	.596**	.328**
	Sig. (2-tailed)	0.092	0.016	0.296	0.797	0.921	0.098	0.383	0.242	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[Q28.13] Download and use a new application agreement: must make it easy for me to correct any errors I make	Pearson Correlation	0.043	-.202**	-0.013	0.000	0.051	-.118*	.103*	0.095	.298**	.292**	.295**	.317**	.454**	.520**	.374**
	Sig. (2-tailed)	0.386	0.000	0.790	0.998	0.305	0.018	0.039	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation Matrix: Perceived Ease of Use & Intention to Use

			PERCEIVED EASE OF USE													
			[Q23.2] Data based voice or video calling applications: know about them but do not know how to use	**[Q23.3]** Data based voice or video calling applications: difficult to set up	**[Q23.6]** Data based voice or video calling applications: more difficult to use than normal	**[Q26.2]** Free wifi hotspots: know about them but do not know how to use them	**[Q26.3]** Free wifi hotspots: difficult to set up	**[Q26.6]** Free wifi hotspots: more difficult to use then normal data services	**[Q26.8]** Free wifi hotspots: no support for them if you have problems	**[Q28.2]** Download and use a new application agreement: must be easy to download and install	**[Q28.4]** Download and use a new application agreement: easy to understand	**[Q28.6]** Download and use a new application agreement: easy to learn	**[Q28.9]** Download and use a new application agreement: must be flexible enough for me to do my specific task	**[v28.10]** Download and use a new application agreement: easy and quick to navigate around	**[Q28.12]** Download and use a new application agreement: must not act in unexpected ways	**[Q28.13]** Download and use a new application agreement: must make it easy for me to correct any errors I make
INTENTION TO USE	**[Q24]** How likely to adapt if network operators were to preload and set them up on your device and encourage you to use them	Pearson Correlation	-0.073	-.231**	-.134**	-0.005	-0.043	0.013	-0.004	0.039	0.090	0.088	0.081	0.089	.183**	.102*
		Sig. (2-tailed)	0.142	0.000	0.007	0.916	0.393	0.802	0.936	0.438	0.071	0.080	0.104	0.074	0.000	0.041
	[Q27] If network provider were to preload them on phone or by using an app, how likely to use them	Pearson Correlation	.178**	0.066	0.047	0.070	-0.060	0.030	0.006	.100*	.192**	.168**	.106*	.217**	.231**	.277**
		Sig. (2-tailed)	0.000	0.187	0.349	0.164	0.235	0.545	0.898	0.046	0.000	0.001	0.035	0.000	0.000	0.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation Matrix: Perceived Usefulness & Intention to Use

			PERCEIVED USEFULNESS														
			[Q23.7] Data based voice or video calling applications: happy to use them as they are cheaper	**[Q23.9]** Data based voice or video calling applications: quality is poor so I use normal voice	**[Q23.12]** Data based voice or video calling applications: use up too much data	**[Q23.13]** Data based voice or video calling applications: they allow me to video conference when face to face meetings not possible	**[Q26.7]** Free wifi hotspots: happy to use as they allow me to save data	**[Q26.9]** Free wifi hotspots: data speed generally so poor so I use normal data	**[Q26.12]** Free wifi hotspots: don't use them for data security issues	**[Q26.13]** Free wifi hotspots: use them as they allow me to save money	**[Q28.1]** Download and use a new application agreement: must be useful	**[Q28.3]** Download and use a new application agreement: must do required function better or faster than similar app or method	**[Q28.5]** Download and use a new application agreement: must make it easier for me to accomplish a task	**[Q28.7]** Download and use a new application agreement: must save me time	**[Q28.8]** Download and use a new application agreement: must make me more effective	**[Q28.11]** Download and use a new application agreement: add value to me	**[Q28.14]** Download and use a new application agreement: greater control over some aspect of my life
INTENTION TO USE	**[Q24]** How likely to adapt if network operators were to preload and set them up on your device and encourage you to use them	Pearson Correlation	.251**	-.238**	-.396**	.118*	0.034	-0.081	-0.064	0.007	0.085	0.088	0.079	.114*	.126*	.132**	-0.015
		Sig. (2-tailed)	0.000	0.000	0.000	0.018	0.495	0.107	0.202	0.896	0.090	0.077	0.116	0.022	0.012	0.008	0.770
	[Q27] If network provider were to preload them on phone or by using an app, how likely to use them	Pearson Correlation	0.064	-.138**	0.035	-0.053	.355**	-.240**	0.033	.398**	.099*	0.083	.126*	.141**	.128*	.191**	.273**
		Sig. (2-tailed)	0.200	0.006	0.481	0.288	0.000	0.000	0.506	0.000	0.048	0.098	0.011	0.005	0.010	0.000	0.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

APPENDIX 7

Moderating Factors in the Final Framework

Moderating Factor: Geographic Location on SPAV_A and MOSPMT_B

Outcome: SPAV_A

Model Summary

R	R-sq	MSE	F	df1	df2	p
,523	,274	,848	29,687	5,000	394,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	,599	,138	4,347	,000	,328	,870
MOSPMT_B	,542	,064	8,528	,000	,417	,667
D1	,593	,265	2,240	,026	,073	1,114
D2	1,187	,272	4,371	,000	,653	1,721
int_1	-,158	,112	-1,408	,160	-,378	,063
int_2	-,348	,092	-3,789	,000	-,528	-,167

Product terms key:

int_1	:	D1	X	MOSPMT_B
int_2	:	D2	X	MOSPMT_B

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,026	7,181	2,000	394,000	,001

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

prov	coeff	se	t	p	Pearson
1,000	,542	,064	8,528	,000	.629**
2,000	,384	,092	4,151	,000	.367**
3,000	,194	,066	2,920	,004	.217*

Level of confidence for all confidence intervals in output: 95

Correlations

[Q3.2] Geographic Location			MOSPMT_B	SPAV_A
Gauteng	MOSPMT_B	Pearson Correlation	1	.629**
		Sig. (2-tailed)		0.000
	SPAV_A	Pearson Correlation	.629**	1
		Sig. (2-tailed)	0.000	
Cape Town	MOSPMT_B	Pearson Correlation	1	.367**
		Sig. (2-tailed)		0.000
	SPAV_A	Pearson Correlation	.367**	1
		Sig. (2-tailed)	0.000	
Ekurhuleni	MOSPMT_B	Pearson Correlation	1	.217*
		Sig. (2-tailed)		0.030
	SPAV_A	Pearson Correlation	.217*	1
		Sig. (2-tailed)	0.030	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Moderating Factor: Ethnicity on SPAV_A and MOSPMT_B

Outcome: SPAV A

Model Summary

R	R-sq	MSE	F	df1	df2	p
,495	,245	,876	18,117	7,000	391,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	1,041	,126	8,238	,000	,793	1,290
MOSPMT B	,388	,045	8,545	,000	,299	,477
D1	-,144	,308	-,468	,640	-,750	,462
D2	-,601	,410	-1,463	,144	-1,408	,207
D3	-,028	,273	-,104	,918	-,565	,509
int 1	,129	,119	1,084	,279	-,105	,364
int 2	,267	,202	1,320	,188	-,131	,664
int 3	-,065	,110	-,590	,556	-,281	,151

Product terms key:

int 1	:	D1	X	MOSPMT B
int 2	:	D2	X	MOSPMT B
int 3	:	D3	X	MOSPMT B

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,007	1,151	3,000	391,000	,328

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

race	coeff	se	t	p	LLCI	ULCI	Pearson
1,000	,388	,045	8,545	,000	,299	,477	.459**
2,000	,517	,110	4,684	,000	,300	,735	.510**
3,000	,655	,197	3,323	,001	,267	1,042	.821**
4,000	,323	,100	3,234	,001	,127	,520	.415**

Level of confidence for all confidence intervals in output: 95

Correlations

[Q4.2] Ethnicity			MOSPMT_B	SPAV_A
Black	MOSPMT_B	Pearson Correlation	1	.459**
		Sig. (2-tailed)		0.000
	SPAV_A	Pearson Correlation	.459**	1
		Sig. (2-tailed)	0.000	
Coloured	MOSPMT_B	Pearson Correlation	1	.510**
		Sig. (2-tailed)		0.000
	SPAV_A	Pearson Correlation	.510**	1
		Sig. (2-tailed)	0.000	
Indian	MOSPMT_B	Pearson Correlation	1	.821**
		Sig. (2-tailed)		0.000
	SPAV_A	Pearson Correlation	.821**	1
		Sig. (2-tailed)	0.000	
White	MOSPMT_B	Pearson Correlation	1	.415**
		Sig. (2-tailed)		0.000
	SPAV_A	Pearson Correlation	.415**	1
		Sig. (2-tailed)	0.000	

**. Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Geographic Location on PEU_A and MOSPMT_B

Outcome: PEU A

Model Summary

R	R-sq	MSE	F	df1	df2	p
,655	,429	1,342	59,256	5,000	394,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	,667	,173	3,847	,000	,326	1,008
MOSPMT_B	,824	,080	10,314	,000	,667	,981
D1	,618	,333	1,854	,065	-,037	1,273
D2	,069	,342	,201	,841	-,603	,741
int_1	-,210	,141	-1,491	,137	-,488	,067
int 2	-,005	,116	-,045	,964	-,232	,222

Product terms key:

int_1	:	D1	X	MOSPMT_B
int 2	:	D2	X	MOSPMT B

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,004	1,284	2,000	394,000	,278

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

prov	coeff	se	t	p	LLCI	ULCI	Pearson
1,000	,824	,080	10,314	,000	,667	,981	.645**
2,000	,614	,116	5,277	,000	,385	,842	.429**
3,000	,819	,083	9,814	,000	,655	,983	.665**

Level of confidence for all confidence intervals in output: 95

Correlations

[Q3.2] Geographic Location			MOSPMT_B	PEU_A
Gauteng	MOSPMT_B	Pearson Correlation	1	.645**
		Sig. (2-tailed)		.000
	PEU_A	Pearson Correlation	.645**	1
		Sig. (2-tailed)	.000	
Cape Town	MOSPMT_B	Pearson Correlation	1	.429**
		Sig. (2-tailed)		.000
	PEU_A	Pearson Correlation	.429**	1
		Sig. (2-tailed)	.000	
Ekurhuleni	MOSPMT_B	Pearson Correlation	1	.665**
		Sig. (2-tailed)		.000
	PEU_A	Pearson Correlation	.665**	1
		Sig. (2-tailed)	.000	

** Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Grouped Age on PEU_A and MOSPMT_B

```
Outcome: PEU_A

Model Summary
          R       R-sq        MSE          F        df1        df2          p
       ,483       ,233       ,900     17,000      7,000    392,000       ,000

Model
              coeff         se          t          p       LLCI       ULCI
constant       ,859       ,213      4,036       ,000       ,440      1,277
MOSPMT_B            ,442       ,078      5,692       ,000       ,289       ,595
D1             ,121       ,270       ,450       ,653      -,409       ,652
D2             ,013       ,253       ,051       ,959      -,484       ,509
D3             ,105       ,346       ,304       ,761      -,576       ,786
int_1         -,027       ,098      -,270       ,787      -,220       ,167
int_2          ,003       ,099       ,029       ,977      -,192       ,198
int_3         -,069       ,137      -,504       ,615      -,338       ,200

Product terms key:
 int_1    :        D1          X        MOSPMT_B
 int_2    :        D2          X        MOSPMT_B
 int_3    :        D3          X        MOSPMT_B

R-square increase due to interaction:
   R2-chng          F        df1        df2          p
      ,001       ,155      3,000    392,000       ,926

***************************************************************************

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:
        age      coeff         se          t          p       LLCI       ULCI        Pearson
      1,000       ,442       ,078      5,692       ,000       ,289       ,595       .775**
      2,000       ,415       ,060      6,900       ,000       ,297       ,534       .706**
      3,000       ,418       ,079      5,315       ,000       ,263       ,573       .430**
      4,000       ,349       ,112      3,118       ,002       ,129       ,569       .576**

Level of confidence for all confidence intervals in output: 95
```

Correlations

[Q2] Grouped age			MOSPMT_B	PEU_A
18-24	MOSPMT_B	Pearson Correlation	1	.775**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.775**	1
		Sig. (2-tailed)	0.000	
25-34	MOSPMT_B	Pearson Correlation	1	.706**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.706**	1
		Sig. (2-tailed)	0.000	
35-44	MOSPMT_B	Pearson Correlation	1	.430**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.430**	1
		Sig. (2-tailed)	0.000	
45+	MOSPMT_B	Pearson Correlation	1	.576**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.576**	1
		Sig. (2-tailed)	0.000	

**. Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Living Standards Measure on PU_A and MOSPMT_B

Outcome: PU_A

Model Summary

R	R-sq	MSE	F	df1	df2	p
,355	,126	2,819	8,051	7,000	392,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	6,315	,423	14,928	,000	5,484	7,147
MOSPMT_B	-,364	,141	-2,572	,010	-,642	-,086
D1	-,636	,558	-1,138	,256	-1,733	,462
D2	-,507	,497	-1,020	,309	-1,484	,471
D3	-1,128	,473	-2,383	,018	-2,058	-,197
int_1	,245	,194	1,265	,207	-,136	,627
int_2	-,099	,187	-,529	,597	-,467	,269
int_3	,173	,196	,884	,377	-,212	,558

Product terms key:

int_1	:	D1	X	MOSPMT_B
int_2	:	D2	X	MOSPMT_B
int_3	:	D3	X	MOSPMT_B

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,006	,952	3,000	392,000	,416

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

lsm	coeff	se	t	p	LLCI	ULCI	Pearson
7,000	-,364	,141	-2,572	,010	-,642	-,086	-.304**
8,000	-,118	,133	-,889	,374	-,380	,143	-.102
9,000	-,217	,132	-1,648	,100	-,476	,042	-.147
10,000	-,044	,145	-,304	,761	-,329	,241	-.027

Level of confidence for all confidence intervals in output: 95

Correlations

[Q5.2] LSM			MOSPMT_B	PU_A
LSM 7	MOSPMT_B	Pearson Correlation	1	-.304**
		Sig. (2-tailed)		.006
	PU_A	Pearson Correlation	-.304**	1
		Sig. (2-tailed)	.006	
LSM 8	MOSPMT_B	Pearson Correlation	1	-.102
		Sig. (2-tailed)		.300
	PU_A	Pearson Correlation	-.102	1
		Sig. (2-tailed)	.300	
LSM 9	MOSPMT_B	Pearson Correlation	1	-.147
		Sig. (2-tailed)		.110
	PU_A	Pearson Correlation	-.147	1
		Sig. (2-tailed)	.110	
LSM 10	MOSPMT_B	Pearson Correlation	1	-.027
		Sig. (2-tailed)		.795
	PU_A	Pearson Correlation	-.027	1
		Sig. (2-tailed)	.795	

** Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Grouped Age on PU_A and MOSPMT_B

Outcome: PU A

Model Summary

R	R-sq	MSE	F	df1	df2	p
,417	,174	2,663	11,810	7,000	392,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	6,496	,366	17,752	,000	5,777	7,215
MOSPMT B	-,332	,134	-2,484	,013	-,594	-,069
D1	-1,124	,464	-2,421	,016	-2,037	-,211
D2	-,806	,434	-1,855	,064	-1,660	,048
D3	-1,329	,596	-2,232	,026	-2,501	-,158
int 1	,222	,169	1,312	,190	-,110	,554
int 2	,131	,170	,769	,443	-,204	,466
int 3	,071	,235	,301	,764	-,392	,534

Product terms key:

int 1	:	D1	X	MOSPMT B
int 2	:	D2	X	MOSPMT B
int 3	:	D3	X	MOSPMT B

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,010	1,597	3,000	392,000	,190

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

age	coeff	se	t	p	LLCI	ULCI	Pearson
1,000	-,332	,134	-2,484	,013	-,594	-,069	-.323**
2,000	-,110	,104	-1,062	,289	-,313	,094	-.094
3,000	,021	,135	,155	,877	-,245	,287	.014
4,000	,092	,193	,476	,634	-,287	,471	.050

Level of confidence for all confidence intervals in output: 95

Correlations

[Q2] Grouped age			MOSPMT_B	PU_A
18-24	MOSPMT_B	Pearson Correlation	1	-.323**
		Sig. (2-tailed)		.004
	PU_A	Pearson Correlation	-.323**	1
		Sig. (2-tailed)	.004	
25-34	MOSPMT_B	Pearson Correlation	1	-.094
		Sig. (2-tailed)		.256
	PU_A	Pearson Correlation	-.094	1
		Sig. (2-tailed)	.256	
35-44	MOSPMT_B	Pearson Correlation	1	.014
		Sig. (2-tailed)		.885
	PU_A	Pearson Correlation	.014	1
		Sig. (2-tailed)	.885	
45+	MOSPMT_B	Pearson Correlation	1	.050
		Sig. (2-tailed)		.690
	PU_A	Pearson Correlation	.050	1
		Sig. (2-tailed)	.690	

** Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Geographic Location on PEU_A and SPAV_A

Outcome: PEU A

Model Summary

R	R-sq	MSE	F	df1	df2	p
,504	,254	1,753	26,897	5,000	394,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	,955	,197	4,848	,000	,568	1,343
SPAV A	,788	,106	7,426	,000	,579	,996
D1	1,257	,352	3,569	,000	,565	1,950
D2	1,117	,351	3,183	,002	,427	1,807
int 1	-,571	,165	-3,452	,001	-,896	-,246
int 2	-,241	,151	-1,598	,111	-,537	,055

Product terms key:

int 1	:	D1	X	SI A
int 2	:	D2	X	SI A

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,023	5,960	2,000	394,000	,003

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable

prov	coeff	se	t	p	LLCI	ULCI	Pearson
1,000	,788	,106	7,426	,000	,579	,996	.531**
2,000	,217	,127	1,705	,089	-,033	,466	.159
3,000	,547	,107	5,109	,000	,336	,757	.396**

Level of confidence for all confidence intervals in output: 95

Correlations

[Q3.2] Geographic Location			SPAV_A	PEU_A
Gauteng	SPAV_A	Pearson Correlation	1	.531**
		Sig. (2-tailed)		.000
	PEU_A	Pearson Correlation	.531**	1
		Sig. (2-tailed)	.000	
Cape Town	SPAV_A	Pearson Correlation	1	.159
		Sig. (2-tailed)		.115
	PEU_A	Pearson Correlation	.159	1
		Sig. (2-tailed)	.115	
Ekurhuleni	SPAV_A	Pearson Correlation	1	.396**
		Sig. (2-tailed)		.000
	PEU_A	Pearson Correlation	.396**	1
		Sig. (2-tailed)	.000	

** Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Average Monthly Income on PEU_A and SPAV_A

Outcome: PEU A							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	,488	,238	1,809	13,474	9,000	388,000	,000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	,567	,445	1,273	,204	-,309	1,442	
SPAV A	1,047	,200	5,237	,000	,654	1,440	
D1	1,695	,596	2,843	,005	,523	2,867	
D2	-,682	,467	-1,462	,144	-1,600	,235	
D3	-,094	,355	-,265	,791	-,792	,604	
D4	-,507	,441	-1,150	,251	-1,373	,360	
int 1	-,542	,268	-2,020	,044	-1,070	-,014	
int 2	,067	,207	,326	,745	-,339	,473	
int_3	-,059	,165	-,360	,719	-,383	,264	
int 4	,180	,207	,867	,386	-,228	,587	
Product terms key:							
int 1 :	D1	X	SPAV A				
int_2 :	D2	X	SPAV_A				
int_3 :	D3	X	SPAV_A				
int 4 :	D4	X	SPAV A				
R-square increase due to interaction:							
R2-chng	**F**	**df1**	**df2**	**p**			
,012	**1,519**	**4,000**	**388,000**	**,196**			
**							
Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:							
income	**coeff**	**se**	**t**	**p**	**LLCI**	**ULCI**	**Pearson**
1,000	**1,047**	**,200**	**5,237**	**,000**	**,654**	**1,440**	**.696****
2,000	**,505**	**,179**	**2,822**	**,005**	**,153**	**,857**	**.286***
3,000	**,573**	**,103**	**5,556**	**,000**	**,370**	**,775**	**.426****
4,000	**,513**	**,128**	**3,997**	**,000**	**,261**	**,766**	**.385****
5,000	**,693**	**,163**	**4,261**	**,000**	**,373**	**1,013**	**.563****
Level of confidence for all confidence intervals in output: 95							

Correlations

[Q5.1] Average monthly income			SPAV_A	PEU_A
Nothing	SPAV_A	Pearson Correlation	1	.696**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.696**	1
		Sig. (2-tailed)	0.000	
R1-R5 000	SPAV_A	Pearson Correlation	1	.286*
		Sig. (2-tailed)		0.036
	PEU_A	Pearson Correlation	.286*	1
		Sig. (2-tailed)	0.036	
R5 001-R10 000	SPAV_A	Pearson Correlation	1	.426**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.426**	1
		Sig. (2-tailed)	0.000	
R10 001-R20 000	SPAV_A	Pearson Correlation	1	.385**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.385**	1
		Sig. (2-tailed)	0.000	
More than R20 000	SPAV_A	Pearson Correlation	1	.563**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.563**	1
		Sig. (2-tailed)	0.000	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Moderating Factor: Geographic Location on PU_A and SPAV_A

Outcome: PU A						
Model Summary						
R	R-sq	MSE	F	df1	df2	p
,274	,075	2,967	6,411	5,000	394,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	4,758	,256	18,561	,000	4,254	5,262
SPAV A	-,155	,138	-1,122	,262	-,426	,116
D1	,255	,458	,557	,578	-,646	1,156
D2	1,040	,457	2,279	,023	,143	1,938
int 1	,373	,215	1,732	,084	-,050	,796
int 2	-,252	,196	-1,288	,199	-,638	,133

Product terms key:

int 1	:	D1	X	SPAV A
int 2	:	D2	X	SPAV A

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,020	4,189	2,000	394,000	,016

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

prov	coeff	se	t	p	LLCI	ULCI	Pearson
1,000	-,155	,138	-1,122	,262	-,426	,116	-.072
2,000	,218	,165	1,319	,188	-,107	,543	.146
3,000	-,407	,139	-2,925	,004	-,681	-,134	-.328**

Level of confidence for all confidence intervals in output: 95

Correlations

[Q3.2] Geographic Location			SPAV_A	PU_A
Gauteng	SPAV_A	Pearson Correlation	1	-.072
		Sig. (2-tailed)		.312
	PU_A	Pearson Correlation	**-.072**	1
		Sig. (2-tailed)	.312	
Cape Town	SPAV_A	Pearson Correlation	1	.146
		Sig. (2-tailed)		.147
	PU_A	Pearson Correlation	**.146**	1
		Sig. (2-tailed)	.147	
Ekurhuleni	SPAV_A	Pearson Correlation	1	-.328**
		Sig. (2-tailed)		.001
	PU_A	Pearson Correlation	**-.328****	1
		Sig. (2-tailed)	.001	

** Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Monthly Income Level on PU_A and SPAV_A

Outcome: PU_A

Model Summary

R	R-sq	MSE	F	df1	df2	p
,346	,120	2,852	5,877	9,000	388,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	6,756	,559	12,086	,000	5,657	7,855
SPAV A	-,417	,251	-1,662	,097	-,911	,076
D1	-,705	,748	-,942	,347	-2,176	,766
D2	-,620	,586	-1,058	,291	-1,772	,532
D3	-,772	,446	-1,732	,084	-1,649	,104
D4	-1,730	,553	-3,126	,002	-2,818	-,642
int_1	-,033	,337	-,098	,922	-,696	,629
int_2	,234	,259	,902	,367	-,276	,744
int_3	,187	,207	,905	,366	-,219	,594
int 4	,560	,260	2,151	,032	,048	1,071

Product terms key:

int 1	:	D1	X	SPAV A
int_2	:	D2	X	SPAV_A
int 3	:	D3	X	SPAV A
int 4	:	D4	X	SPAV A

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,033	3,637	4,000	388,000	,006

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

income	coeff	se	t	p	LLCI	ULCI	Pearson
1,000	-,417	,251	-1,662	,097	-,911	,076	-.370*
2,000	-,450	,225	-2,004	,046	-,892	-,008	-.289*
3,000	-,216	,129	-1,672	,095	-,471	,038	-0.14631
4,000	-,029	,161	-,182	,856	-,346	,288	-0.01551
5,000	,530	,204	2,597	,010	,129	,932	.315*

Level of confidence for all confidence intervals in output: 95

Correlations

[Q5.1] Average monthly income			SPAV_A	PU_A
Nothing	SPAV_A	Pearson Correlation	1	-.370*
		Sig. (2-tailed)		0.029
	PU_A	Pearson Correlation	**-.370***	1
		Sig. (2-tailed)	0.029	
R1-R5 000	SPAV_A	Pearson Correlation	1	-.289*
		Sig. (2-tailed)		0.034
	PU_A	Pearson Correlation	**-.289***	1
		Sig. (2-tailed)	0.034	
R5 001-R10 000	SPAV_A	Pearson Correlation	1	-0.146
		Sig. (2-tailed)		0.090
	PU_A	Pearson Correlation	**-0.146**	1
		Sig. (2-tailed)	0.090	
R10 001-R20 000	SPAV_A	Pearson Correlation	1	-0.016
		Sig. (2-tailed)		0.869
	PU_A	Pearson Correlation	**-0.016**	1
		Sig. (2-tailed)	0.869	
More than R20 000	SPAV_A	Pearson Correlation	1	.315*
		Sig. (2-tailed)		0.016
	PU_A	Pearson Correlation	**.315***	1
		Sig. (2-tailed)	0.016	

*. Correlation is significant at the 0.05 level (2-tailed).

Moderating Factor: Geographic Location on PU_A and PEU_A

Outcome: PU A							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	,329	,108	2,861	9,568	5,000	394,000	,000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	5,044	,237	21,263	,000	4,578	5,510	
PEU A	-,240	,091	-2,631	,009	-,420	-,061	
D1	1,581	,429	3,683	,000	,737	2,426	
D2	,594	,444	1,336	,182	-,280	1,468	
int 1	-,198	,150	-1,325	,186	-,493	,096	
int 2	-,002	,135	-,017	,986	-,267	,262	
Product terms key:							
int_1 :	D1	X	PEU A				
int_2 :	D2	X	PEU A				
R-square increase due to interaction:							
R2-chng	**F**	**df1**	**df2**	**p**			
,005	**1,047**	**2,000**	**394,000**	**,352**			
**							
Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:							
prov	**coeff**	**se**	**t**	**p**	**LLCI**	**ULCI**	Pearson
1,000	**-,240**	**,091**	**-2,631**	**,009**	**-,420**	**-,061**	-.165*
2,000	**-,439**	**,119**	**-3,695**	**,000**	**-,672**	**-,205**	-.402**
3,000	**-,243**	**,099**	**-2,451**	**,015**	**-,437**	**-,048**	-.270**
Level of confidence for all confidence intervals in output: 95							

Correlations

[Q3.2] Geographical Location			PEU_A	PU_A
Gauteng	PEU_A	Pearson Correlation	1	-.165*
		Sig. (2-tailed)		.019
	PU_A	Pearson Correlation	**-.165***	1
		Sig. (2-tailed)	.019	
Cape Town	PEU_A	Pearson Correlation	1	-.402**
		Sig. (2-tailed)		.000
	PU_A	Pearson Correlation	**-.402****	1
		Sig. (2-tailed)	.000	
Ekurhuleni	PEU_A	Pearson Correlation	1	-.270**
		Sig. (2-tailed)		.007
	PU_A	Pearson Correlation	**-.270****	1
		Sig. (2-tailed)	.007	

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Ethnicity on PU_A and PEU_A

Outcome: PU A

Model Summary

R	R-sq	MSE	F	df1	df2	p
,284	,081	2,971	4,894	7,000	391,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	5,882	,231	25,454	,000	5,428	6,336
PEU A	-,347	,070	-4,970	,000	-,485	-,210
D1	-1,106	,509	-2,172	,030	-2,106	-,105
D2	-,765	,666	-1,149	,251	-2,074	,544
D3	-1,041	,462	-2,250	,025	-1,950	-,131
int 1	,451	,176	2,559	,011	,104	,797
int 2	,360	,287	1,251	,212	-,205	,925
int 3	,134	,171	,781	,435	-,203	,471

Product terms key:

int 1	:	D1	X	PEU A
int 2	:	D2	X	PEU A
int 3	:	D3	X	PEU A

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,018	2,549	3,000	391,000	,055

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

race	coeff	se	t	p	LLCI	ULCI	Pearson
1,000	-,347	,070	-4,970	,000	-,485	-,210	-.316**
2,000	,103	,162	,638	,524	-,215	,421	.078
3,000	,012	,279	,044	,965	-,536	,560	.010
4,000	-,214	,156	-1,366	,173	-,521	,094	-.150

Level of confidence for all confidence intervals in output: 95

Correlations

[Q4.2] Ethnicity			PEU_A	PU_A
Black	PEU_A	Pearson Correlation	1	-.316**
		Sig. (2-tailed)		.000
	PU_A	Pearson Correlation	**-.316****	1
		Sig. (2-tailed)	.000	
Coloured	PEU_A	Pearson Correlation	1	.078
		Sig. (2-tailed)		.542
	PU_A	Pearson Correlation	**.078**	1
		Sig. (2-tailed)	.542	
Indian	PEU_A	Pearson Correlation	1	.010
		Sig. (2-tailed)		.963
	PU_A	Pearson Correlation	**.010**	1
		Sig. (2-tailed)	.963	
White	PEU_A	Pearson Correlation	1	-.150
		Sig. (2-tailed)		.200
	PU_A	Pearson Correlation	**-.150**	1
		Sig. (2-tailed)	.200	

** Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Geographic Location on PEU_A and IU

Outcome: IU							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	,331	,109	,541	9,679	5,000	394,000	,000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	4,216	,103	40,863	,000	4,013	4,418	
PEU_A	-,107	,040	-2,700	,007	-,185	-,029	
D1	,459	,187	2,459	,014	,092	,826	
D2	-,376	,193	-1,946	,052	-,756	,004	
int_1	-,058	,065	-,895	,371	-,186	,070	
int_2	,255	,059	4,351	,000	,140	,370	
Product terms key:							
int_1 :	D1	X	PEU_A				
int_2 :	D2	X	PEU_A				
R-square increase due to interaction:							
R2-chng	**F**	**df1**	**df2**	**p**			
,063	**13,845**	**2,000**	**394,000**	**,000**			
**							
Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:							
prov	**coeff**	**se**	**t**	**p**	**LLCI**	**ULCI**	Pearson
1,000	**-,107**	**,040**	**-2,700**	**,007**	**-,185**	**-,029**	-.169*
2,000	**-,166**	**,052**	**-3,206**	**,001**	**-,267**	**-,064**	-.357**
3,000	**,148**	**,043**	**3,429**	**,001**	**,063**	**,232**	.370**
Level of confidence for all confidence intervals in output: 95							

Correlations

[Q3.2] Geographic Location			PEU_A	IU
Gauteng	PEU_A	Pearson Correlation	1	-.169*
		Sig. (2-tailed)		.017
	IU	Pearson Correlation	**-.169***	1
		Sig. (2-tailed)	.017	
Cape Town	PEU_A	Pearson Correlation	1	-.357**
		Sig. (2-tailed)		.000
	IU	Pearson Correlation	**-.357****	1
		Sig. (2-tailed)	.000	
Ekurhuleni	PEU_A	Pearson Correlation	1	.370**
		Sig. (2-tailed)		.000
	IU	Pearson Correlation	**.370****	1
		Sig. (2-tailed)	.000	

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Grouped Age on PEU_A and IU

Outcome: IU

Model Summary

R	R-sq	MSE	F	df1	df2	p
,247	,061	,573	3,635	7,000	392,000	,001

Model

	coeff	se	t	p	LLCI	ULCI
constant	4,326	,157	27,599	,000	4,018	4,634
PEU A	-,017	,051	-,335	,738	-,117	,083
D1	-,130	,197	-,661	,509	-,517	,257
D2	-,166	,196	-,846	,398	-,551	,219
D3	-,129	,281	-,458	,647	-,680	,423
int_1	,039	,063	,612	,541	-,085	,162
int_2	,001	,068	,011	,991	-,134	,135
int_3	-,077	,095	-,812	,417	-,263	,109

Product terms key:

int_1	:	D1	X	PEU_A
int 2	:	D2	X	PEU A
int 3	:	D3	X	PEU A

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,003	,368	3,000	392,000	,776

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

age	coeff	se	t	p	LLCI	ULCI	Pearson
1,000	-,017	,051	-,335	,738	-,117	,083	-.040
2,000	,022	,037	,582	,561	-,051	,094	.051
3,000	,022	,058	,387	,699	-,091	,135	.036
4,000	-,055	,075	-,727	,468	-,203	,093	-.082

Level of confidence for all confidence intervals in output: 95

Correlations

[Q2] Grouped age			PEU_A	IU
18-24	PEU_A	Pearson Correlation	1	-.040
		Sig. (2-tailed)		.727
	IU	Pearson Correlation	**-.040**	1
		Sig. (2-tailed)	.727	
25-34	PEU_A	Pearson Correlation	1	.051
		Sig. (2-tailed)		.537
	IU	Pearson Correlation	**.051**	1
		Sig. (2-tailed)	.537	
35-44	PEU_A	Pearson Correlation	1	.036
		Sig. (2-tailed)		.710
	IU	Pearson Correlation	**.036**	1
		Sig. (2-tailed)	.710	
45+	PEU_A	Pearson Correlation	1	-.082
		Sig. (2-tailed)		.516
	IU	Pearson Correlation	**-.082**	1
		Sig. (2-tailed)	.516	

Moderating Factor: Grouped Age on PU_A and IU

Outcome: IU						
Model Summary						
R	R-sq	MSE	F	df1	df2	p
,379	,144	,523	9,415	7,000	392,000	,000

Model	coeff	se	t	p	LLCI	ULCI
constant	3,826	,339	11,293	,000	3,160	4,492
PU	,080	,058	1,387	,166	-,033	,193
D1	,335	,398	,843	,400	-,446	1,117
D2	-,521	,287	-1,817	,070	-1,085	,043
D3	-,799	,271	-2,955	,003	-1,331	-,267
int_1	-,061	,070	-,884	,377	-,198	,075
int_2	,078	,056	1,389	,166	-,032	,188
int_3	,166	,062	2,694	,007	,045	,287

Product terms key:

int_1	:	D1	X	PU_A
int_2	:	D2	X	PU_A
int_3	:	D3	X	PU_A

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,036	5,473	3,000	392,000	,001

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

age	coeff	se	t	p	LLCI	ULCI	Pearson
1,000	,080	,058	1,387	,166	-,033	,193	.159
2,000	,018	,039	,471	,638	-,058	,095	.039
3,000	,096	,040	2,397	,017	,017	,175	.214*
4,000	,262	,047	5,598	,000	,170	,354	.603**

Level of confidence for all confidence intervals in output: 95

Correlations

[Q2] Grouped age			PU_A	IU
18-24	PU_A	Pearson Correlation	1	.159
		Sig. (2-tailed)		.164
	IU	Pearson Correlation	.159	1
		Sig. (2-tailed)	.164	
25-34	PU_A	Pearson Correlation	1	.039
		Sig. (2-tailed)		.634
	IU	Pearson Correlation	.039	1
		Sig. (2-tailed)	.634	
35-44	PU_A	Pearson Correlation	1	.214*
		Sig. (2-tailed)		.026
	IU	Pearson Correlation	.214*	1
		Sig. (2-tailed)	.026	
45+	PU_A	Pearson Correlation	1	.603**
		Sig. (2-tailed)		.000
	IU	Pearson Correlation	.603**	1
		Sig. (2-tailed)	.000	

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Highest Academic Level on PU_A and IU

Outcome: IU

Model Summary

R	R-sq	MSE	F	df1	df2	p
,371	,138	,530	6,901	9,000	389,000	,000

Model

	coeff	se	t	p	LLCI	ULCI
constant	3,354	,554	6,057	,000	2,265	4,442
PU	,144	,102	1,411	,159	-,057	,344
D1	,437	,581	,752	,452	-,705	1,580
D2	-,308	,265	-1,162	,246	-,830	,213
D3	,172	,312	,552	,581	-,441	,786
D4	-,881	,395	-2,231	,026	-1,658	-,105
int_1	-,048	,107	-,448	,654	-,258	,162
int_2	,034	,050	,678	,498	-,065	,133
int_3	-,024	,067	-,368	,713	-,155	,106
int_4	,086	,088	,984	,326	-,086	,259

Product terms key:

int 1	:	D1	X	PU A
int 2	:	D2	X	PU A
int 3	:	D3	X	PU A
int 4	:	D4	X	PU A

R-square increase due to interaction:

R2-chng	F	df1	df2	p
,004	,456	4,000	389,000	,768

****

Conditional Effect of Focal Predictor in Groups Defined by the Moderator Variable:

edu	coeff	se	t	p	LLCI	ULCI	Pearson
2,000	,144	,102	1,411	,159	-,057	,344	.337
3,000	,096	,033	2,914	,004	,031	,160	.232**
4,000	,130	,038	3,403	,001	,055	,205	.296**
5,000	,105	,055	1,927	,055	-,002	,213	.253
6,000	,192	,069	2,793	,005	,057	,326	.370*

Level of confidence for all confidence intervals in output: 95

Correlations

[Q4.1] Highest academic level			PU_A	IU
Secondary schooling	PU_A	Pearson Correlation	1	.337
		Sig. (2-tailed)		.146
	IU	Pearson Correlation	.337	1
		Sig. (2-tailed)	.146	
Achieved matric	PU_A	Pearson Correlation	1	.232**
		Sig. (2-tailed)		.002
	IU	Pearson Correlation	.232**	1
		Sig. (2-tailed)	.002	
Post matric certificate/diploma	PU_A	Pearson Correlation	1	.296**
		Sig. (2-tailed)		.001
	IU	Pearson Correlation	.296**	1
		Sig. (2-tailed)	.001	
UG	PU_A	Pearson Correlation	1	.253
		Sig. (2-tailed)		.070
	IU	Pearson Correlation	.253	1
		Sig. (2-tailed)	.070	
PG	PU_A	Pearson Correlation	1	.370*
		Sig. (2-tailed)		.024
	IU	Pearson Correlation	.370*	1
		Sig. (2-tailed)	.024	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Moderating Factor: Technical Knowledge, Ability and Skills on MOSPMT_B and PEU_A

```
Outcome: PEU A

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      ,6575      ,4323     1,3282   100,5350     3,0000   396,0000      ,0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     2,5239      ,7515     3,3586      ,0009     1,0465     4,0012
q10          -,3957      ,1686    -2,3468      ,0194     -,7272     -,0642
MOSPMT B       ,3380      ,2639     1,2809      ,2010     -,1808       ,8569
int_1         ,1024      ,0592     1,7283      ,0847     -,0141      ,2189

Product terms key:

 int 1    MOSPMT B        X      v10

R-square increase due to interaction(s):
         R2-chng          F        df1        df2          p
int_1      ,0043     2,9871     1,0000   396,0000      ,0847

*************************************************************************

Conditional effect of X on Y at values of the moderator(s):
        v10     Effect         se          t          p       LLCI       ULCI  Pearson
     3,4743      ,6938      ,0712     9,7481      ,0000      ,5539      ,8337  .414**
     4,2375      ,7720      ,0472    16,3466      ,0000      ,6791      ,8648  .587**
     5,0000      ,8500      ,0590    14,4071      ,0000      ,7340      ,9660  .739**

Values for quantitative moderators are the mean and plus/minus one SD from mean.
Values for dichotomous moderators are the two values of the moderator.

NOTE: For at least one moderator in the conditional effects table above, one SD
      above the mean was replaced with the maximum because one SD above the mean
      is outside of the range of the data.

Level of confidence for all confidence intervals in output: 95
```

Correlations

[Q10] Level of competence regard current mobile			MOSPMT_B	PEU_A
Slight competence	MOSPMT_B	Pearson Correlation	1	0.493
		Sig. (2-tailed)		0.178
	PEU_A	Pearson Correlation	**0.493**	1
		Sig. (2-tailed)	0.178	
Somewhat competent	MOSPMT_B	Pearson Correlation	1	.414**
		Sig. (2-tailed)		0.002
	PEU_A	Pearson Correlation	**.414****	1
		Sig. (2-tailed)	0.002	
Moderate competence	MOSPMT_B	Pearson Correlation	1	.587**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	**.587****	1
		Sig. (2-tailed)	0.000	
Extremely competent	MOSPMT_B	Pearson Correlation	1	.739**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	**.739****	1
		Sig. (2-tailed)	0.000	

**. Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Attitude towards Technology on MOSPMT_B and PEU_A

Outcome: PEU_A							
Model Summary							
	R	R-sq	MSE	F	df1	df2	p
	,6556	,4299	1,3340	99,5262	3,0000	396,0000	,0000
Model							
	coeff	se	t	p	LLCI	ULCI	
constant	,7470	,3729	2,0034	,0458	,0139	1,4801	
q11	,0173	,0969	,1784	,8585	-,1732	,2078	
MOSPMT_B	,9187	,1262	7,2768	,0000	,6705	1,1668	
int_1	-,0395	,0338	-1,1692	,2430	-,1059	,0269	
Product terms key:							
int_1	MOSPMT_B	X	v11				
R-square increase due to interaction(s):							
	R2-chng	**F**	**df1**	**df2**	**p**		
int_1	**,0020**	**1,3670**	**1,0000**	**396,0000**	**,2430**		
**							
Conditional effect of X on Y at values of the moderator(s):							
v11	**Effect**	**se**	**t**	**p**	**LLCI**	**ULCI**	Pearson
2,2296	**,8306**	**,0629**	**13,2058**	**,0000**	**,7070**	**,9543**	0.332
3,4800	**,7812**	**,0469**	**16,6559**	**,0000**	**,6890**	**,8734**	.590**
4,7304	**,7319**	**,0633**	**11,5564**	**,0000**	**,6074**	**,8564**	.612**
Values for quantitative moderators are the mean and plus/minus one SD from mean.							
Values for dichotomous moderators are the two values of the moderator.							
Level of confidence for all confidence intervals in output: 95							

Correlations

[Q11] Attitude towards changing communication technology			MOSPMT_B	PEU_A
I am happy with existing	MOSPMT_B	Pearson Correlation	1	.762**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.762**	1
		Sig. (2-tailed)	0.000	
Wait and see what others are dMOSPMTng	MOSPMT_B	Pearson Correlation	1	0.332
		Sig. (2-tailed)		0.165
	PEU_A	Pearson Correlation	0.332	1
		Sig. (2-tailed)	0.165	
Do not actively follow technology	MOSPMT_B	Pearson Correlation	1	.590**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.590**	1
		Sig. (2-tailed)	0.000	
Actively keep myself up to date	MOSPMT_B	Pearson Correlation	1	.612**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.612**	1
		Sig. (2-tailed)	0.000	
Always investigating new technology	MOSPMT_B	Pearson Correlation	1	.662**
		Sig. (2-tailed)		0.000
	PEU_A	Pearson Correlation	.662**	1
		Sig. (2-tailed)	0.000	

**. Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Technology Knowledge, Ability and Skills on PEU_A and IU

```
Outcome: IU

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      ,1933      ,0374      ,5819     5,1251     3,0000   396,0000      ,0017

Model
              coeff         se          t          p       LLCI       ULCI
constant     4,3746      ,4622     9,4637      ,0000     3,4658     5,2834
q10          -,0583      ,1044     -,5580      ,5772     -,2635      ,1470
PEU_A        -,3084      ,1375    -2,2428      ,0255     -,5788     -,0381
int_1         ,0741      ,0313     2,3633      ,0186      ,0125      ,1357

Product terms key:

 int_1    PEU_A        X      v10

R-square increase due to interaction(s):
         R2-chng          F        df1        df2          p
int_1      ,0136     5,5850     1,0000   396,0000      ,0186

*************************************************************************

Conditional effect of X on Y at values of the moderator(s):
         v10     Effect         se          t          p       LLCI       ULCI  Pearson
      3,4743     -,0511      ,0365    -1,4016      ,1618     -,1228      ,0206  -.404**
      4,2375      ,0054      ,0254      ,2137      ,8309     -,0445      ,0553  -0.010
      5,0000      ,0619      ,0332     1,8653      ,0629     -,0033      ,1271  0.147

Values for quantitative moderators are the mean and plus/minus one SD from mean.
Values for dichotomous moderators are the two values of the moderator.

NOTE: For at least one moderator in the conditional effects table above, one SD
      above the mean was replaced with the maximum because one SD above the mean
      is outside of the range of the data.

Level of confidence for all confidence intervals in output: 95
```

Correlations

[Q10] Level of competence regard current mobile			PEU_A	IU
Slight competence	PEU_A	Pearson Correlation	1	0.151
		Sig. (2-tailed)		0.698
	IU	Pearson Correlation	**0.151**	1
		Sig. (2-tailed)	0.698	
Somewhat competent	PEU_A	Pearson Correlation	1	-.404**
		Sig. (2-tailed)		0.003
	IU	Pearson Correlation	**-.404****	1
		Sig. (2-tailed)	0.003	
Moderate competence	PEU_A	Pearson Correlation	1	-0.010
		Sig. (2-tailed)		0.897
	IU	Pearson Correlation	**-0.010**	1
		Sig. (2-tailed)	0.897	
Extremely competent	PEU_A	Pearson Correlation	1	0.147
		Sig. (2-tailed)		0.059
	IU	Pearson Correlation	**0.147**	1
		Sig. (2-tailed)	0.059	

**. Correlation is significant at the 0.01 level (2-tailed).

Moderating Factor: Attitude towards Technology on PEU_A and IU

Outcome: IU

Model Summary

R	R-sq	MSE	F	df1	df2	p
,1498	,0224	,5909	3,0297	3,0000	396,0000	,0293

Model

	coeff	se	t	p	LLCI	ULCI
constant	3,8506	,2305	16,7064	,0000	3,3975	4,3037
Q11	,0702	,0605	1,1611	,2463	-,0487	,1891
PEU_A	-,0126	,0654	-,1932	,8469	-,1412	,1159
int_1	,0079	,0178	,4414	,6592	-,0271	,0429

Product terms key:

int_1 PEU_A X v11

R-square increase due to interaction(s):

	R2-chng	F	df1	df2	p
int_1	,0005	,1948	1,0000	396,0000	,6592

****

Conditional effect of X on Y at values of the moderator(s):

v11	Effect	se	t	p	LLCI	ULCI	Pearson
2,2296	,0049	,0328	,1492	,8815	-,0596	,0693	-0.331
3,4800	,0147	,0257	,5732	,5668	-,0358	,0652	-0.016
4,7304	,0245	,0351	,6984	,4853	-,0445	,0936	-0.043

Values for quantitative moderators are the mean and plus/minus one SD from mean.

Values for dichotomous moderators are the two values of the moderator.

Level of confidence for all confidence intervals in output: 95

Correlations

[Q11] Attitude towards changing communication technology			PEU_A	IU
I am happy with existing	PEU_A	Pearson Correlation	1	0.018
		Sig. (2-tailed)		0.898
	IU	Pearson Correlation	**0.018**	1
		Sig. (2-tailed)	0.898	
Wait and see what others are doing	PEU_A	Pearson Correlation	1	-0.331
		Sig. (2-tailed)		0.167
	IU	Pearson Correlation	**-0.331**	1
		Sig. (2-tailed)	0.167	
Do not actively follow technology	PEU_A	Pearson Correlation	1	-0.016
		Sig. (2-tailed)		0.872
	IU	Pearson Correlation	**-0.016**	1
		Sig. (2-tailed)	0.872	
Actively keep myself up to date	PEU_A	Pearson Correlation	1	-0.043
		Sig. (2-tailed)		0.613
	IU	Pearson Correlation	**-0.043**	1
		Sig. (2-tailed)	0.613	
Always investigating new technology	PEU_A	Pearson Correlation	1	0.178
		Sig. (2-tailed)		0.099
	IU	Pearson Correlation	**0.178**	1
		Sig. (2-tailed)	0.099	

APPENDIX 8

Moderating Factors against Usage

Moderating Factors: Usage per Application

	Question	Use Mobile for?	Total sample	[Q2] Grouped age				[Q3.2] Geographic Location			[Q4.1] Highest academic level				
			Average	18-24	25-34	35-44	45+	Gauteng	Cape Town	Ekurhuleni	Secondary schooling	Achieved matric	Post matric diploma	Under Grad	Post Grad
Communication	[Q16.1]	Voice	98.8%	98.7%	98.7%	98.1%	100.0%	98.5%	100.0%	98.0%	95.0%	98.8%	98.3%	100.0%	100.0%
	[Q16.3]	Messaging (SMS)	90.5%	71.8%	93.3%	97.2%	95.4%	86.0%	98.0%	92.0%	90.0%	85.9%	90.8%	100.0%	97.3%
	[Q16.4]	USSD	81.5%	94.9%	85.9%	71.3%	72.3%	67.5%	98.0%	93.0%	95.0%	95.9%	71.7%	59.6%	70.3%
	[Q16.5]	Instant Messaging (Whatsapp)	96.3%	98.7%	97.3%	93.5%	95.4%	99.5%	93.0%	93.0%	100.0%	94.7%	98.3%	98.1%	94.6%
	[Q16.6]	e-mail	86.8%	94.9%	87.2%	88.9%	72.3%	94.5%	88.0%	70.0%	75.0%	77.1%	95.0%	96.2%	97.3%
	[Q16.9]	Take & send photographs	91.5%	94.9%	89.3%	94.4%	87.7%	98.5%	94.0%	75.0%	85.0%	88.2%	93.3%	94.2%	100.0%
	[Q16.17]	Social Networking	85.3%	92.3%	89.9%	88.0%	61.5%	82.5%	89.0%	87.0%	90.0%	83.5%	81.7%	92.3%	94.6%
		Average	**90.1%**	**92.3%**	**91.7%**	**90.2%**	**83.5%**	**89.6%**	**94.3%**	**86.9%**	**90.0%**	**89.2%**	**89.9%**	**91.5%**	**93.4%**
Alternate Voice	[Q16.2]	Alternative Voice (Whatsapp voice)	**88.8%**	**94.9%**	**91.9%**	**91.7%**	**69.2%**	**93.5%**	**89.0%**	**79.0%**	**85.0%**	**82.4%**	**94.2%**	**94.2%**	**97.3%**
Information	[Q16.7]	Internet searching	93.8%	97.4%	92.6%	94.4%	90.8%	98.0%	96.0%	83.0%	90.0%	91.8%	95.0%	96.2%	100.0%
	[Q16.19]	Alternative Apps (Weather, Maps)	84.8%	88.5%	81.2%	91.7%	76.9%	92.5%	77.0%	77.0%	75.0%	78.2%	90.0%	92.3%	94.6%
		Average	**89.3%**	**92.9%**	**86.9%**	**93.1%**	**83.8%**	**95.3%**	**86.5%**	**80.0%**	**82.5%**	**85.0%**	**92.5%**	**94.2%**	**97.3%**

	Question	Use Mobile for?	Total sample	[Q4.2] Ethnicity				[Q5.1] Average monthly income					[Q5.2] LSM			
			Average	Black	Coloured	Indian	White	Nothing	R1-R5 000	R5 001-R10 000	R10 001-R20 000	More than R20 000	LSM 7	LSM 8	LSM 9	LSM 10
Communication	[Q16.1]	Voice	98.8%	99.1%	96.9%	96.0%	100.0%	97.1%	96.3%	100.0%	98.3%	100.0%	97.5%	98.1%	99.2%	100.0%
	[Q16.3]	Messaging (SMS)	90.5%	87.2%	96.9%	92.0%	94.7%	54.3%	90.7%	90.4%	96.6%	100.0%	93.7%	85.7%	91.6%	91.8%
	[Q16.4]	USSD	81.5%	84.7%	78.1%	88.0%	72.0%	88.6%	98.1%	96.3%	71.6%	48.3%	93.7%	92.4%	83.2%	57.7%
	[Q16.5]	Instant Messaging (Whatsapp)	96.3%	94.0%	100.0%	100.0%	98.7%	100.0%	96.3%	96.3%	95.7%	94.8%	91.1%	96.2%	97.5%	99.0%
	[Q16.6]	e-mail	86.8%	84.3%	98.4%	80.0%	86.7%	100.0%	64.8%	82.2%	94.0%	94.8%	68.4%	95.2%	86.6%	92.8%
	[Q16.9]	Take & send photographs	91.5%	88.1%	98.4%	96.0%	94.7%	100.0%	83.3%	88.1%	94.8%	94.8%	82.3%	94.3%	89.1%	99.0%
	[Q16.17]	Social Networking	85.3%	79.1%	90.6%	96.0%	96.0%	97.1%	81.5%	82.2%	85.3%	87.9%	69.6%	87.6%	88.2%	91.8%
		Average	**90.1%**	**88.1%**	**94.2%**	**92.6%**	**91.8%**	**91.0%**	**87.3%**	**90.8%**	**90.9%**	**88.7%**	**85.2%**	**92.8%**	**90.8%**	**90.3%**
Alternate Voice	[Q16.2]	Alternative Voice (Whatsapp voice)	**88.8%**	**87.2%**	**92.2%**	**96.0%**	**88.0%**	**94.3%**	**85.2%**	**85.2%**	**89.7%**	**94.8%**	**78.5%**	**92.4%**	**89.1%**	**92.8%**
Information	[Q16.7]	Internet searching	93.8%	91.9%	98.4%	88.0%	97.3%	100.0%	92.6%	88.1%	97.4%	96.6%	91.1%	93.3%	92.4%	97.9%
	[Q16.19]	Alternative Apps (Weather, Maps)	84.8%	80.0%	93.8%	80.0%	93.3%	85.7%	64.8%	82.2%	91.4%	94.8%	65.8%	88.6%	85.7%	94.8%
		Average	**89.3%**	**86.0%**	**96.1%**	**84.0%**	**95.3%**	**92.9%**	**78.7%**	**85.2%**	**94.4%**	**95.7%**	**78.5%**	**91.0%**	**89.1%**	**96.4%**

Usage Above application average

Usage Below application average

	Question	Use Mobile for?	Total sample	[Q2] Grouped age				[Q3.2] Geographic Location			[Q4.1] Highest academic level				
			Average	18-24	25-34	35-44	45+	Gauteng	Cape Town	Ekurhuleni	Secondary schooling	Achieved matric	Post matric diploma	Under Grad	Post Grad
Financial	[Q16.10]	Purchase ringtones, music	69.0%	85.9%	77.9%	70.4%	26.2%	79.5%	55.0%	62.0%	65.0%	61.2%	75.0%	71.2%	86.5%
	[Q16.11]	Financial services (banking)	72.5%	52.6%	79.9%	83.3%	61.5%	78.0%	61.0%	73.0%	65.0%	55.3%	83.3%	88.5%	97.3%
	[Q16.18]	E-commerce/shopping	42.5%	24.4%	50.3%	53.7%	27.7%	53.0%	32.0%	32.0%	30.0%	23.5%	45.8%	73.1%	81.1%
		Average	**61.3%**	**54.3%**	**69.4%**	**69.1%**	**38.5%**	**70.2%**	**49.3%**	**55.7%**	**53.3%**	**46.7%**	**68.1%**	**77.6%**	**88.3%**
Entertainment	[Q16.12]	Music (preloaded)	71.0%	91.0%	81.9%	68.5%	26.2%	78.0%	63.0%	65.0%	75.0%	64.7%	76.7%	69.2%	83.8%
	[Q16.13]	Games (preloaded)	64.0%	87.2%	74.5%	58.3%	21.5%	73.5%	57.0%	52.0%	65.0%	58.8%	66.7%	65.4%	75.7%
	[Q16.14]	Games streaming	31.0%	41.0%	36.9%	29.6%	7.7%	31.5%	20.0%	41.0%	45.0%	25.9%	35.8%	32.7%	29.7%
	[Q16.15]	Audio streaming	47.3%	71.8%	47.7%	42.6%	24.6%	49.0%	40.0%	51.0%	60.0%	52.4%	43.3%	42.3%	35.1%
	[Q16.16]	Video streaming	28.3%	34.6%	34.9%	25.0%	10.8%	35.5%	9.0%	33.0%	25.0%	21.2%	33.3%	32.7%	40.5%
		Average	**48.3%**	**65.1%**	**55.2%**	**44.8%**	**18.2%**	**53.5%**	**37.8%**	**48.4%**	**54.0%**	**44.6%**	**51.2%**	**48.5%**	**53.0%**
Work	[Q16.20]	Work applications	**41.8%**	**17.9%**	**49.7%**	**60.2%**	**21.5%**	**50.0%**	**24.0%**	**43.0%**	**30.0%**	**25.3%**	**45.8%**	**63.5%**	**78.4%**

Usage Above application average

Usage Below application average

	Question	Use Mobile for?	Total sample	[Q4.2] Ethnicity				[Q5.1] Average monthly income					[Q5.2] LSM			
			Average	Black	Coloured	Indian	White	Nothing	R1-R5 000	R5 001-R10 000	R10 001-R20 000	More than R20 000	LSM 7	LSM 8	LSM 9	LSM 10
Financial	[Q16.10]	Purchase ringtones, music	69.0%	73.2%	60.9%	92.0%	54.7%	85.7%	57.4%	69.6%	71.6%	62.1%	67.1%	75.2%	68.1%	64.9%
	[Q16.11]	Financial services (banking)	72.5%	72.3%	73.4%	72.0%	72.0%	37.1%	44.4%	68.1%	91.4%	91.4%	65.8%	66.7%	72.3%	84.5%
	[Q16.18]	E-commerce/shopping	42.5%	39.6%	48.4%	52.0%	42.7%	20.0%	16.7%	25.9%	61.2%	79.3%	30.4%	30.5%	42.9%	64.9%
		Average	**61.3%**	**61.7%**	**60.9%**	**72.0%**	**56.4%**	**47.6%**	**39.5%**	**54.6%**	**74.7%**	**77.6%**	**54.4%**	**57.5%**	**61.1%**	**71.5%**
Entertainment	[Q16.12]	Music (preloaded)	71.0%	74.5%	75.0%	92.0%	49.3%	97.1%	66.7%	65.9%	75.0%	62.1%	65.8%	82.9%	68.9%	64.9%
	[Q16.13]	Games (preloaded)	64.0%	67.7%	59.4%	80.0%	50.7%	85.7%	66.7%	60.0%	63.8%	56.9%	70.9%	68.6%	59.7%	58.8%
	[Q16.14]	Games streaming	31.0%	30.6%	23.4%	72.0%	24.0%	40.0%	29.6%	31.9%	30.2%	24.1%	27.8%	22.9%	36.1%	36.1%
	[Q16.15]	Audio streaming	47.3%	54.5%	39.1%	80.0%	20.0%	77.1%	59.3%	51.1%	38.8%	25.9%	60.8%	56.2%	37.0%	39.2%
	[Q16.16]	Video streaming	28.3%	26.4%	23.4%	56.0%	28.0%	40.0%	14.8%	24.4%	33.6%	29.3%	15.2%	18.1%	28.6%	49.5%
		Average	**48.3%**	**50.7%**	**44.1%**	**76.0%**	**34.4%**	**68.0%**	**47.4%**	**46.7%**	**48.3%**	**39.7%**	**48.1%**	**49.7%**	**46.1%**	**49.7%**
Work	[Q16.20]	Work applications	**41.8%**	**43.0%**	**29.7%**	**56.0%**	**42.7%**	**8.6%**	**22.2%**	**34.1%**	**51.7%**	**75.9%**	**41.8%**	**32.4%**	**36.1%**	**58.8%**

Usage Above application average

Usage Below application average

Variation on Moderating Factors on Monthly Spend on Mobile Services

Question #	Question	Total sample	[Q2] Grouped age				[Q3.2] Geographic Location			[Q4.1] Highest academic level				
		Average	18-24	25-34	35-44	45+	Gauteng	Cape Town	Ekurhuleni	Secondary schooling	Achieved matric	Post matric diploma	Under Grad	Post Grad
[Q14]	Average Spend Per Month	737.36	361.12	646.09	1059.69	862.54	1085.75	370.45	407.50	336.00	377.66	790.07	1374.92	1550.51

Question #	Question	Total sample	[Q4.2] Ethnicity				[Q5.1] Average monthly income					[Q5.2] LSM			
		Average	Black	Coloured	Indian	White	Nothing	R1-R5 000	R5 001-R10 000	R10 001-R20 000	More than R20 000	LSM 7	LSM 8	LSM 9	LSM 10
[Q14]	Average Spend Per Month	737.36	667.36	778.03	749.88	901.00	340.54	264.24	439.88	898.55	1799.52	324.15	453.39	732.76	1386.93

(red)	Usage Above application average
(green)	Usage Below application average

Moderating factors against Data Usage and Time interacting with Mobile

Question #	Question	Factor	Total sample	[Q2] Grouped age				[Q3.2] Geographic Location			[Q4.1] Highest academic level				
			Average	18-24	25-34	35-44	45+	Gauteng	Cape Town	Ekurhuleni	Secondary schooling	Achieved matric	Post matric diploma	Under Grad	Post Grad
[Q17]	Average Data Used per Month	0-500MB	20.5%	20.5%	17.4%	20.4%	27.7%	9.0%	33.0%	31.0%	30.0%	25.3%	21.7%	7.7%	8.1%
		500MB-1GB	15.3%	24.4%	16.1%	9.3%	12.3%	12.5%	14.0%	22.0%	25.0%	20.0%	12.5%	9.6%	5.4%
		1-2GB	15.3%	12.8%	19.5%	10.2%	16.9%	14.0%	16.0%	17.0%	20.0%	15.9%	15.8%	11.5%	10.8%
		2-5GB	19.8%	28.2%	16.1%	22.2%	13.8%	23.0%	24.0%	9.0%	20.0%	22.4%	16.7%	17.3%	21.6%
		>5GB	29.3%	14.1%	30.9%	38.0%	29.2%	41.5%	13.0%	21.0%	5.0%	16.5%	33.3%	53.8%	54.1%
[Q18]	How Long using Phone per Day	0-60 minutes	1.8%	2.6%	2.7%	0.9%	0.0%	3.5%	0.0%	0.0%	0.0%	1.2%	2.5%	3.8%	0.0%
		1-2 hours	16.5%	9.0%	22.1%	17.8%	10.8%	16.5%	15.2%	18.0%	15.0%	13.0%	21.7%	9.6%	27.0%
		2-3 Hours	18.0%	16.7%	17.4%	18.7%	20.0%	16.0%	10.1%	30.0%	10.0%	17.2%	18.3%	23.1%	18.9%
		3-4 Hours	14.8%	15.4%	12.8%	11.2%	24.6%	15.5%	13.1%	15.0%	20.0%	16.0%	10.0%	7.7%	29.7%
		>4 hours	48.9%	56.4%	45.0%	51.4%	44.6%	48.5%	61.6%	37.0%	55.0%	52.7%	47.5%	55.8%	24.3%
[Q19]	% of time on the phone during the day (6am-6pm)		54.9%	50.3%	54.3%	54.2%	63.1%	51.8%	55.1%	60.9%	60.0%	55.8%	56.1%	52.8%	46.9%

Question #	Question	Factor	Total sample	[Q4.2] Ethnicity				[Q5.1] Average monthly income					[Q5.2] LSM			
			Average	Black	Coloured	Indian	White	Nothing	R1-R5 000	R5 001-R10 000	R10 001-R20 000	More than R20 000	LSM 7	LSM 8	LSM 9	LSM 10
[Q17]	Average Data Used per Month	0-500MB	20.5%	26.0%	12.5%	20.0%	10.7%	22.9%	35.2%	25.9%	12.9%	8.6%	39.2%	30.5%	13.4%	3.1%
		500MB-1GB	15.3%	14.0%	14.1%	32.0%	14.7%	22.9%	24.1%	21.5%	9.5%	0.0%	24.1%	15.2%	13.4%	10.3%
		1-2GB	15.3%	13.2%	20.3%	16.0%	17.3%	5.7%	14.8%	22.2%	14.7%	6.9%	19.0%	21.0%	14.3%	7.2%
		2-5GB	19.8%	18.3%	29.7%	12.0%	18.7%	40.0%	16.7%	14.1%	21.6%	19.0%	6.3%	21.9%	23.5%	23.7%
		>5GB	29.3%	28.5%	23.4%	20.0%	38.7%	8.6%	9.3%	16.3%	41.4%	65.5%	11.4%	11.4%	35.3%	55.7%
[Q18]	How Long using Phone per Day	0-60 minutes	1.8%	1.7%	1.6%	4.0%	1.3%	2.9%	0.0%	3.7%	0.0%	1.7%	2.6%	1.9%	2.5%	0.0%
		1-2 hours	16.5%	17.5%	15.6%	8.0%	16.0%	11.4%	16.7%	17.2%	16.4%	19.0%	24.4%	21.0%	12.6%	10.3%
		2-3 Hours	18.0%	18.8%	10.9%	24.0%	20.0%	17.1%	18.5%	19.4%	19.8%	12.1%	24.4%	15.2%	17.6%	16.5%
		3-4 Hours	14.8%	19.7%	7.8%	12.0%	6.7%	17.1%	16.7%	14.9%	11.2%	19.0%	19.2%	16.2%	12.6%	12.4%
		>4 hours	48.9%	42.3%	64.1%	52.0%	56.0%	51.4%	48.1%	44.8%	52.6%	48.3%	29.5%	45.7%	54.6%	60.8%
[Q19]	% of time on the phone during the day (6am-6pm)		54.9%	52.8%	58.8%	49.8%	60.0%	51.0%	55.3%	55.5%	55.1%	54.7%	56.8%	51.8%	55.4%	56.0%

Variation in Moderating Factors against Question 14 (Monthly spend

	Demographic Factor	Anova	Brown-Forsythe (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests	
		Sig	Sig	Sig	Bonferroni	Games-Howell
Question 14: What is your average spend per month for mobile services?	**Grouped Age**	0.000	0.000	0.000	18-24 with All; 25-34 with All except 45+	18-24 with All; 25-34 with All except 45+
	Location	0.000	0.000	0.000	Gauteng with All	Gauteng with All
	Highest Academic Level	0.000	0.000	0.000	Under Grad with all except Post Grad; Post Grad with all except Under Grad	Under Grad with all except Post Grad; Post Grad with all except Under Grad
	Ethnicity	0.155	0.141	0.280		
	Average Monthly Income	0.000	0.000	0.000	R10001 to R20000 with All; R20000+ with All	R10001 to R20000 with All; R20000+ with All
	LSM Band	0.000	0.000	0.000	LSM 9 with All; LSM 10 with All	LSM 9 with All; LSM 10 with All

	Demographic Factor	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Q15.1: If mobile voice prices were to drop I would make more calls	Grouped Age	0.002	0.001	0.002	0.000	0.000	18-24 with All	18-24 with All
	Location	0.080	0.315	0.169	0.159	0.741		
	Highest Academic Level	0.001	0.000	0.000	0.001	0.014	Under Grad with Matric and Matric Diploma; Post Grad with Matric and Matric Diploma	Under Grad with Matric and Matric Diploma; Post Grad with Matric and Matric Diploma
	Ethnicity	0.000	0.000	0.000	0.000	0.000	White with Black and Coloured	White with Black and Coloured
	Average Monthly Income	0.000	0.000	0.000	0.000	0.000	R20000+ with All	R20000+ with All
	LSM Band	0.000	0.000	0.000	0.000	0.000	LSM 10 with All	LSM 10 with All; LSM 8 with LSM 9
Q15.2: If mobile voice prices were to drop it would not make much difference to me as I make as many calls as I need to	Grouped Age	0.028	0.084	0.038	0.048	0.968	18-24 with 35-44	18-24 with 35-45
	Location	0.000	0.119	0.287	0.298	0.006		
	Highest Academic Level	0.005	0.002	0.001	0.001	0.639	Post Grad with Matric and Matric Diploma	Post Grad with Matric and Matric Diploma
	Ethnicity	0.000	0.002	0.002	0.003	0.229	Black With Coloured and White	Black With Coloured and White
	Average Monthly Income	0.000	0.000	0.000	0.000	0.047	R20000+ with All except R1-R5000	R20000+ with All except R1-R5001
	LSM Band	0.000	0.000	0.000	0.000	0.281	LSM 10 with All	LSM 10 with All

	Demographic Factor	Pearson Chi-squared	Linear by Linear Association	Anova	Welch Test (Equality of Means)	Levene Statistic (Homogeneity of Variances)	Post Hoc Tests	
		Asymptotic Significance (2-sided)	Asymptotic Significance (2-sided)	Sig	Sig	Sig	Bonferroni	Games-Howell
Q15.3: If mobile data prices were to drop significantly I would make buy more data and spend more time online	Grouped Age	0.022	0.004	0.005	0.005	0.072	18-24 with 35-44	18-24 with 35-45
	Location	0.059	0.811	0.292	0.282	0.520		
	Highest Academic Level	0.005	0.002	0.001	0.001	0.040	Post Matric Diploma with Under Grad and Post Grad Degree	Post Matric Diploma with Under Grad and Post Grad Degree
	Ethnicity	0.045	0.051	0.010	0.005	0.026	White with Coloured	White with Coloured
	Average Monthly Income	0.023	0.000	0.001	0.002	0.016	R20000+ with All except R1-R5000	R20000+ with Nothing and R5001-R10000
	LSM Band	0.002	0.018	0.001	0.001	0.001	LSM 10 with LSM 8 and LSM 9	LSM 10 with LSM 8 and LSM 10
Q15.4: If mobile data prices were to drop significantly it would not make much difference as I have adequate data to do what I want	Grouped Age	0.002	0.057	0.002	0.003	0.806	18-24 with 35-44	18-24 with 35-45
	Location	0.000	0.519	0.438	0.395	0.000	LSM 10 with All	LSM 10 with All
	Highest Academic Level	0.000	0.000	0.000	0.000	0.377	Under Grad with Matric and Post Matric Diploma; Post Grad with Matric and Post Matric Diploma	Under Grad with Matric and Post Matric Diploma; Post Grad with Matric and Post Matric Diploma
	Ethnicity	0.000	0.002	0.006	0.008	0.328	Black with White	Black with White
	Average Monthly Income	0.000	0.000	0.000	0.000	0.963	R20000+ with All	R20000+ with All
	LSM Band	0.000	0.000	0.000	0.000	0.376		