

Fixed-to-Mobile Broadband Substitution in South Africa

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***A Research Report submitted to the Graduate School of
Public and Development Management, University of the
Witwatersrand in partial fulfilment of the degree of
Master of Management in Information Communication
Technology, Policy and Regulation***

28 March 2011

Abstract

Broadband is an important technology for development. Research has proven that development is directly linked to high speed internet. Over the past few years mobile broadband has overtaken fixed-line broadband as a primary connection for many households. The purpose of this exploratory study was to investigate how pricing and quality of service have either encouraged or inhibited fixed-to-mobile broadband in South Africa, and research if there are any other factors affecting broadband growth. The study, conducted in a predominantly middle-income neighbourhood, found that there is a trend towards fixed-to-mobile broadband substitution in South Africa.

Declaration

I declare that this report is my own, unaided work. It is submitted in partial fulfilment of the requirements of the degree of Master of Management in the field of Information and Communications Technology, Policy and Regulation at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

Letlhogonolo Hendrick Moroeng

28 March 2010

Dedication

This work is dedicated to my lovely wife Thandeka, for her understanding throughout the period of this study; to my two boys, Otlotleng and Tshegofatso for their inspiration.

Acknowledgements

Firstly I would like to thank the Almighty God for the unmerited favour upon my life. Your grace and mercy continues to propel me to better things; thank you

I am grateful to:

My supervisor; Luci Abrahams for her guidance and patience throughout the research process;

Mark Burke for his assistance at certain stages of the process;

Patient and helpful participants in the target population for their invaluable assistance and co-operation in providing insightful information for this research project;

My manager; Sinaye Nxumalo for affording me the space and time to complete this project;

My parents Ngoato and Maruping; and my sister Lebo for their support, love and just being part of my life;

My friends for their endless and heartfelt love and support.

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1 CHAPTER 1: BACKGROUND TO BROADBAND, MOBILITY AND SUBSTITUTABILITY IN SOUTH AFRICA

1.1 Introduction

This study reviews the fixed-line and wireless broadband environment, and analyses trends in fixed and mobile broadband usage over the period from 2005 to 2010 in South Africa. The study will focus on fixed-to-mobile broadband substitutability, namely the migration from low bandwidth fixed line data access in the early part of the decade to high bandwidth mobile data access in the latter part of the decade. This will be done through an exploratory study of the South African market. The study is conducted within the context of the emerging information society in South Africa.

The study will examine the characteristics and evolution of the data market and will focus primarily on how pricing and quality of service (QoS) have affected the adoption of broadband. It will analyse the impact that policy and regulatory interventions have had on the pace of growth of broadband technologies and services. This study will look at several market studies to examine how ICT have developed during the period between 2005 and 2010, particularly broadband. The reports themselves are interesting and are exploring different research questions, some of which may be relevant to this study. None of the reports explore fixed-to-mobile broadband substitution specifically, but they indicate trends in the development of ICT's in South Africa. The

study will analyse these trends in order to see the extent of fixed-to-mobile broadband substitution.

Analysis of the data collected will lead to a set of conclusions regarding the extent to which fixed-to-mobile substitutability has taken place in the broadband space, what this means for services that require high speed broadband (pricing and QoS) and the implications for future policy and regulatory interventions.

Broadband is defined differently in different countries, given the level of bandwidth provided in a country. As an example, in the UK, broadband is said to be any bandwidth at 560 Kbps and above, whilst in South Korea the bandwidth should be above 2 Mbps (Sawyer S, Allen J.P, & Lee h, 2003,, p. 122). The US Federal Communication Commission defines broadband as at least 200Kbps (Sawyer *et al* 2003, p. 122). In other countries and organisations, broadband is defined as delivery of multi-play services over the same network connection rather than speed. This paper will adopt the definition:

Always on access, at work, at home or on the move provided by a range of fixed-line, wireless or satellite technologies to progressively higher bandwidths capable of supporting genuinely new and innovative interactive content, applications and services and the delivery of enhanced public services. (Sawyer *et al*, 2003, p 122).

1.2 The society in South Africa is a mobile information society

In 2007, South Africa approved the building of an Information Society; this decision was based on the outcomes of the United Nations World Summit on the Information Society (RSA, 2010).

The government came to a conclusion that pervasive information infrastructure would be beneficial for the continuous development of the country, particularly broadband and usage thereof. Given the imbalances created by the former regime and widespread underdevelopment, South Africa continuously looks for innovative solutions to address these issues. South Africa has a history of social exclusion by virtue of differentiated access to employment, income, assets and education. In the present day, social exclusion affects approximately 32% of the working age population, if employment or self-employment is used as the main criterion; while digital exclusion affects more than 80% of households, if household combined mobile and Internet access is used as the main criterion. (Abrahams L, Burke M, Elliott L & Hero W, 2010)

This has created numerous challenges for the country ranging from crime, poverty, inequality and lack of basic infrastructure in certain quarters. Since the advent of democracy in 1994 South Africa has been hard at work trying to redress the imbalances of the past and

entrench democracy in the hearts and minds of its citizenry. Parallel to this, the government through the ministry of communications and all other interested parties is introducing South Africa into the global information society. The country has seen a fair amount of success in entrenching democracy; there are regular elections at all levels of government, all laws are debated before they are passed and there is a considerable amount of effort in ensuring the separation of powers; Legislature, Judiciary and the Executive are all structurally separated (Abrahams *et al*, 2010). In relation to the global information society, South Africa has not seen a considerable amount of success. The mobile phone has revolutionised communication in the country, but access to the internet remains very low and growth isn't satisfactory either.

Currently in South Africa, Information society leadership requires a strategic shift in its short and long-term objectives. In order to transform the digital divide (for low and no income households, for low income SMEs and for communities in low revenue areas) into digital economic participants, the targets for universal access and service should be household computer and broadband access to spur Internet usage for a variety of economic and domestic purposes; and cheap, competitively-priced mobile call charges to spur high levels of mobile voice and SMS usage. This will push Gauteng and eventually South Africa into an era in which ICT usage becomes the main factor in the next stage of evolution of the information society, an era where users

base their usage on what they need to do, rather than on limiting their usage based on lack of affordability (Abrahams & Burke, 2010). This will further lay the foundation for keeping pace with adoption of constantly emerging new ICTs and new media, such as social networking media (Facebook) and economic facilitation media (LinkedIn) (Abrahams & Burke, 2010).

“Household computer, broadband and mobile Internet access for both voice and data presents the foundation infrastructure for the ‘small production cells of the future’”. (Abrahams & Burke, 2010). The current perception in South Africa is that this is not developing at the requisite pace and thus the country continues to lag behind countries of similar size and economic ability. A large proportion of SMEs already operate from home, there however no objection on how mobile phones have revolutionised communication in this country. Given that the global and local economies are predominantly services economies in the 21st century, the opportunities present themselves for households to become small production units or cells. This does not imply that industry, factories and other large institutions will disappear, simply that the household production cell will become an additional economic formation. It is significant for South Africa to be able to enable these production cells from home. These cells will improve the productivity rate of the country and therefore improve individuals’ contributions to the economy. The information society currently have not developed to an extent that ordinary South Africans interested in participating

actively in the current economic setup, are enabled to do so, using ICT's. It is on this basis that this study will look into the issues inhibiting broadband access, penetration and usage, and furthermore to look at issues of mobility in relation to broadband and how mobility may enhance access and therefore production.

The access and penetration of broadband in South Africa is skewed towards areas of the country which are well-off. This is not different to anywhere in the world, the affluent part of the population turn to take up technology quicker than the poor and citizens in rural and remote areas. This is not desirable in a country that is intending to build an information society; a society where economic growth and management is based on information and related communication technologies, where knowledge is paramount. The study acknowledges that there are a number of other factors that are significant in a knowledge based economy and the information society besides broadband. As an example, from an information society perspective, Gauteng occupies a position defined by comparatively high levels of fixed, mobile and broadband infrastructure, as well as being the space where a large proportion of online content producers are located – broadcasting, Internet and mobile content (Abrahams et al, 2010), this is not the case with most of the South African provinces. According to Abrahams et al, 2010, even Gauteng is only at the entry point of the information society when compared to other knowledge based economies, besides pervasive mobility in voice telephony.

Infrastructure and content is developed, but mostly households, firms and institutions are disconnected from the network, and as Castells, (2000) puts it; those who are left outside the network are disadvantaged. This is due to inadequate public policy. This same point is made by Gillwald (2007).

The government did acknowledge in 2009 that broadband is very important in the development of the information society, where the economy is knowledge based (DoC, 2009). Without a clear broadband policy and roll-out, the Gauteng government through the Gauteng shared services centre, tried to introduce a portal that would provide citizens with some government information and the citizens could access certain services and interact with government. This service according to Abrahams et al, 2010, could not be sustained. It is therefore important for government to re-look the model and also consider internet access for the citizens, especially the marginalised and the poor.

Access and diffusion of broadband, being one of the main factors in the development of the information society, happens in a particular societal context. For the Gauteng province it is as follows; according to Abrahams & Burke, 2010, The majority of Gauteng's 3, 4 million households (approx. 62%) have an imputed average monthly income of less than ZAR10, 000 and 6% of the population or 626 835 people are estimated to be living below the poverty line of ZAR283 a month

(RSA, 2009: 26 as cited by Abrahams & Burke, 2010). More than 1, 5 million people receive social grants, of which more than two-thirds, or more than a million, are children. In 2008/9, there remained 9,622 households with no access to water infrastructure, 11,9% with no access to sanitation and 23% with no access to electricity (ibid.: 31- 33 as cited by Abrahams & Burke, 2010). These reported 62% of households, including those with limited access to infrastructure, are least likely to be connected to the information society or to be able to access the limited existing range of e-government services.

Gauteng has 1, 8 million learners in schooling or 16% of all learners and 16% of all educators, with a learner: educator ratio of 29 (ibid. 44 as cited by Abrahams & Burke, 2010). The province has more than 5,5 million people registered to vote in national and provincial elections and more than 4,7 million people registered to vote in local government elections (ibid.: 52 – 53 as cited by Abrahams & Burke, 2010). Contact crime is high in the province (ibid.: 60) and average life expectancy for men is 57 years and for women is 60 years, probably as a result of HIV/AIDS (ibid.: 36 as cited by Abrahams & Burke, 2010). This selection of areas of government activity, namely education, voting and crime prevention, are areas where a very large proportion of the population can benefit significantly from access to ICT infrastructure and the introduction of electronic services and the services may be more accessible if they are introduced on a mobile platform, as the majority of South Africans have access to a mobile phone.

Furthermore, access to electronic services such as electronic banking services for SMEs and web-based tourism services for local and international tourists can reduce the costs of these services to the user and the creation of value-add in these economic sectors.

The above state of affairs has denied South Africans opportunities to fully participate in the global social, economic and entertainment activities, enabled by pervasive and robust broadband infrastructure. If there is any participation, is by a small minority. It is quite possible that the challenges relating to access to ICT's play a big role in social exclusion and the apathetic tendencies exhibited by the majority of South Africans in formal economic activities.

The above background, detailing the state of South Africa in terms of the emergence of the information society, is in the context of South Africa being a mobile society. South African households are generally mobile due to historical reasons. Economically active adults were forced to work in other provinces or big cities where economic activities are concentrated and leave their immediate families in other parts of the country.

This has created a highly mobile society as they are forced to commute between these places on a regular basis. Even within cities the majority of South Africans live outside the economic hubs, in the townships and informal settlements. The previous system created these areas which

are high concentration of economic activity i.e. city centres, and other areas of high services economic activity like Sandton in Johannesburg and Umhlanga in Durban; and then areas of economic and social reproduction, being townships and informal settlements. The majority of South Africans, who are already migrants from other provinces and rural areas, have to commute between these two areas. In the South African government's quest to create an information society, it will not be possible to ignore the already existent mobility of the society. This will be an interesting piece of study how electronic communications assists this already mobile society

1.3 Substitutability and Mobility

Consumers want an always on communication service that can be accessed anywhere (Gillwald, 2007); it is apparent that South Africans have substituted fixed-line voice services with mobile voice services. The attraction of mobile in the emerging information society is supported by, amongst others, the fact that work and employment are substantially transformed into relentless mobility (Castells 1999). Work is conducted on the move. This trend towards mobile communications may apply to Internet access, because information is not just shared through voice, but large documents and video as well and therefore, mobile broadband data access and usage may become as attractive as mobile voice. Information society trends suggest that consumers should be able to access any form of data and information at high

upload and download speeds to become significant participants in this economy.

As we have seen with telephony, mobility expands the reachable market for telecommunications services. Mobile phones have significantly addressed the need for telephony in rural areas in South Africa, where due to high costs; the incumbent fixed operator was not willing to deliver services. In this case the fixed-to-mobile substitution has taken place. According to research ICT Africa, only 18% of the respondents in a study had a working fixed-line telephone in South Africa (Research ICT Africa, 2008). The concept and theory of substitutability will further be explored in the literature review.

1.4 The role of public policy in fostering the broadband market

Even though South Africa had adopted the orthodox reform model in 1996, (Gillwald, 2007), it progressed very slowly with respect to opening up competition in the data market as, for example, 3G was available commercially only towards the end of 2004 (Goldstuck, 2008). Inadequate policy development has stifled competition and thus has kept telecommunications prices high.

According to Esselaar and Gillwald as cited by Gillwald, 2007; the high cost of broadband access has resulted in growth in broadband services slowing down more rapidly than would have been the case if access

and usage were cheaper. High costs may be attributed to the lack of decisive policy interventions by the DoC. Furthermore, the regulator has been accused of stifling competition by failing to liberalise the market and regulate prices decisively. More recently, in 2009 - 2010, the regulator has attempted to take action to lower interconnection charges, but this has met with the usual resistance from the mobile operators. These issues will be further explored in the study.

On the 13th July 2010, Gen (retired) Sipiwe Nyanda, the then minister of communications, published the national broadband policy (RSA, 2010). This was a direct response to some of the issues raised above. The intentions and objectives of the policy are clearly stated in the policy and also expected outcomes are specified. Some of the issues lamented by Gillwald, 2007, are addressed by the policy; they include but are not limited to the following; the definition of broadband, the accessibility, availability, affordability and usage of broadband throughout South Africa (RSA, 2010; Gillwald 2007).

The same issues are raised by Goldstuck in his 2010 Internet report of South Africa (Goldstuck, 2010). It is therefore getting clearer that one of the biggest challenges in South Africa when it comes to broadband has been the lack of clear policy. The funding of broadband has also been a problem, from the roll-out of undersea cables to local government initiatives. The funding of Broadband services in the South African context is both fragmented and uncoordinated (RSA, 2010). At

a national level all national departments have budgets that are allocated to ICT roll-out, however these are not spent appropriately and in a coordinated fashion. Further provincial and local Government competencies are not duty bound to coordinate ICT programmes and policies for national benefit and homogeneity. This policy therefore proposes to create a uniform, integrated, homogeneous and coordinated Government approach on the roll-out of Broadband in South Africa, thus ensuring both optimal utilisation of resources and coordinated rollout of infrastructure (RSA, 2010).

The DoC policy document defines broadband as an always available, multimedia capable connection with a download speed of at least 256 kbps (RSA, 2010). This definition is not very far-off when compared to the one adopted by this study. The vision of the policy is clear:

To ensure universal access to broadband by 2019 by ensuring that South Africans are able to access broadband either individually, or as household, subscribe to a broadband service directly or indirectly at a private or public access point. (RSA, 2010)

The above statement does augur well for broadband access and it clarifies the intentions of government. The vision is supported by an objective, which is:

To facilitate the provisioning of affordable, accessible, universal access to broadband infrastructure to citizens, business

communities and the three spheres of government, and to stimulate the usage of broadband services – in order to promote economic development and growth and act as an enabler for further social benefits. (RSA, 2010)

There appears to be, given the recently promulgated broadband policy, a renewed energy and will from government to introduce universal access as a goal for broadband access. The policy will seek to encourage development of infrastructure that is reliable, robust and secure. All these, as per the policy, are done to support the emergence of the information society in South Africa, of which broadband is regarded as one of the most important enablers. The government seeks to ensure:

The development of a people centered, inclusive and development oriented information society where everyone can utilize, create, access and share information and knowledge, enabling individuals and communities to realise their full potential in promoting sustainable development and improving the quality of their lives” (RSA, 2010). The above statement has informed the country’s vision which is to “establish South Africa as an advanced information society in which information and ICT tools are key drivers of economic and societal development. (RSA, 2010)

The implementation of this policy will determine how far South Africa goes, in becoming an advance information Society, the characteristics of which will be discussed further later in this report.

All these objectives won't be achieved if the issues of affordability, uptake and usage are not considered. The policy rightly so considers these issues (RSA, 2010). Provision of broadband in certain areas is prohibitively costly and therefore the government will have to intervene to ensure that these areas are not left unconnected. The remote and rural areas of South Africa need a special intervention to ensure connectivity, and the policy recognizes that. Several options will therefore be explored by the government and the Universal Service Agency of South Africa (USAASA) regarding construction, ownership and operations of networks in these underserved areas (RSA, 2010). According to the DoC, this will ensure that access to broadband services becomes available to the majority of the citizens (DoC, 2009).

To encourage uptake and usage the policy recognizes the importance of content development. Content can be developed by independent content developers and broadcasters, civil society, government and individuals and households. The policy recognizes content developed in areas of education, health and e-government as significant. The society would want to be able to access government services anywhere and anytime, and this falls squarely on the capabilities of broadband technologies. Digital literacy is also critical when it comes to

access to broadband (RSA, 2010). It will be difficult for the citizens to fully utilize broadband as a developmental tool, economically and socially, if the skills to use the technology are not there. The policy therefore will seek to improve the skills of the citizens in that regard. Due to the demands for increased high-speed data access which is characteristic of the emerging information society, policy and regulatory interventions needs to respond accordingly.

1.5 Background to Broadband Internet access and usage; 2005 - 2010

The following reports will be analysed for this study; Internet access reports for 2008 and 2010, Statistics SA community survey 2007 for Gauteng, Genesis Analytics reports for 2005 and 2007, Nielsen online report, 2008, Research ICT Africa: ICT access and usage 2008, Mobility report 2009 and SMME survey 2009.

1.5.1 Telecommunications prices in South Africa

A study commissioned by the South African Foundation, which is an association of South Africa's largest corporation and major multinational companies with a significant interest in South Africa (Genesis Analytics, 2005), found that telecoms prices were too high in South Africa. The objective of the study was to compare South African Telecommunications prices with those of international peers. The

ultimate aim was to ensure that costs of doing business are reduced in South Africa.

South African telecommunications prices were compared to both to overall best practice markets and to best practice markets with similar characteristics as South Africa, including input costs, geographical dispersion of population, income dispersion and level of development. There was overwhelming evidence in the 2005 study which indicated that South African telecoms prices were well above competitive levels in the country's international peer group (Genesis Analytics, 2005).

Given the changes that had taken place in the telecommunications sector, the organisation felt it was an opportune time to evaluate the progress made in lowering the telecommunications costs and improving the regulatory environment and therefore another study was conducted in 2007. This study confirmed the 2005 findings and that even though there had been some changes in the sector, the prices were still too high compared to developed markets and others with similar characteristics as South Africa (Genesis Analytics, 2007).

The selection of international comparator markets was done the same way as 2005 in order to obtain credible results. Only 5 countries which were used in the 2005 study were included in the 2007 study

1.5.2 Internet Access and Usage

Several studies were conducted between 2005 and 2010 to measure the level of internet and broadband access and usage in South Africa. The major finding of these studies was that access and usage in South Africa is very low. Stats SA conducted a survey in 2007. The Stats SA; community survey collected information on population dynamics (population size, composition and distribution; and fertility. Mortality and migration), disability and social grants, school attendance and educational attainment, labour force, housing conditions, household goods and income. The community survey covered 274 348 dwelling units across all provinces, out of these only 238 067 had completed questionnaires when the field work was completed. This indicated a response rate of 93.9% (Stats SA, 2007).

The major household goods that the survey looked at included; mobile phones, television sets, radio, land lines and computers. The study also looked at internet access by households. The community survey results are key to this study, in particular the results pertaining to household goods that were just mentioned above.

The two studies were conducted using the same methodologies and in the same setting. The internet access studies of 2008 and 2010 comprehensively report on the internet access market in South Africa. These studies have successfully and credibly measured the internet

user base in South Africa for over 10 years (Goldstuck, 2010). Its success comes on the basis of not using only a single methodology, which may result in over-counting or under-counting. It combines traditional market research methodologies with extensive market intelligence work. There is also extensive engagement with key players in the market in order to collate, validate and verify user numbers (Goldstuck, 2010).

In the above-mentioned studies the researcher contacted more than 400 South African Internet Service Providers, Internet Access Providers and Value Added Network Service Providers and asked them to complete a questionnaire. Publicly available information was also analysed to gain further insight. A survey of 600 internet users based in urban centres in South Africa was conducted to establish usage patterns and in particular cellular access to the internet, which is a major interest of this study.

This study commissioned by Nelsen online, a service of the Nielsen Company in London, looked at how the South African Internet fared across 2008 in terms of consumer behaviour, how the audience changed and the fastest growing brands, in particular online-news brands.

An SMME access and usage study was conducted in 2009. The sample selected was proportional per province given how many

SMMEs are registered in that province as per company and closed corporations registration records. Telephonic interviews were conducted with business leaders and financial decision makers across 2500 SMMEs (Goldstuck, 2009a).

The objective of the study was to show how effective the SMME sector was in coping with the recession and how confident they were about the future. In order to get a full picture of each business surveyed, the study also included SMME demographics with financial activity and concern, internet connectivity technologies and business management disciplines. This study will concern itself primarily with the internet connectivity technologies part of the report.

A study conducted in 2008 found that access to the internet in the African continent is very low (Gillwald & Stork, 2008). This study was conducted to positively contribute to evidence-based ICT policy formulation and regulation on the African continent. The study concerned itself with access and usage between 2007 and 2008. The study looked at 23000 households and individuals across 17 African countries.

The survey provides insights into the continued marginalisation of large numbers of Africans and confirms the sub-optimal use of communications services due to the high costs of access to services. The study further provides insights into issues related to internet

access and usage, which of great interest to this study (Gillwald & Stork, 2008).

1.5.3 Online media in South Africa 2009

The online media study was conducted among all online publishers in South Africa. The study was conducted by World Wide Worx and supported by Online Publishers Association. Publishers were invited individually to participate in the study. 44 publishers participated. Participants were asked to provide case studies of online campaigns which were successful, amongst other things. The study furthermore compared South Africa to certain international countries which were known to be using this media and some who have similar characteristics as South Africa. The purpose of looking at this report is to attempt to start showing how availability of content affects access to the internet and therefore access mechanisms like broadband, even mobile broadband.

South Africa indeed has decided to develop an information society, where ICTs play a primary role in the economic, social and cultural lives of all South Africans. This objective is clearly articulated in the recently adopted broadband policy for South Africa. Several studies have been conducted to look at internet access, mobility, SME's and ICT's etc. but none of these studies have looked at the issue of fixed-to-mobile broadband substitutability in South Africa; what factors would

inhibit or encourage such a phenomenon and what impact would that have on the South African broadband market. This study will focus on that, given all other studies that have already been done since 2005.

2 CHAPTER 2: LITERATURE RELATED TO BROADBAND, MOBILITY AND SUBSTITUTABILITY

Extensive research has been undertaken, especially in the Organisation for Economic Development and Cooperation (OECD) countries to look at fixed-to-mobile substitution in the developed world regarding voice. This study is particularly interested in understanding the adoption and use of broadband in South Africa, the issues pertaining to fixed-to-mobile substitution with respect to broadband Internet access, and the policy factors that could impact on future access and usage. The reason for this interest in broadband Internet access is influenced by the interest in the demands of the information society.

This study will explore the existing body of literature with the aim of setting out the concepts, theories, arguments and debates around broadband access, pricing, usage and services. It will look at the extent to which certain factors, including pricing and QoS influence bias towards adoption of either fixed-line or mobile data access. In this literature review, the following themes are explored:

- Emerging information society
- Broadband pricing and services
- Mobility and substitutability

- The role of policy in fostering the broadband market

2.1 Emerging information society

According to Castells, the new socio-economic system is dependent on information as an input factor to social and economic productivity (Castells 2000). Benkler refers to this economy as the “networked information economy” (Benkler, 1999). This study will refer to the Information Society. In the information society we have the massive and systemic exploitation of information by commercial, social and political interests (Robins & Webster, 1988). A question may arise; what is the value of this information? The indeterminacy of the value of information is based on a number of factors; according to Bates: firstly the value of a piece of information is not constant, the full value of information cannot be known until that information has been put to use by its consumer (Bates 1988). The circumstances of the use of any piece of information affect its value. It is not that the value of information is indeterminable, but it requires an understanding of circumstances around its use. Information as an economic good has definitive and distinctive value, that represents the expected returns from the future use of the information (Bates, 1988). Seemingly the returns may also accrue to the people who did not use the information directly; what Bates calls ancillary value.

Information have always had a place in society, even from pre-industrial times, it was just not collected and stored for purposes of deriving value (Robins & Webster, 1988). The deliberate gathering in on the part of those on the side of management, e.g. in an organisation, of all the great mass of traditional knowledge, which in the past has been in the heads of the workmen, and in the physical skill of the workmen through years of experience, is an indication of the perceived value of this information. The task of gathering and recording it, tabulating it and finally reducing it to laws, rules and even formulae is important, the next step would be to transmit and communicate it so that it can be widely used around the globe. Organisations are now treating information as a resource like money and personnel (Schiller, 1988). Information has therefore become the essential part of any organisation serious about growth and government serious about service delivery to its citizenry.

According to May, the whole idea of the information society, information age or the new economy is more of an exaggeration than a real phenomenon (May 2002). Though no one can argue the impact of the ICT's on the social and economic structures, information is not a new concept in society (May 2002). Society has always been about information and therefore May argues that what has changed is not the importance of information but how that information is transmitted and stored and that cannot be referred to as a revolution. He continues to argue that the "revolution" is too abrupt and not intense enough to be a

revolution and therefore these are merely changes and not a new age (May 2002). Nevertheless, research has proven that hidden inside this advance in ICT's, is a potential for social change so breath-taking in scope that few in society have been willing to face its meaning because, as an example, in reality, jobs and labour are being distributed to homes. Homes are being revolutionised as well. The impact of the formation of the information society therefore extends beyond ICT's but also to social structures.

Society is continuously changing and these changes have something to do with communication and computer technologies (Mosco & Wasco, 1988). These changes represent the production, storage and transmission of information. Castells argues at length that the development of ICT's produces a networked society, one where not only businesses and companies, but also individuals can benefit from new communication capacities (Castells 2000). The pillars of the information society, as opposed to the industrial economy, are: information/knowledge, technology and networks. While networks are old forms of social organization, they are empowered by new information and communication technologies (Castells, 2000).

Tom Stonier argues that in a post-industrial society a country's store of information is its principal asset, its greatest source of wealth (Robins & Webster, 1988), this is also true for any type of organisation; a not-for-profit organisation, an educational institution and any form of business

enterprise, regardless of size. It is the ability to share and obtain the information and the speed at which this can be done that will, amongst other things, give firms and economies a competitive edge. In the information society and the networked economy, more and more of social and economic activities' added value is created by brain rather than brawn. The information is created in the brain, transmitted through the internet either in the form of data, music or video. The speed at which this information is transmitted becomes important, when it can be consumed or utilized also determines its relevance and therefore value-add.

The information can be transmitted in many forms: voice, data and video, on the same technology platform in what is known as double-play, triple-play and when mobile services are added, the concept is referred to as quadruple-play. In short, this is referred to as multi-play services (Henten & Godoe, 2010). The bandwidth requirement for transmission of these multi-play services is enormous. Hence, high speed broadband can facilitate participation in the networked information society. According to Sawyer et al, broadband connectivity expands what can and might be transmitted across the Internet (Sawyer et al, 2003). Electronics, telecoms and data processing industries are said to be undergoing a process of convergence and integration, in order to accommodate the information society requirements (Robins & Webster, 1988). This should therefore be understood, in the context of information society, as a transformation in

the existing structures of information production, storage and transmission.

According to Curtis, one of the fundamental benefits of the information society is the availability of information to everyone who is connected to the network. This information can then be used to the advantage of those who have direct access to it and those with indirect access (Curtis, 1988). Curtis on the other hand warns that one of the fundamental threats of the information society is the threat to privacy. One just looks at the current pervasiveness of the social media, which has made the world smaller and personal information available globally. This however does not erode the benefits of the information society.

Networks change relentlessly: they move along, form and reform, in endless variation. Those who remain inside have the opportunity to share and, over time, to increase their chances to succeed. Those who drop out, or become switched off, will see their chances vanish. (Castells 2000).

These networks and the services they enable are therefore the heartbeat of the 21st century economy. Benkler stated: 'How life would be in this new environment will largely depend on policy choices that would be made over the next decade or two' (Benkler, 2003). This has proved to be true to a large extent, as it is apparent that countries that

have developed relevant policies have progressed more than those that did not, with respect to telecommunications in general and with respect to broadband availability in particular and therefore the development of the information society.

2.2 Broadband pricing and services

Research by the OECD discovered that broadband connectivity is a key component in ICT development, adoption and use. It is of strategic importance to all countries because of its ability to accelerate the contribution of ICTs to economic growth in all sectors, enhance social and cultural development, and facilitate innovation. Widespread and affordable access can contribute to productivity and growth through applications that promote efficiency, network effects and positive externalities, with benefits for business, the public sector, and consumers (OECD, 2003). Broadband networks are an important platform for the development of knowledge-based global, national, regional, and local economies.

Pricing plays a significant role when it comes to take up of telecommunications services. Price influences consumer choices differently depending on the product and its perceived economic value. This concept is known as price elasticity. Price elasticity is the measure of responsiveness of consumers to a change in price (De Jaegher, 2009). Products with few good substitutes generally have a lower

elasticity with regard to price than products with many substitutes (De Jaegher, 2009). This may mean telecommunication services have lower elasticity, but when one looks at fixed-line services against mobile services the elasticity increases. The change in price of the mobile services may affect its uptake and usage. Theories of costing and pricing raise the following themes for discussion; how costing can influence the level of competition in the market; the influence of pricing on the uptake of services and many more. Martin Cave, argues that because of the significance of costs in the telecommunications space; some form of cost modelling or cost estimation is required, to give policy makers and regulators space to encourage competition and enforce Universal service obligations without disadvantaging smaller players (Cave, 1997).

Cave argues that underlying most regulatory economics is the existence of problems associated with lack of competitive entry (Cave, 2006). This is what makes markets fail or succeed. The failure of markets makes regulation necessary and therefore economic regulation as well. Economic regulation refers to applying structured approach using financial measures to monitor and regulate market behaviour (Cave, 2006). Price regulation ensures that the interests of the consumer are protected and that there is no discriminatory pricing (Esselaar, 2007). Two measures used in price regulation are price cap regulation whereby tariff increases for existing services are limited and tariffs for new services are approved by the authority, and regulatory financial reporting where operators have to report their costs against

their profit in order for the authority to ensure that price controls are effective.

Globally, operators have packaged the pricing of broadband offerings in ways they believe will improve their take-up. In the UK, stand-alone broadband is hardly sold at all (OFCOM, 2007). Broadband services are generally bundled with other services like cable television, fixed-line telephone or mobile phone. Sometimes broadband will be offered “free”, subsidised by other services (ACMA, 2008). It appears that, when the public perceive a service to be over-priced, they normally don't use it. The above analysis does not take into account the differing population demographics and distribution across different countries. It only gives an idea how pricing may affect take-up and usage of telecommunications services.

One of the most difficult to manage aspects of the shift from voice to data for mobile revenues is to get the pricing right (ITU, 2003). Studies over time have proven that in many markets, non-mobile internet users quoted high prices as the reason they don't use the service (ITU, 2003). The challenge with pricing data is to ensure that it is not priced too low or too high. It seems like the pricing is seldom right and therefore continuous adjustment of the prices. The three most important things in pricing data according to the ITU are the following: Subscription, volume of data and the cost of content (ITU, 2003). Subscription will normally carry some free data bundle which is

capped, and after data an out-of-bundle charge is preferred to the consumer, some service providers like in Korea did not charge subscription (ITU, 2003). The volume of the downloaded data is normally charged per megabyte, by the operator and then there is the charge for the content which is generally based on the perceived value of the data and its timeliness.

According to the OECD, for the private sector, broadband is an enabler of e-business and new market opportunities, allowing firms, including small and medium-sized enterprises (SMEs), to realise growth through productivity increases stemming from improved information exchange, value chain transformation, and process efficiency (OECD, 2003). Broadband can significantly improve the efficiency, availability and reach of public sector services in areas of high government interest, such as health, education and other government services. For consumers, broadband can enhance the quality of life through economic, social and cultural, development. For small, rural and remote communities it can be an enabler for economic and social inclusion; especially, it can facilitate access to new and advanced goods and services, as well as opportunities to participate in the digital economy and information society. However, price poses challenges to extending broadband to all communities, particularly in countries with low income and relatively high population densities.

In Korea, By January 2000, almost all government ministries and agencies were online and connected to a high-speed backbone network. More than 80 per cent of the central government's documents were computerized and 55 per cent of the government's (both national and local) documents were handled electronically (ITU, 2003). This indicates that e-Government has been possible in Korea since the turn of the century. To get here, Korea combined the positive effects of a free market system, with the positive effects of a robust government.

Korea did not just excel in e-government but even in introducing ICT's into the education system. By early 2001, all primary and secondary schools had a computer lab and a local area network (LAN), linked to the government's high speed backbone. By the end 2003 all teachers had their own personal computer and 93% of Korean kids between 7 and 19 years old could use the internet (ITU, 2003). Above are a few examples of services that are made possible by high speed internet or broadband. Unfortunately access to this technology is generally skewed.

In a 2007 World Bank report, two reasons were given for lack of broadband penetration in Sub-Saharan Africa: Prices were too high and availability was low (World Bank, 2007, page 2). In 2006, the average retail price for basic broadband was about US\$366 per month as compared to an average of US\$44 in India and about US\$12 in parts of Europe (World Bank, 2007, page 2). The high price of the

broadband services may impact on the ability of the less fortunate to take advantage of services enabled by broadband and therefore benefits of the information society.

Schiller argues that the great virtue of the new ICT's lies in their capacity to transcend the limitations of the time-discipline of the industrial period (Schiller, 1988). During this period there was rigid division of the day into work time and reproduction time, there developed inflexibility in terms of time use and exploiting opportunities. Broadband availability facilitate the restructuring of patterns of time use on a more flexible and individual basis, its provides the technological means to break the times of working, consumption and recreation into pellets of any duration, which may then be arranged in individual complex configurations and shifted to any part of the day or night (Schiller, 1988). It is thus important for all persons in a society to have access and to understand the impact of technology, especially broadband. The impetus of the previous social system (Industrialisation) was based upon control by centralization; new technologies halt this tendency and inaugurate a new era of decentralisation. Creativity is also decentralized from institutions to individuals.

One of the significant possibilities brought about by broadband is triple-play. Triple-play is the ability of the network to provide all telecommunications services; Television, telephony and internet via a

single cable (Janssen & Mendys-Kamphorst, 2008). This provision can be via cable TV or fixed-line telephone network. It is further anticipated that in the long run all the services will be obtained from a single service provider. These services are bandwidth intensive and therefore they would be difficult to offer without broadband. The triple play service can also be defined as a marketing term for the provisioning of two bandwidth-intensive services, high-speed Internet access and television, and a less bandwidth-demanding (but more latency-sensitive) service, telephone, over a single broadband connection, and thus justifying broadband access. Triple play focuses on a combined business model rather than solving technical issues or a common standard. There is also, according to Janssen & Mendys-Kamphorst, the roll-out of fibre to the premises (FttP), which in itself increases broadband capacity for all the services that consumers would like to access.

The advent of broadband Internet access has produced a plethora of innovative interactive multimedia services and created a new distribution platform for audio and visual content and information. Broadband Internet is providing not only text, data and images, but also entertainment content, resulting in a process whereby Internet (telecommunications) and broadcasting applications are starting to converge. (OECD, 2004) The provision of these services over a variety of platforms has enabled broadcasters to offer services that were traditionally offered by network operators and vice versa. Television

over broadband (ADSL or 3G) is just one example of possible convergence services. Broadcasting services were traditionally offered by state broadcasting monopolies in a very uncompetitive environment. The OECD has found that the blurring of the lines between broadcasting and telecommunications will encourage competition in certain areas (OECD, 2004)

Stratus technologies in their 2007 report confirmed that Technology allows for voice over broadband as technological advances are creating a wealth of opportunities for new services, this happens while intense competition is driving down the pricing of conventional telephony. Consumers and businesses of all sizes are wisely taking advantage of the current market disruption, demanding high-quality advanced communications services priced and packaged to suit their unique needs. It has thus become a bit challenging for some carriers and service providers to meet market demand for feature-rich services even as the telecommunications network undergoes an evolutionary transformation from a traditional network to a next-generation converged network. Packet-based voice services or voice over IP, are proving to be key offerings during this transition period, both as stand-alone telephony services and as a critical component of multimedia services.

Voice over broadband (VoBB) has emerged as the platform of choice for delivering traditional and advanced voice services in today's hybrid

telecommunications network. In countries like the United States of America, Japan and the United Kingdom, VoBB is a popular product which is making serious inroads in traditional voice markets (Stratus 2007).

Access to services, made possible by broadband are said to be economically and socially beneficial. Access to these services ensures that citizens and communities can play a role in the economy and political spaces of their respective localities and countries. Literature identified services such as e-government, e-health and e-learning as those that the majority of ICT consumers would want to access through their broadband connections. The costs of the connection will play an important role in determining the extent to which some of the services are used.

2.3 Substitutability and Mobility

A popular argument for the view that mobile usage is substituting for fixed lines is in its prevalence where access to main lines is low or unreliable. For instance, cellular phones may be an attractive alternative where it is difficult to install fixed-line networks. Because mobile networks can be installed more rapidly than fixed networks, they can alleviate waiting time for potential subscribers and reduce unsatisfied demand (Hamilton, 2003). At the turn of this century, in South Africa for an example mobile telephony was growing at the rate

of 4.5. Per 1000 annually and fixed-line at 3.9 per 1000 annually. The same trend was evident in Tanzania where growth for fixed-line was 0.1 per 1000 and 0.3 per 100 for mobile (Hamilton, 2003). At this stage mobile was viewed as a complimentary service for fixed-line because both services were growing parallel to each other even though mobile was growing faster. Albon (2006) also argued that the relationship between fixed-line and mobile cannot be simply that of fixed-to-mobile substitution where fixed-line services are replaced by mobile subscription and calling.

This relationship can be understood by careful examination of what is happening within each network and what is happening across networks; which may be convergence, complementarity or even substitutability (Albon, 2006). A number of studies had been conducted previously which sought to clarify this relationship. A study conducted by the Australian Communications and Media Authority (ACMA) on behalf of the Australian government found that in Australia, fixed-line access had declined by 6% since its peak in 2004, In the US it had declined by 9% since it peaked in 2000, in Canada fixed-line picked in 2001 and experienced a decline of 8% between 2001 and 2005; in all these countries the number of mobile handsets continued to increase (ACMA, 2008)

Hamilton goes on to highlight that one of the advantages of mobile services was the introduction of prepaid services, which enabled

individuals and households who would naturally have not qualified for a phone, to have one in the form of a mobile phone (Hamilton, 2003). This in itself supported the theory of substitutability.

The International Telecommunications Union (ITU) estimates that, in 2002, the number of mobile subscribers worldwide (over 1.15 billion) surpassed the number of fixed main lines in service (nearly 1.13 billion) for the first time. Yet, as recently as 1991, there were only 16 million mobile subscribers as compared to 546 million fixed mainlines worldwide, a ratio of 1-to-34 (Banerjee & Ros, 2004). In Korea the stock of mobile telephones had surpassed fixed phones by end 2002 (Sung & Lee, 2002). The density was more than 60 of every 100 inhabitants. Thus, the potential for mobile telephones to become a substitute for, and directly compete with fixed telephones, was already evident at that time. The above scenario supports what other telecommunications scholars like Hamilton and Albon found, further strengthening the theory of substitutability in voice telephony.

Over time, since the turn of the century, research has shown that mobile phone services are substitutes for fixed-line phone services (De Jaegher, 2009). Two goods or services are substitutes for each other, if the marginal utility of good 1 decreases, when more of good 2 is bought (De Jaegher, 2009). This is the case in voice telephony: the usefulness of a fixed-line has been shown to be reducing as the number of mobile phones increases, especially in developing countries

as observed by Garbacz and Thompson (2007), cited in De Jaegher, 2009. In developed countries, the argument is made that fixed line and mobile voice services are complementary (Rondini, et al, 2003), though amongst younger age cohorts in the same countries, fixed-to-mobile substitution appears to have taken place. According to Xiao-yu and Cai-lan, in China, the relation between the wireless and fixed telecommunication industry has changed from a state of being complementary in the last decades of the twentieth century to that of being substitutes at present (Cai-lan & Xiao-yu, 2006).

The concept of mobility plays a major role in consumer choice: individuals and organisations choosing mobile services. The spectacular growth of mobile phone services is well documented, with mobile users now exceeding one billion worldwide (Rodini et al, 2003). Mobile broadband is growing, driven by the fact that it offers full support for device mobility, it provides universal coverage e.g. international roaming and that in areas where the fixed network is not fully developed, it may be the only alternative for obtaining broadband access (Dulski & Persson, date unknown). The literature does highlight the substitutability of voice access technologies and the opportunities offered by mobile broadband for data access. However, there is not yet a significant literature on the substitutability of fixed and mobile data access methods.

In a study conducted in the US, it was observed that whereas voice telephony was going mobile, supplemental fixed-line continued to grow, fuelled by internet and other data access needs (Rondini et al, 2003). This factor was found to be true in Australia, where broadband characteristics continued to influence the development of fixed-to-mobile substitution in voice telephony (ACMA, 2008). The basis of this being that in Australia 73% of broadband connections is DSL and often required the user to retain a fixed-line in order to access broadband. A point is further made that the increasing take-up of wireless broadband and the increased data speeds available from cellular services will lessen the influence of this factor (ACMA, 2008).

2.4 The role of public policy in fostering the broadband market

According to Hamilton, some research has shown that competition does improve productivity in a sector (Hamilton, 2003). Competition in telecoms is a product of public policy because telecoms is a public good. Telecoms policies have evolved over time to accommodate rapid changes in the telecoms space, even though in other markets they still are somewhat catching up with the changes, nevertheless literature thus show that policy continue to improve access and usage.

Many countries globally had to review their policies and regulations to accommodate the rapid take up of mobile phones, in both the developing and the developed world. As an example, there was a time

where the government regulation in the telephone industry was heavily biased toward fixed telephones in most countries (Sung & Lee, 2002). For example, local fixed-line tariffs were strictly regulated in many countries, while mobile tariffs were not. When fixed and mobile telephony became competitors in the same market policies had to change. At a point fixed-line operators had universal access obligations and mobile telephone providers were free from those obligations. Many countries had to consider their universal policy obligations in order to accommodate mobile services which were becoming more popular than fixed-line services, even in remote areas, and therefore for universal service policies to work, mobiles had to be part of it (Sung & Lee, 2002).

There is enough evidence in literature to suggest that different markets formulated and applied different policy initiatives to encourage broadband access and usage. One of the biggest contributing factors to broadband access growth in the OECD countries, especially Asian countries was the introduction of enabling policy to encourage broadband access and usage (OECD, 2001). For example, Korea took a policy decision not to unbundle the local loop as they strongly believed that this would stimulate broadband growth as it encourages facilities competition (OECD, 2001 & ISCR, 2002). The success subsequently experienced by Korea in the rollout of high speed Internet access is due to competition between companies, introduction of a range of different technologies and infrastructures, underpinned by

public policy. There are multiple companies competing to offer broadband infrastructure. By the end of 2000, more than 92% of the Korean population had access to high speed broadband (OECD, 2001)

On the other hand, infrastructure roll-out had to be funded. One would have thought that government funding would be accessed by different operators but in Korea it was not so (OECD, 2004). Korea's success was not due to government funding policy. The government initiated low cost loans during the Asian financial crisis, but operators soon found they could get less expensive capital elsewhere as the crisis eased. The Korean government did stimulate the backbone market by financing capacity and then being repaid based on utilisation of the broadband services by government agencies. But backbone markets are not the barriers to broadband access in developed countries. A number of governments have funded national backbones in various ways and not experienced success in broadband access. Subsidies are no substitute for competition and a lack of access competition usually means investment is deployed ahead of demand. Liberalisation has been found to be the best way to stimulate backbone construction (OECD, 2004). By the end of 2002, the Korean government had fully divested itself of the Korean Telecoms incumbent: Korea Telecom Corporation (KT) (ITU, 2003)

Korea and Japan were among the first countries to develop and promote policies around wireless broadband. In 2001 Korea's

broadband access was 5 times more than that of the USA (Sawyer et al, 2003). Broadband access in Japan was primarily on the fast growing wireless technology. At this stage both Japan and Korea were leading the world in the rollout of 3G technologies. It was believed then that wireless technologies encouraged broadband and internet use and therefore growth in Korea and Japan surpassed the rest of the world. A study conducted by the OECD found that in Japan most of the access was through PDA's and mobile phones (OECD, 2003). Japan had developed a strategy that had deadlines and milestones to ensure that broadband is made accessible to all citizens and that appropriate content is developed.

A study was conducted in two countries; Sweden and Finland to see how policies influenced take up of broadband. This study investigated broadband policies applied in Finland and Sweden with special reference to the geographical coverage of the required network infrastructure (Eskelinen & Hirvonen, 2008). The study further suggests that the two countries are seen as forerunners in the development of the information society, and they also share several other similarities bearing relevance to the take-up of broadband. However, they applied different broadband strategies: Sweden, one of the first-movers in this field, already launched its ambitious and interventionist national ICT infrastructure program in 2000, whereas the Finnish broadband strategy, published in 2003, largely relied on market forces (Eskelinen & Hirvonen, 2008). The findings of this study strengthen further the

findings of several OECD studies that argue that policy interventions do determine the extent of the success of the particular market. Policies should also be responsive to particular market requirements.

As compared to the US and Korea the launch of broadband internet service started quite late in Europe (Picot & Wernick, 2007). In the European union there were different results emanating from individual countries' interventions, even though policies for broadband access were similar, the responses were market specific (Picot & Wernick, 2007). As an example, countries leading in broadband access like Netherlands, Denmark and Finland benefited from strong platform competition. Others like France managed to enhance broadband penetration using shared lines and local loop unbundling. It can be argued that penetration rates in the European market seem to have benefited from a combination of both infrastructure and service competition (Picot & Wernick, 2007).

The more important factor is the commercial environment in which the new capability is marketed, as this can encourage subscription and usage. Competition is a necessary requisite for broadband growth, most importantly for uptake and usage. It is important to realise that broadband uptake in the OECD countries was actively pushed at policy level. Viviane Reding, 2006, in a speech on behalf of the European Commission, confirmed the importance of broadband and indicated the

commitment of the Commission in achieving broadband for all Europeans through various EU policy instruments.

The question being posed for some time now is whether universal service policies should be formulated for broadband (OECD, 2004). This was asked in 2004, when some felt these policies were premature. Are they still premature?

2.5 Conceptual Framework

The literature review above has highlighted a number of issues relating to broadband access and usage in South Africa and other parts of the world. This discussion is happening within the context of the information society or the networked information economy as described by Benkler (Benkler, 1999). Theories and concepts describing this economy are widely publicised and referred to. This will form the basis of this study.

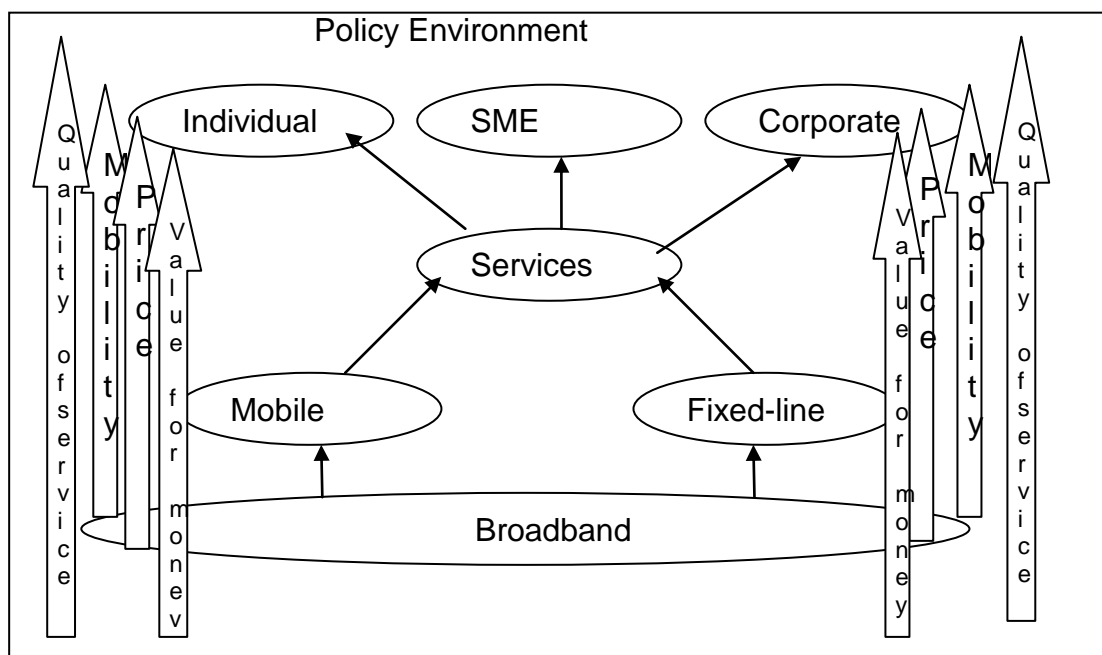
Individuals and organisations that have access to these networks are able to create and share or consume information better than those who are outside these networks. It may therefore be important for anyone who wants to be a significant player in this economy, whether socially, politically or commercially and otherwise to have access to these networks.

These networks are facilitated by a combination of ICT and information. Information is processed and transmitted through these networks at varying speeds, at a defined cost and at a certain level of quality. This information can be in the form of documents, voice, video, and graphics using multi-media channels. These progressively require high bandwidth and therefore broadband as opposed to narrowband.

The growth of broadband connectivity expands what can be transmitted across the World Wide Web and the internet. Coupled with the increasing levels of mobile internet connectivity, broadband may allow for a new round of changed patterns in the way computers are used (Sawyer et al, 2003). Mobility adds to broadband connectivity: anytime, anywhere, always on benefits (Sawyer et al, 2003). According to Benkler, work has also become mobile in the networked information economy (Benkler, 1999).

Hence, the information society perspective sketched here suggests that the conceptual framework for this study on mobile broadband should incorporate the application of the concepts of mobility and substitutability; costing and pricing of broadband services; and the role of policy to this changing landscape. These concepts and themes are inter-related and will enable an analysis of fixed-mobile broadband substitutability in the South African context.

Figure 1: Diagram for mobility and substitutability.



Source: *Moroeng , 2010*

The diagram above depicts the process of and the factors that could impact the access and use of broadband technology by different consumers, a consumer can be an individual, a Small or Medium Enterprise (SME) or a big corporate. The interest of the consumer is on the services accessed through the broadband technology, whether fixed-line or mobile. The choice of the technology is influenced by a number of factors, including, quality of service, mobility, price and value for money.

3.1 Problem Statement

The state-owned fixed-line incumbent has rolled out ADSL since 2002. The service is currently used by just over 600 000 consumers. On the other hand the two major mobile phone operators, Vodacom and MTN have rolled out 3G services and they have just over a million broadband subscribers, combined.

The government of South Africa has identified access to broadband as a significant factor in reducing economic inactivity, social imbalances and poverty. It is therefore important for the majority of the citizens to have access to broadband technologies and services. It appears like in South Africa mobile broadband is not used as a complementary broadband, to complement fixed-line, but for most people it is their primary broadband access technology.

It has since emerged that the price of broadband services, especially mobile broadband, may be prohibitive in terms of access and usage for the broader citizenry. We have already seen fixed-to-mobile substitution in voice services. Despite the perceptions of the high price of mobility and the varying reliability of the technology, little research has been conducted to review the trends in, characteristics of and reasons for fixed-to-mobile substitution in broadband services. It is of

significant value to understand how quality of service and pricing can affect the concept of substitutability. Can the South African citizenry access the same services, at a similar price as the developed world, which is mostly on fixed-line broadband, even though South Africa is mostly on mobile?

3.2 Purpose of the study

The purpose of this research is to explore the evolution of the broadband market in South Africa between the year 2003 and 2010, and to review the fixed-to-mobile broadband substitutability. The study will look specifically at pricing and quality of service as inhibitors of mobile broadband adoption. At the conclusion of this study, it should be possible to understand the depth and character of the trend of fixed-to-mobile substitutability in the broadband market and the role played by pricing and quality of service and the increased demand for data-driven services attributed to information society formation. Furthermore, the study will explore the role played by the policy and regulatory processes in promoting or inhibiting either fixed or mobile broadband.

3.3 Research questions

The central research question is:

To what extent does the pricing of mobile broadband, data demands and the perceived quality of service influence consumer bias towards either fixed-line or mobile broadband?

In order to respond to this main question, the following sub-questions will be investigated:

- To what extent is fixed-to-mobile broadband substitution taking place in South Africa?
- What trends in mobile broadband adoption are observable from historical academic research and market surveys?
- How does the demand for data access (volume, mobility) influence mobile broadband adoption?
- What factors influence user bias towards either fixed or mobile broadband?
- Are there any other factors?

3.4 Research methodology

This study will use a qualitative research approach. The qualitative approach is relevant when a detailed analysis of a situation or phenomenon is sought (Babbie & Mouton, 2001). This kind of study is described as one that involves the non-numerical examination and interpretation of observations, for purposes of discovering underlying meanings and patterns of relationship. Creswell defines qualitative research as:

An enquiry process of understanding based on distinct methodological tradition of inquiry that explores a social or human problem. The researcher builds a complex, holistic picture, analyses words, reports detailed views of informants,

and conducts the study in a natural setting. (Creswell, 1998). Creswell goes further to enhance this definition by defining qualitative research as a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. (Cresswell, 2009)

The above definition suggests that a qualitative study requires an in depth understanding of the society, the societal choices and the natural setting within which the choices are being made. This study will therefore seek to explore the societal experiences and choices relating to data access methods. The choices are based on certain strengths of the chosen method and the perceived weaknesses of the other, the study will seek to explore and describe these reasons. The proposed study will therefore offer an in-depth understanding of the issues around broadband usage and fixed-to-mobile substitutability.

An exploratory study will be conducted for this research project. An exploratory study is considered when the subject of study is relatively new (Babbie and Mouton, 2001), which is the case with this study. While other studies review the technological advances, especially in the developed world and the statistics around the usage of such technologies, this study investigates why society will choose one data access method over another. Babbie and Mouton argue that any research design should be based on the kind of evidence that would be required to meet the actual objectives of the study (Babbie & Mouton,

2001). It is clear that given the objectives of this study, it will be easier to achieve them if the researcher goes beyond the numbers and understand the issues raised. Qualitative research has certain qualities that make it appropriate for this kind of a study. Creswell (2009) describes these characteristics as follows;

- a) Natural setting – qualitative researchers tend to collect data in the field at the site where participants experience the issue or problem under study. The information is gathered by actually talking to people. Seeing them behave and act within their context is a major characteristic of qualitative research.

- b) Researcher as key instrument -Qualitative researchers collect data themselves through examining documents, observing behaviour or interviewing participants. Even though an instrument is used to gather data, it is actually the researcher who gathers the information.

- c) Multiple sources of data – Qualitative researchers typically gather multiple forms of data, such as interviews, observations and documents rather than rely on a single data source. The researcher then reviews all the data, make sense of it and organise it into themes.

- d) Participants' meanings – In the entire process, the research focus on the meaning that the participants hold about the problem or issue.
- e) Emergent design – the process for qualitative research is emergent i.e. the initial plan for the research cannot be tightly prescribed and, importantly, all phases of the research may shift as the researcher enters the field and begins to collect the data as the primary aim of the study is to focus on the participants' experiences.
- f) Interpretive – Qualitative research is a form of interpretive enquiry, in which researchers interpret what they see, hear and understand. Their interpretations cannot be separated from their backgrounds, history, contexts and prior understandings.

The above characteristics are important to note and understand for purposes of this study. The study on the broadband market in South Africa, focussing on the impact of price, QoS and any other factor on fixed-to-mobile broadband substitution is not based on any hypothesis. This study will only focus on the experiences of the consumers in their natural settings, which could be home or work or both. The researcher is the primary research instrument in data collection.

A semi-structured interview is used to gather information; the expectation is that the output will be descriptive. The set of questions in the interview will be used to gauge the participants' perceptions, experiences and attitudes in relation to broadband access, both fixed-line and mobile. Thereafter, the researcher will interpret the results and make sense of them. From the brief description and analysis of the qualitative research methodology, it would appear like the methodology would be appropriate for this study and therefore, the methodology was applied throughout the study.

The study will have elements of content analysis in order to describe the extent to which fixed-to-mobile substitution is taking place and to study the related trends. Content analysis is a detailed and systematic examination of a particular body of material for the purpose of identifying patterns, themes or biases (Leedy and Ormrod, 2010). Leedy and Ormrod captured the essence of what this part of the study seeks to achieve, which is to understand the themes, the biases and the patterns that characterises the trends within the broadband market in South Africa, which is either fixed or mobile.

The study seeks to further understand what kind of data is accessed by the consumer and what broadband services are being used: this will also be obtained through content analysis and the semi-structured interviews. The perceived QoS will be studied by analysing the problems consumers experience with the broadband connectivity. The

study will have elements of descriptive and interpretive studies. This will provide the researcher with a better understanding of a particular activity or process, which may then assist in future research initiatives (Babbie & Mouton, 2001).

3.5 The Research Design

The research will use a qualitative exploratory study, with elements of descriptive and interpretive analytical approaches. Data will be gathered through content analysis and in-depth semi-structured interviews. Babbie & Mouton (2001), argue that exploratory studies are conducted to satisfy the researcher's curiosity and desire for better understanding, amongst other reasons, which is the case in this study.

For the content analysis, the study looked at multiple specific research initiatives, as detailed in the background. These studies were reviewed from 2005 until 2010. The information they provide was supported by secondary data of existing reports and academic literature. For each year between 2005 and 2010, a few studies shed light on developments in ICT access and usage for that particular year. The research design therefore includes an analysis of data on the 2005 to 2010 timeline creating a foundation to analyse trends in ICT access and usage from which inferences about mobility and substitutability can be drawn.

For the household survey, the study selected Melville in Johannesburg. Melville is a suburban area situated on the North-Western part of the city centre; it is less than 10 km from the city centre. There are a number of tertiary education institutions in and around Melville. There are a sizeable number of SME's in the area; small research houses, restaurants, bed and breakfast establishments etc. These factors made Melville relevant for this study; the citizenry of the area is varied. There are low income earners e.g. students, middle income earners and high income earners and a sizeable number of SMEs.

In-depth interviews will be held with households Small, Medium and Micro Enterprises (SME's) that would be purposely selected. A household survey relating to Broadband access and usage was conducted at the selected sites. Employees of the City of Johannesburg were also interviewed. The objective was to look at how work influences the selection of broadband technology.

Annual reports for Telkom, Neotel, Vodacom, MTN and Cell C were analysed to identify trends in investments by operators in broadband, and usage of such services by consumers.

3.6 Sampling Methodology

Convenience sampling was used for this study. This is because a population with particular characteristics need to be targeted. 20 households were selected which included; mobile broadband users,

fixed-line broadband users and households who have both. Given the objectives of this research and the time frames, 20 interviews were adequate to provide reliable findings. The area which was surveyed for this study is Melville. This is because Melville has a representative population of students, mid to high income households and small businesses. This sample is not statistically representative and therefore this does not in any way represent the Gauteng or South African population.

It is critical to ensure that the sample selected would be able to provide answers to the research questions (Leedy & Ormrod, 2010). For the purposes of this study Melville was therefore convenient. Convenience sampling met the requirements of this study since it is an exploratory study, which does not seek to determine or confirm any phenomenon, the idea is to explore a phenomenon and look at trends related to it. The idea was not even to draw inferences about an entire population.

City of Johannesburg employees were purposely selected to participate in this research. Only 15 individuals in senior management positions were randomly selected as they would naturally have access to broadband which is funded by the City. The City of Johannesburg was conveniently selected as the researcher is employed by it.

Creswell, (2009) makes a point that participants in a qualitative research are purposely selected. Therefore as already mentioned

above, the intention is to explore the experiences of the selected individuals which the researcher believes will best help in understanding the problem.

3.7 Research Instrument

A semi-structured interview questionnaire was developed and used for the purposes of this study. This would gather information on;

- Whether the household has access to broadband,
- Whether its mobile or fixed-line
- Users' level of experience and usage
- The impact of pricing and QoS on broadband access and use
- Other factors supporting access and use of mobile broadband
- Perceptions of broadband market in South Africa

The research instrument was used to collect specific data as explained above. According to Leedy & Ormrod (2010), data collection in a qualitative study takes a great deal of time, which is what was experienced in this study. The data had to be recorded thoroughly, accurately and systematically. The researcher ensured that data collection were consistent with ethical principles as participants were informed of their rights in terms of participating in the research, this is recommended by Leedy & Ormrod, (2010). The data used can as such not be traced back to any individual.

3.8 Data Collection

Data for this study, as discussed earlier was collected using semi-structured interviews and the responses provided by the respondents forming the primary source of data. Specific questions were put to the respondents their responses recorded by the researcher on the prepared standard questionnaire.

According to Leedy & Ormrod, (2010), interviews can yield a great deal of useful information, provided they are done properly. To derive maximum benefits from interviews, Creswell, (2009) recommends that an interview protocol should be designed and used for asking questions and recording answers during a qualitative interview. The protocol should include the following components;

- A heading with date and place of interview
- Prepared questions which are part of the research plan
- Probing on the above questions
- Space between the questions to record responses
- A final thank-you note to acknowledge the time the interviewee spent during the interview

The study did not use any recording equipment but relied on the notes taken during the interviews. The answers were recorded verbatim as recommended by Creswell, (2009). Probing questions were asked where open-ended questions were used. Some of the questions were

mutually exclusive and therefore answers provided by the participants were enough.

3.9 Data Analysis

The process of data analysis involves making sense out of the text data obtained from participants (Creswell, 2009). Data analysis involves collecting the open-ended data, based on the questions the researcher would have asked the participants, and developing themes and pictures. The researcher will begin with a large body of information and through inductive reasoning, sorted and categorized it to a small set of underlying themes (Leedy & Ormrod, 2010) There is a data analysis process, suggested by both Leedy & Ormrod, (2010) and Creswell, (2009) which this study used. This assisted the researcher in following a logical pattern of building themes and deriving meaning from the text.

The process is depicted as follows;

- a) Organizing and preparing data for analysis; this involves typing field notes and ensuring that everything is documented.
- b) Read through all the data just to get the general sense of the information and obtain a general sense of the meaning.

- c) Identify general categories of the data, at this point the researcher would have an idea of what the general themes are and a sense of what the data mean.
- d) Integrate and summarise the data, this is where the relationships between different categories are described to even give a holistic meaning of the data.

Adopted from *Creswell, 2009 and Leedy & Ormrod, 2010*.

The above steps were followed in the analysis of the findings of this study. Themes were identified and they are presented in the chapter detailing the results of the study.

Setting

The study was limited to the South African environment, specifically Johannesburg in the Gauteng province. The study though looked at international studies, reports and analysis in order to be able to put the broadband market in South Africa in context. The study happened in an urban area as the subject of the study demanded that. The researcher ensured that predominantly the interviews were conducted in a natural setting; being the site of the participant, which was either work place or home. In cases where face-to-face interaction was not possible the interview was conducted either telephonically or the questionnaire was sent to the participant.

3.10 Significance of the study

It is important to realise that South Africa is lagging behind when it comes to both roll-out and usage of broadband; mobile and fixed-line. At the same time mobile broadband has taken the lead in terms of usage and roll-out. The question that is important is that is there a trend developing of fixed-to-mobile broadband substitution in South Africa.

The research may indicate whether mobile broadband can become a primary broadband solution for South Africa and the rest of the developing world, even though the rest of the world is on ADSL, fibre optic and cable modem. The study may also be able to highlight the challenges experienced by broadband users and issues that if corrected may improve their usage and experience of the technology. The results of the study may be made available to the Department of communication and the regulator to further enhance their policies and strategy on broadband.

3.11 Limitations of the study

The study was specifically an explorative look at the broadband market in South Africa. The focus of the study was on how pricing, QoS and any other factor may promote or inhibit fixed-to-mobile substitution. The

study focussed more on the services rather than technology and therefore weaknesses in technology were not discussed in detail.

The study did not focus on quantifying the degree of substitutability, but focussed more on the trends observed in data access methods in South Africa. The sample selected was only based in Gauteng and as such the study does not claim to have quantified the degree of substitutability in South Africa.

4 CHAPTER 4: INSIGHTS INTO BROADBAND, MOBILITY AND SUBSTITUTABILITY

4.1 Introduction

The study reviewed trends in fixed-to-mobile broadband substitutability in South Africa, drawing on multiple studies of Internet access, Online media, SME's and internet, mobility in South Africa, telecoms prices and a household survey conducted by Stats SA. All these studies were for South Africa as a whole.

In order to better understand the trends which appears to emerge from these studies and market surveys, the researcher conducted household interviews in Mellville, a predominantly middle-income area in Johannesburg. SMEs in this area were also interviewed. The assumption was that Mellville is a proxy for any predominantly middle-income area in South Africa. The choice of this particular area, is premised on the assumption that middle-income areas are more likely to use broadband internet access than low-income areas. This was the basis for the bounded nature of the study.

4.2 Content Analysis results

Internet access studies in South Africa and other reports, as detailed in the introduction, were analysed to gauge the extent to which mobile broadband has overtaken fixed-line. This part of the chapter will therefore present, in detail, the findings of the content analysis. The

results are presented per theme. The identified themes were the following;

- Broadband Internet Access and the Emerging Information Society
- Broadband Pricing and Services
- Mobility and substitutability

4.2.1 Broadband Internet Access and the Emerging Information Society

Internet access has seen a steady growth since 2005 (Goldstuck, 2008 & 2010). In 2008 the growth was even greater, according to Goldstuck, (2008); this was due to the extensive roll out of ADSL among SME's. According to Goldstuck, (2008) the context for such developments must also be seen in the light of the commercial Internet entering its 16th year in South Africa. From 1993 to 2005, it saw a significant transformation from a niche industry, only used by IT savvy individuals, to one that underpins the effectiveness of most industries. During 2006 and 2007, it became clear that it was an essential tool for staying in business, no longer a nice to have. From 2007, it became clear that the government was failing to make this important resource available to all communities across the country.

A study by Research ICT Africa found that the internet was of limited use in the communication strategy of households and individuals for a number of reasons; perception of its unreliability due to poor network quality, limited bandwidth and high costs or simply that people communicated with were not using the internet (Gillwald & Stock, 2008). The study found that 15% of households had computers, but only 5% had connectivity in South Africa. These findings upheld what the community survey found a year earlier; household internet access was at 7.3% and households with computers were at 15.6% in 2007 (Stats SA, 2007). According to Goldstuck, (2010) South African internet penetration has broken through the 10% mark at the end of 2009.

Internet access growth has seen a steady increase in the past 5 years, but the biggest challenge according to Gillwald & Stork, there is few people out there who know what the internet is, and even fewer who use it. The reasons given for this growth was the landing of the new undersea cable on the South African coast and the continued uptake of broadband by small companies.

Broadband technology was launched in South Africa in 2003, with the roll-out of the first commercial Asynchronous Digital Subscriber Line (ADSL) service by Telkom (Goldstuck, 2008). Since then South Africa has had a relatively poor broadband performance, even though mobile broadband take-up has increased steadily over the years. By the end of 2004 there were 51000 broadband users in the country (Goldstuck,

2010); this heralded a new chapter for internet access in the country. Broadband has been seen around the world as an important technology that improves internet access.

By the end of 2005, broadband access had grown to just over 170000 after the launch of iBurst, Vodacom 3G and the Mywireless service from Sentech (Goldstuck, 2010). However, broadband access in South Africa has remained very low as compared to other low-middle income countries (Gillwald, 2005), this despite the government's acknowledgement of the centrality of broadband infrastructure to modern economies and development (DoC, 2006).

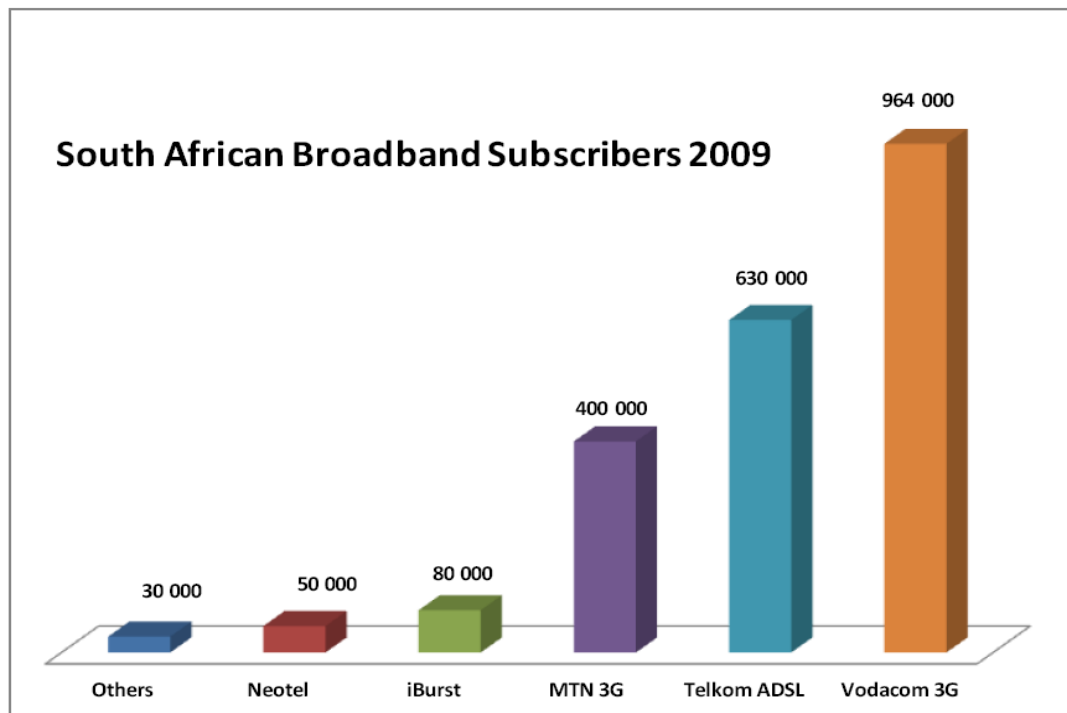
In 2006, the broadband penetration rate was about 0.7 per 100 inhabitants, which translates to about 313 000 broadband users (Gillwald & Stork, 2008). The story of broadband continued, and since the introduction of mobile broadband, the growth penetration rate improved dramatically as the paragraph below will show. The growth however slowed quicker. This was in line with international trends though, however international markets were maturing and therefore growth became a bit slow, the difference with South Africa is that the market is maturing quickly because of the high costs of the services, especially mobile broadband. This is partly because of the historical lack of broadband policy, the limited numbers of fixed lines to businesses and households, and an uncompetitive market (Abrahams & Burke, 2010).

It appears that one of the serious challenges to fixed-line broadband is the continuing decline of teledensity, the number of fixed-line telephones have been declining since 2001 (Gillwald & Stork, 2008). In 2001 there were 24.4 % of households in South Africa and by 2007; it was 28.7% (Gillwald & Stork, 2008). The trend was evident in the Gauteng province and the City of Johannesburg; the provincial percentage was 31.8 in 2001 and 24.4 in 2007, a dip of just over 7%, the municipal percentage was 33.9 in 2001 and 28.7 in 2007. This situation was put into perspective by Mark Williams cited by Goldstuck, (2010); by stating that the problem is a regional (Sub-Saharan) crisis as the region also has very limited coverage of the fixed line access telephone networks which have been used to provide broadband access in the rest of the world. The average fixed line penetration rates in the region currently lies below 2% and, in many countries, the number of fixed lines is declining as people switch to mobile telephones. The potential growth for ADSL is directly related to the number of telephone lines to business premises and homes.

Since the advent of broadband Telkom had connected 630 000 ADSL users by the end of 2009 (Goldstuck, 2010). MTN has about 7700 2G and 3G sites that cover 35% of MTN subscribers. Data products currently contribute about 12.4% to the revenue (MTN, 2008 Pg. 36), MTN did not report specifically on its number of mobile broadband users, but they are estimated to have been around 90 000 at the end of

2008 (Goldstuck, 2008). Currently MTN subscribers are estimated to be around 400 000 (Goldstuck, 2010), see figure 2 below. Vodacom on the other hand had 370 000 Vodafone data connect card users at the end of March 2008, by 2009 they had 720 000 subscribers (Vodacom, 2009 Pg. 9). This figure represents a 48% increase in the number of subscribers, year-on-year. At the end of the 2010 financial year the data users had grown by 29.1% and data traffic by 58.4% (Vodacom, 2010). These figures clearly indicate that there are currently more mobile broadband users than ADSL users. By mid-2007 there were about 450 000 broadband users in South Africa and Telkom had more than two thirds of the market (Gillwald, 2007). It's clear that the picture has significantly changed since then, putting mobile broadband way ahead of fixed-line broadband, where Vodacom is the single biggest provider of broadband services (Goldstuck, 2008).

Figure 2: South African Broadband subscribers



Source: Goldstuck, 2010.

A competitive landscape has emerged in South Africa, this is coupled with an aggressive approach by the new converged services operator; Neotel. The growth in broadband access is at the rate last seen in internet access in the mid-1990s (Goldstuck, 2010), even though this growth in itself is not satisfactory.

The infrastructure side of broadband is growing at an alarming rate for the South African market. The infrastructure is being developed by the national government, municipalities and telecoms operators. These improvements are increasing the available bandwidth, connection speeds, coverage and services that can be accessed through these networks. The experience of other countries shows that reducing the

cost of communications without increasing available infrastructure, will reduce the quality of communications to undesirable levels thus impacting negatively on the expected economic impact (Matsepe-Casaburri 2008). Greater investments in infrastructure therefore become unavoidable. The South African government has committed itself to lowering broadband costs, as clearly indicated by the paragraph below.

The South African government has committed itself through the government's economic cluster programme of action to benchmark themselves against the best with respect to, not only the costs of telecommunications services but also, quality, access to services, high uptake and usage of ICTs as a matter of priority over the next three years. In an attempt to bring costs down, the government has approved the building of the AfricanWest Coast Cable (A.W.C.C.) undersea cable, with Infracore at the lead and gave support to the NEPADs UhuruNet led by Baharicom as well as the UmojaNet terrestrial project, both undersea cables should be ready by May 2010 and will create a sustainable competitive international bandwidth market in South Africa, the region and the continent and is in line with the former President's (Thabo Mbeki) State of the nation's address statement on operationalizing that project in partnership with other governments and the private sector. (Matsepe-Casaburri, 2008)

Other undersea cable initiatives, Seacom and EASSy, are steaming ahead and these initiatives will also help in creating a sustainable competitive international bandwidth market in South Africa. By the end of 2013 there may be up to twelve undersea cables running along both the east and the west coasts of Africa, (Goldstuck A, 2009). According to Arthur Goldstuck, 2010, the two biggest changes in South Africa's connectivity environment in 2009, were both regulatory and physical; the granting of broader telecommunications licenses and the arrival of the new undersea cable. The EASSy cable was built at a cost of USD 265 million and is said to fill the missing link in Africa and South Africa's broadband link (Goldstuck, 2010). First customers were to be connected as from July 2010. These undersea cables will go a long way in lowering international bandwidth prices.

With the dawn of a newly liberalised era in legislation through the Electronic Communications Act and ICASA Amendment Act, talk of Infraco emerged in August 2006 when Government decided to retain the power utility, Eskom's telecommunications infrastructure and lease it to new entrant, Neotel, instead of selling it to them as originally planned (Gillwald, 2007) .The South African government has just legislated a formation of a state owned entity, Infraco, which would provide low-cost bulk broadband access to the service providers, first to Neotel and then the rest (Gillwald, 2007). Infraco has a mandate to play an important role in reducing the digital divide, specifically in the

provision of broadband, between the first and the second economy, by reducing the national long-distance connectivity prices.

Broadband Infraco is a state owned enterprise, which was formed by an act of parliament, enacted on the 8th January 2008 (RSA, 2008). The objectives of the company are set out in the act and they are to expand the availability and affordability of access to electronic communications including but not limited to underdeveloped and underserviced areas, in accordance with the electronic communications act and international best practice (RSA, 2008).

A number of major South African cities are in the process of rolling out fibre optic cables across the cities to provide broadband access first to the relevant city's operations and then to small businesses at reasonable prices. All these projects will increase the country's broadband capacity.

Broadband connectivity is of no use if there is no content. A study by Nielsen online showed that South Africans are spending time online (Nielsen, 2008). Minutes spent online increased by 45%, from 2.6 million hours in 2007 to 3.8 million hours in 2008 (Nielsen, 2008). The Nielsen study indicated that there are more people online and they spend longer, viewing more content. Nielsen online agrees with the Online media study conducted by Arthur Glodstuck of World Wide

Worx. The study also found that South African advertisers are developing confidence in the online medium (Goldstuck A, 2009a).

Online advertising is said to have grown by a whopping 32% in 2008, coming from a big growth of 27% in 2007 (Goldstuck, A 2009a). South Africa's online advertising market was the fastest growing market globally among the English speaking countries. Annual spending grew from R60 million in 2005 to R319 Million in 2008, further indicating the fact that business is starting to realise the appeal of the internet and online media, especially given the fact that users have grown as well. The only country that had a better growth than South Africa was Brazil, 45% in 2008. USA and Canada outpaced South Africa in 2006 and 2007, but fell below the 30% mark in 2008, admittedly due to recessionary pressures (Goldstuck, 2009a). The three big industries that support the online advertising medium actively are finance, insurance and the automotive industries, they each provide advertising to 80% of online publishers (Goldstuck, 2009a). Even though the products they sell are not generally bought online, it is strongly believed that purchase decisions in these three sectors are first researched online.

4.2.2 Broadband and SMEs

SMEs are a significant portion of registered entities in South Africa. They account for 96% percent of registered entities (Goldstuck, 2009c).

Given their prominence in the South African business landscape, they are very important for social and economic development (Herrington M & Kew J, 2009). Annual sampling has revealed that 90% of these are connected to the internet.

SME internet connection is still predominantly on ADSL, which was at 73% of all SME connections at the end of 2008 (Goldstuck, 2009c). This was a further 10% growth from 63% a year earlier (Goldstuck, 2009c). Mobile broadband account for only 8% of the connections, which is a 3% decline from 11 % a year earlier (Goldstuck, 2009c). Dial up continued to decline, from 8% 2007 to 4% in 2008, further indicating the death of dial-up (Goldstuck, 2009c). In the three years preceding this study, mobile broadband had shown robust growth. This according to Goldstuck, (2009c) may be an indication of that mobile broadband does not meet SME's needs to the extent that ADSL does, from both a cost and performance view. Generally the costs of broadband in South Africa are seen to be exorbitant for small businesses (Herrington M & Kew J, 2009).

4.2.3 Broadband Services, Pricing and Service Quality

The data market in South Africa has evolved from the time of fixed-line dial up connectivity to the high-speed mobile broadband connectivity. This evolution has facilitated and made easier some of the services that are important to consumers. Services in these areas are the most

common; banking and transactions; hospitality, tourism and accommodation; online media; education and training; personal services (health, lifestyle, etc.); electronic government; electronic commerce and social networking.

This brief overview of the data market illustrates the significant services that are enabled by internet connectivity. Broadband access to the Internet facilitates even a wide range of services and applications that are difficult to configure or inconvenient to use in a narrowband environment. The services include, but are not limited to the following; e-learning; an interactive learning process for students, and also tele-medicine. Tele-medicine is currently being piloted in the Free State (IT Web website, 2009), where patients in rural areas may be diagnosed without having to travel to the hospital itself, which is generally in a town or city. MTN SA Foundation will be spending more than R4 million on providing bandwidth to four primary healthcare telemedicine workstations, which are being opened in the Free State (IT web website, 2009).

The above services are examples of what would be difficult to render in a narrowband environment. Broadband has capacity to allow for interactive communication at required levels of quality, giving a customer an experience similar to face-to-face interaction.

Research has proven that service quality is not always at required levels, especially in mobile services. It is argued that one of the strengths of fixed services is superior transmission quality (Rondini et al, 2003).

The prices of broadband, both mobile and physical-line indicate that Fixed and Mobile Broadband services are expensive for an average South African. In order for us to clearly show the difference in costs, we will look at the broadband costs for a home user. An assumption that a home user will use about 3 gigabyte is made to illustrate the point we are making on costs. The costs for mobile and fixed broadband will be separated for each class of users.

From the packages offered by different network operators, 1 Gb of data will cost R72 from Telkom's fixed line services, R100 from Neotel, mobile offerings will cost R266 per Gb from Vodacom, R216 from MTN and R163 from Telkom's mobile offerings (Vodacom, Telkom and MTN 2009) Fixed-line broadband is still cheaper than Mobile broadband by as much as 100%.

In 2005 a study was conducted by Genesis Analytics, commissioned by the South African foundation, which later changed their name to Business leadership South Africa, to look at telecoms pricing. This study revealed that South African broadband products were the most expensive amongst the 15 comparator countries. South African

business ADSL product was more than 9 times more expensive than the cheapest country surveyed and 100% more expensive than the average price. In 2007, business broadband in South Africa was the third most expensive amongst the 15 surveyed countries and it was 127% higher than the average price (Genesis Analytics, 2007). The retail offering was no different; it was 8 times more expensive than the cheapest country surveyed (Genesis analytics, 2005), in 2007 nothing had changed significantly, it was about 139% more expensive than the average price in the comparison group (Genesis Analytics, 2007). This was despite the fact the products sampled from comparator countries had a substantially higher specification than the Telkom ADSL. The maximum ADSL speed locally was 1 mbps at the time, and the comparator countries were at least 1.5 mbps (Genesis Analytics, 2007). The majority of the comparator countries were at least on 2 mbps ADSL speed (Genesis Analytics, 2007).

A similar picture was painted by a senior economist Mark Williams, in his attempt to put the South African situation in global context, cited in Goldstuck, (2010), that;

The average retail price for basic broadband in Sub-Saharan Africa in 2006 was US\$366 per month, compared with US\$6 - US\$44 per month in India. Typical prices for entry level broadband services in Europe average around US\$40 per month, falling as low as US\$12 per month in some European

countries. The region also has very limited coverage of the fixed line access telephone networks which have been used to provide broadband. (Goldstuck, 2010)

This picture hasn't changed much; South Africa still has some of the most expensive broadband offerings in the world.

There has been price reduction on the ADSL product between 2005 and 2009 (Goldstuck, 2010). The 1 to 4 mbps ADSL product cost about R680 per month in 2005 and it reduced to R413 in 2009. The reduction looks significant, but this is still un-affordable for an ordinary consumer.

4.2.4 Mobility and Substitutability

Mobility has become an integral part of the South African society, and therefore to discuss internet and content and not bring in mobility won't be adequate. Studies have found that 16% of banking customers use the internet for banking, yet 28% use their cellphones (Goldstuck, 2009b). It is therefore safe to believe that there are more cellphones in the South African households than computers. A community survey by Stats SA have confirmed that in 2001 there were 466 313 households with cellphones in Johannesburg as compared to 166 696 with computers, and in 2007 there were 950 768 households with cellphones and 303 540 with computers. Both have significantly increased but cellphones are now in 81% of the households whereas

computers are in 26% (Stats SA, 2007). In actual fact, by the end of 2008 cell phones were in 114% of households in South Africa (Goldstuck, 2009b). This further illustrates that mobility is very much part of the life of a South African.

According to Goldstuck, (2010), ADSL was overtaken by wireless broadband at the end of 2007. Since 2007, wireless broadband has grown more rapidly than ADSL, and has opened up a gap over ADSL in terms of market penetration. There are over 1 million mobile broadband subscribers, dispersed across all mobile broadband network operators, as compared to just over 600 000 ADSL subscribers (Goldstuck, 2010).

The pervasiveness of mobile phones has addressed the access gap and not necessarily the usage gap (Gillwald & Stork, 2008). This is due to the high cost of the services, the report concluded. Gillwald & Stork (2008), further make the point that equally, the phenomenal growth of the mobile telephony haven't addressed the divide between those who are able to access the internet and other high bandwidth interactive services and those that do not have access to such services. Further highlighting the need for powerful and easy to use mobile data services, by consumers (Goldstuck, 2009b). Studies have proven that as the services get a bit more complex, this inadvertently excludes some individuals with access, but lack the necessary skills and knowledge (Gillwald & Stork, 2008).

4.3 Household and SME Survey Results

The results from the household surveys are presented as per the category of questions; in support of the themes presented above,

1) Choice of broadband access

This set of questions sought to investigate the type of broadband access that a consumer has, and to further investigate the reasons for a particular choice, whether fixed-line or mobile, and in certain instances dual access. The question considered all sites, whether home or work. This set of questions further highlight issues of mobility and substitutability.

2) Household income and choice of broadband access

These questions were to evaluate if there is a correlation between the income and the level of usage of either broadband technology. Furthermore, to look at the relationship between income and the kind of services that a consumer uses regularly. This set of questions further highlight issues of broadband services and pricing.

3) Individual and household broadband usage

This set of questions sought to obtain from the participant information relating to what the participant or his household uses their broadband access for. To also relate the access type, fixed-line or mobile, to the kind of work performed by the participant. To further investigate if the household's lifestyle has

any influence on the choice of broadband access. This set of questions also sought to investigate issues of mobility and substitutability.

4) Experience of broadband and related services usage

This set of questions sought information related to the services the consumer uses, what those services are and how easy and efficient is the use of those services, in relation to connectivity. To further investigate the problems experienced by the participant, that impacts the participant's use of broadband. This set of questions investigated issues of substitutability and mobility in relation to quality of service.

5) Other factors affecting individual broadband usage

This question was open-ended, to allow the participant to mention any other factors he may not have mentioned that impacted his ability to use broadband or general issues that he perceives as having an impact on the use of broadband in the country.

4.3.1 Choice of broadband

Table 4.1: No of respondents with access to broadband

Response	Value	Percentage
Home (including mobile)	5	14
Work (including mobile)	20	56
Another location	1	3
Both work and home	7	19
None	3	8
Total	36	100

Source: Household survey 2010

The majority of the participants indicated that they had broadband access. Only three indicated that they did not have access to any broadband technology, two however indicated that they do have access to the internet at another location; institution of higher learning and internet café. There was no evidence to suggest that this access was however through a broadband connection or not, but for the purposes of analysis, the access was regarded as a normal internet access through a normal telephone line from the fixed-line operator or a leased line. The other participant without any broadband connection was a pensioner who regarded “internet and computers” as resources for younger people. She believed these new technologies are not safe and thus she still prefers doing her banking the good old way, if she wants anything she walks to the shops. This particular response was captured in order to qualitatively analyse it to make a point which is relevant to this explorative study.

The majority of the respondents (56%) do have access to a broadband connection, but this is through their employers. Another 14% have access at home. Only 7% have access both at work and at home. Work or home does not in this case mean a physical line at home or at work, it indicates who carries the cost of the service; the household or the employer. These statistics therefore include both mobile and fixed-line broadband connections. Where respondents were not certain if their workplace fixed-line connection was a broadband connection that was regarded as normal internet connection, which was the majority of the respondents. As an example some of the CoJ respondents indicated that they had fixed-line broadband at work, which is not the case as the City is only now rolling out its broadband network.

The overwhelming majority of the respondents agreed that access to broadband is a necessity for the modern day employee and citizen, and it should not be a problem whether the access is at work or at home or even at another location, so long as citizens, including the unemployed and marginalized have access.

4.3.2 Choice of Broadband Access

Households & SMME

Table 4.2: Households and SMME's who use either fixed-line or mobile broadband

Response	Value	Percentage
Fixed-line	3	14
Mobile	9	43
Both	6	29
None	3	14

Total	21	100
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Source: Household survey 2010COJ employees

Table 4.3: CoJ employees with access to broadband

Response	Value	Percentage
Fixed-line	0	0
Mobile	15	0
Both	0	0
none	0	0
Total	15	100

Source: Household survey 2010

Table 4.2 represents the results of the household survey conducted in Melville; Johannesburg. A substantial majority of the respondents undoubtedly have access though mobile broadband. Only three respondents had access to fixed-line broadband. The reasons for this will be explored further in the study. Furthermore, there are 6% of the respondents who had access to both fixed-line and mobile broadband. It is also worth noting that two of the three respondents who have access through fixed-line broadband are SMME's and four of the six who have dual access are also SMME's. It seems like SMME's are starting to realise the importance of broadband access as a fundamental resource in their businesses.

Table 4.3 is a presentation of the results of the interviews conducted with the CoJ employees. This part of the study sought to evaluate the extent to which organisations; public or private, uses broadband to enhance competitiveness or service delivery, and thus the Coj was conveniently selected for this purpose. All COJ senior officials selected (100%) were provided with mobile data access cards or laptops with an internal mobile data access card.

This question was aimed at determining why an individual would choose a particular broadband access technology over the other i.e. why would one choose fixed-line broadband over mobile broadband and vice versa. It should also be noted that the question called for both positive and negative reasons that would influence a respondent choosing one broadband access over another, i.e. a respondent would raise positive factors about their choice of broadband and negative factors about the one they do not prefer. Respondents identified a number of reasons which included; affordability, customer service, simplicity of installation, speed, convenience, mobility and company subsidy/sponsorship. Each respondent was allowed to mention as many reasons as it applied to them.

All the respondents who have access to mobile broadband, either from work or home, mentioned mobility as the primary reason they use mobile broadband. Mobility represents that always on connection, anytime and anywhere, which is capable for progressively high bandwidth transmission and capable of providing quality and fast access to multi-play services. The convenience of mobility is therefore seen as an important factor in influencing the adoption of mobile broadband access technologies.

One of the other factors mentioned by most of those who use mobile broadband was the fact that mobile broadband is easily available. One

can walk into a store and walk out a few minutes later with access to mobile broadband. A perception exists out there that application for fixed-line access is cumbersome and waiting periods are generally long, this emanating from the fact that most South Africans do not have a fixed-line telephone at home. Mobile billing also came out as more reliable as mentioned by some of the respondents. Variety of packages and options including pre-paid options were also hailed by a number of respondents as a factor in deciding what one will choose.

The senior managers surveyed were all provided with 3G cards by the CoJ to ensure that they have access to work systems after formal working hours. This is meant to facilitate efficient service delivery in case serious service delivery issues are raised after working hours. Senior managers should have access not just to work systems, but should be able to communicate with each other if there are decisions to be made. All the senior managers were therefore provided with mobile broadband access technology in order to facilitate access from anywhere outside the CoJ offices. To enhance this process senior officials were also provided with mobile phones for ease of discussions should a need arise. The process above may not require the input of the employee, and such may not go down as the choice of the individual, to either select mobile broadband or fixed-line broadband, but access to mobile broadband and the convenience it offers has convinced most of the individuals to consider a mobile broadband package of their own.

The choice of fixed-line broadband by three of the respondents had largely to do with costs. Mobile broadband was perceived to be way too expensive and out of reach for most telecommunications services consumers. The respondents would use fixed-line access every time they are in the office and change to mobile when they are not office-bound. Two of the respondents admitted that since they had access to a mobile broadband technology, their usage of fixed-line broadband had reduced.

At least two of the respondents mentioned that they struggled with obtaining an ADSL line from Telkom for some time until they decided to then opt for a more expensive option because it was easily available and was easy to install and could provide an added advantage of mobility.

This question is follow-up on the previous question, which sought to investigate if there may be a well thought reason for having dual access or it may just have been a coincidental occurrence. As mentioned previously, six respondents (29% of the sample) were found to have access through both fixed-line and broadband data access methods. Their reasoning varied from just a coincidence to a well thought approach to broadband access, which as mentioned previously have something to do with costs, quality and availability of the services. One of the respondents made a point that by the time he got a job at an organization that provided broadband access technology as a tool

of trade, he already had a fixed-line broadband connection at their house which for him explains the dual access. Further to this the respondent made a point that he only uses the mobile broadband access provided for accessing work systems and communicating with colleagues only. For private and personal access he uses the fixed-line broadband. He further suggests that connection is generally better with fixed line except when there is inclement weather.

A point was made earlier in this chapter that most of the respondents with dual access and usage is SMME's. The factors influencing this situation is firstly redundancy, an individual would always like to be connected even if there is a problem with the other connection. For a small business this is important in order to be in constant contact with suppliers and clients. Secondly, mobile broadband is quite expensive and therefore it is only used when necessary, i.e. when one is not in the office, some of the respondents further admitted that mobile broadband usage is further exceeding their fixed-line usage.

4.3.3 Household income and choice of broadband access

Table 4.4: After-tax monthly household income & monthly usage

After tax income per month	Total number of respondents	Number of respondents with broadband	Mobile	Fixed-line	Monthly usage(Average)
R5000 or less	4	1	0	1	R100
R5000 - R9999	2	2	2	0	R400
R10000 - R14999	2	2	2	0	R400
R15000	4	4	4	1	R600

- R19999					(Mostly subsidized by the employer)
R20000 and above	18	18	17	3	R600 (only one not subsidized)
SMME	6	6	5	4	R800

Source: Household survey 2010

Table 4.4 depicts the spread of broadband access and broadband services usage, represented in amounts, among the respondents given their income. The average monthly usage represents an average of all the respondents in each income bracket. It is therefore possible to find an SMME who use less mobile broadband data per month, and therefore pay less than an individual in the R15000 to R19999 income bracket. These averages were taken from the figures given by some of the respondents, as not everyone provided a figure and therefore they are only indicative.

From the picture presented by table 4.4 it appears that the usage is related to income, yet at the same time it appears there is no discernable correlation between income and the kind of broadband access method. The results indicate that most of the respondents are on mobile broadband which is largely subsidised by their employers and therefore the costs are not theirs, but that still impacts on what they can do because an employer, which is the case with the city of Johannesburg, cap data use to a certain limit. When an individual goes out of bundle the costs accrue to them.

The majority of the respondents appear to be earning over R20000. This is influenced by the fact part of the sample was selected from the senior management team of the CoJ. Nevertheless it still appears that even when one discounts the CoJ participants, the picture does not change much. This is because the sample was selected from a suburban area where income levels are a bit higher as compared to townships and rural areas.

Most of the users have set a limit on their broadband use especially those who use mobile. The majority of the respondents indicated that they only use their data bundles and they try not to go out of bundle. Prepaid users indicated that they only purchase data bundles when they need to access data for something quite important. Even some of those who use fixed-line only use the in-bundle data. The usage increases slightly as the income levels increase. Those who have are able to use a bit more data than others. It is also important to note that the higher the income levels, the more subsidies from the employers.

SMME's appear to use, on average, more data than most users. The average usage per month is around R800. The highest usage by an SMME's came at R2000 by one SMME whose income from the business is about R200 000.

Several respondents, seven, indicated that their usage is not affected by how much they earn, but when one looks at the services they use,

they are not bandwidth intensive and thus it makes sense that they haven't considered costs as yet.

4.3.4 Individual and household broadband usage

The value of a broadband connection is derived from the services that a telecommunications consumer can access. The question drew primarily three answers from the consumers. All the respondents with broadband access use their connection for work, internet and email. As already shown above, the majority of the respondents obtain their broadband access from the employer. The primary use of such access is therefore work related. As previously mentioned in this study, work has become mobile and office is not limited to four walls of a building, it can literally be anywhere, and that's basically what corporates and government institutions would like to create.

The second most use of broadband is internet access. Internet access came second after work given the fact that there were CoJ employees purposely selected for this study. The participants use their broadband connection to access the World Wide Web and where necessary download information, in certain instances where interactive communication and services are possible, then individuals can upload information as well. Furthermore the majority of participants use their access for communications, which is mostly email and VoIP.

The question drew similar responses from SMME's, but there were other specific functions they raised which for them is the reason they have the access. All the six respondents admitted that always-on internet access and access to their suppliers and clients is a fundamental in their business. SMME's further use the service for communications like all the other users.

Other respondents use broadband for recreational purposes which may include online gambling, sport betting and video and audio streaming of international television and radio stations. The use for a number of users is primarily for leisure.

Most of the individuals who participated in this study are employed in one way or another. Only 3 respondents were students who were not employed at the time of this study. The rest of the other participants were either employed by government, corporates or were self-employed, running SMME's. These individuals had varying responsibilities as far as work is concerned. It was thus important to find out from respondents if their work had anything to do with the fact that they had broadband first, and then fixed-line or mobile. The most of respondents admitted that the kind of work they did required that they access the internet regularly for research purposes or to communicate with clients and consumers by posting something on the internet. Have to have access to work systems from anywhere in the

world, of which generally the employer provide a mobile broadband device for this purpose.

The majority of the respondents who work in the services economy admitted that it will be difficult to effectively participate if one is not online. Whether is a manufacturing business, a health business or a consulting business one needs to constantly communicate with suppliers and customers? Individuals are constantly on the move and therefore it is important for them to have an always on access.

One of the respondents work for a telecommunications company and their offices are connected to broadband. This enables the head office to communicate with regional offices and other offices in the continent, without any one having to travel. The organization uses a lot of video conferencing over broadband in order to communicate decisions or to have discussions that may have an impact on the business as a whole.

Table 4.5: Household lifestyle influence on choice of broadband

Response	Impact	No impact
Fixed-line	2	6
Mobile	24	4
School going children (Y/N)	26	n/a

Source: Household survey 2010

The question sought to investigate if the regular household activities by individual members of the household; parents and children, and also those activities undertaken by the household as a whole have any impact on the choice not to have broadband access or a choice to have

either fixed-line or mobile broadband access technologies. The first question above revealed that only five respondents (14%) had access to broadband at home. In order to give a better picture, the researcher then posed the same question to those who have broadband access at work to respond to the same question. The question was posed to them in this way: "How do you think that your household's lifestyle will influence your decision to either have access to broadband at home or not, and if you do, to then decide between fixed-line and mobile?" the results were consolidated, and table 4.5 reflects those results. 28% of the respondents indicated that their life style would not have any impact on their choice. Their choice is coincidental and therefore there is no well thought process that leads to a particular decision. An overwhelming majority, 72% indicated that their lifestyle either influenced their choice or it will, the day they decide to obtain broadband access at home.

It is important to note that 100% of the respondents who believe that their lifestyle does influence their choice to have broadband and also whether to have fixed-line or mobile, have school going children, either primary, high school and even tertiary institutions.

Only one respondent indicated that broadband access was not important to them. Nevertheless all respondents see the importance of having access to any form of broadband access technology. One of the respondents with fixed-line access indicated that he Works from home

and generally does research and prepares his work from there to only leave home to the client for presentations. The fact that he is generally based at his home office and the nature of his job and life, both influenced his choice of fixed-line broadband. The overwhelming majority of the (72%); respondents who believe that lifestyle does have influence, raised a number of issues that would affect this choice.

Firstly school going-children have educational requirements that necessitate that they regularly conduct research. A significant part of the school work is done by the child at home with the help of parents or guardians. If the household have no form of access to the internet at home, the parents would generally take these to their workplaces to further research and finalise. Furthermore the respondents indicated their kids' school communicates key activities and dates via the internet, and therefore access from home is important. Other respondents made the point that mobile broadband access makes sense because one doesn't have to be physically at home to be able to access such important information.

A few of the respondents have friends and family across the world, in the UK, US and across Africa and this necessitates broadband access, to be able to keep in touch with friends from anywhere across the world. For others is the need to always be kept abreast of new developments and to be able to communicate with the rest of the world. Interest in tracking global stock markets performance and global events

make broadband attractive to some. The idea of freedom and not being restricted and the fact that one enjoys regular updates, especially through video, using the broadband connection encourages households to obtain mobile broadband.

Sometimes one has to attend shows and webinars online and broadband facilitates this efficiently. For some is only the convenience of knowing that if you want access you can have it; an always on connection that is capable of increasingly high bandwidth connection, which is capable of multi-play services.

South African households generally have a number of homes one in the big city and another, usually parents' home, in the rural areas or townships which may be in another province, and therefore the flexibility of access is important. Others have holiday homes in other provinces and therefore a mobile broadband access is preferred, as one takes it to the other location without any technical, commercial or administrative hassles. Even when the entire household goes on holiday they are not entirely offline as they can check updates, especially if they are running a business that they left in the hands of someone. Communications can be in the form of data, video or audio files. Holiday bookings; flights, restaurants, accommodation etc. are booked online, and the faster the connection the better.

4.3.5 Experience of broadband usage

	Internet Services							
Responses	Social networking (Facebook)	Online Banking	Online Shopping	News Updates	gaming and gambling	VoIP	Download huge files (movies)	Research
No of respondents	33	31	20	19	2	6	3	31
Percentage	92	86	56	52	6	17	9	86

Table 4.6: Regularly used internet-based services

Source: Household survey 2010

Table 5.6 depicts the services commonly used by the respondents with broadband access. The respondents have listed about twenty services that they access through their broadband connection, some of the services listed included, banking, research websites e.g. Google scholar, search engines e.g. yahoo, Google and ananzi, online shopping websites like Kalahari and bid-or-buy, you-tube, online databases, Facebook, Skype, Gmail, lifestyle websites like discovery vitality, news websites and channels, online share-trading, Wikipedia and many more. The services were grouped and depicted on table 5.6.

It is clear that overwhelming majority of the respondents (92%) use their connections for social networking, especially Facebook. Other major services accessed are online banking and research at 86%. News channels and websites, which include sports website and news agencies, appear to be accessed regularly by 52% of the respondents. This is no way an indication that these are the only services accessed, but rather some of the major ones. The services accessed by the

respondents are over and above work requirements for those who obtain their access from work, which is the majority of our respondents.

Bandwidth intensive services which are convenient to access on a broadband connection like; VoIP, Online gambling and any downloading of large files, which can be anything from large documents, voice recordings or video appear to be used by only a small percentage of the respondents; 6 % for online gambling, 9 % for downloading large files and 17% for voice over broadband.

The usage of the broadband access services has proven to be plagued with access, cost and other problems. A substantial majority (90%) of the interviewees agreed that there are problems that beset broadband access in South Africa. Some of the major challenges regarding fixed broadband are coverage, inclement weather, cable-theft and customer service.

Coverage; fixed-line broadband connections are not available everywhere. One of the respondents made a point that in his attempt to put a broadband connection at his home in the rural areas of Limpopo, he was informed the line was too far from his household and therefore the cost would be too high. Hence it became impossible to make this service available to his siblings and parents who live in rural Limpopo. Poor teledensity was highlighted by one of the respondents as the main cause of poor ADSL coverage as the total market potential for ADSL is determined by the total number of fixed-lines in the country

Inclement weather; about three respondents who have access to fixed-line broadband raised an issue of inclement weather. It appears that when there are heavy rains or thunderstorms telephone connections, including ADSL connections are affected or connection is lost.

Cable theft; Telephone copper cables are regularly stolen in South Africa and sometimes it takes a bit long for the fixed-line operator to fix or replace the cable. This negatively affects broadband connections, as much as it does voice lines.

Customer service; two of the respondents with access to fixed broadband make a point that sometimes it takes the fixed-line operator a long time to attend reported faults. A point is further made that communication sometimes is lacking if a fault was not repaired the first time around. Furthermore a point was made by two mobile broadband users that they opted for mobile broadband after numerous attempts to arrange broadband access with the fixed-line operator yielded no results.

Three major problems were raised relating to mobile broadband access. These included costs of the service, coverage and the speed. Several of the respondents raised the issue of erratic connection, which this study will regard as a problem of coverage for purposes of analysis.

Costs; All the respondents with mobile broadband access raised the issue of price as the main problem. Most of the respondents indicated that it generally appeared like their data bundles deplete too quickly,

this may be a clear indication of the high costs of the service. The general consensus was that the price was too high when compared internationally. Even though the question of uptake and the rate thereof, was not specifically asked, most of the respondents blamed the high price of mobile broadband for the poor uptake.

Coverage/Network capacity; Mobile data access network is said to cover the majority of the big cities and towns, yet sometimes within a city or a town the coverage is not up to standard, and therefore one experience a lot of dropped calls and broken connections in the middle of a download session; this was raised by the majority of the respondents. Some of the respondents refer to this as erratic connection, some refer to it as speed and it is a big part of quality of service. This is the biggest network related problem experienced by subscribers of mobile broadband access.

Long-term contracts (24 or 36 months); one of the major challenges raised by the respondents as well, is the long service contracts. The pre-paid option exists but it is still a bit more expensive if you look at real price per megabyte. Meaning that heavy data users would still prefer a contract as it offers better rates. It is true that respondents would like to have the pre-paid flexibility, with price benefits of a long-term contract. The challenge is that some of these contracts come with equipment like data cards and laptops; which become obsolete before the end of the contract.

Table 4.7: number of respondents with broadband problems

Broadband access method	Problems (number of respondents)-seldom	Problems (number of respondents)-regular	None
Fixed-line	5	1	2
Mobile	13	12	2

Source: Household survey 2010

As mentioned above, a substantial majority (90%) of the interviewees agreed that there are problems that beset broadband access in South Africa. The problems are not just limited to fixed-line or mobile broadband access technologies or service providers. Only 2 out of 8 of respondents (25%) with access to fixed-line broadband indicate they haven't had any problems with their access or service provider. One of the respondents made a point that the problems were related more to customer service than the technology itself and therefore he felt it wasn't a problem enough to mention. 75% of the respondents have had problems with their broadband access, yet only one respondent (12%) feels the problems occur regularly enough to cause frustration.

Out of the 27 respondents with access to mobile broadband, only two respondents felt they had no problems with their broadband connections. An overwhelming majority of these respondents (95%) have had problems with their broadband connections. About half of these respondents felt that the problems were regular enough to cause

frustration, and just over half of the respondents felt the problems were there but it was only seldom, and therefore were tolerable. An interesting point that was noted was that the individuals who did not have problems had very low usage.

The challenges mentioned above had different effects on users. For just less than half of the respondents, the identified challenges haven't led to any change in the pattern or level of usage. It is important though to note, that some of the respondents did however mention that if some of the challenges raised, regarding broadband access were not occurring they could probably use the services more than they currently do.

Just more than half of the respondents indicated that due to the erratic nature of the connection or the unavailability of the network they try, where possible, to access the internet-based services they would like to access during off-peak hours, where network congestion has reduced because there is less network traffic as compared to peak hours. Telecommunications operators have over the years introduced reduced rates to stimulate off-peak access and usage, in order to alleviate pressure on their networks during peak hours.

One respondent is seriously considering not renewing his mobile broadband access contract when it expires. The frustration is mainly caused by perceived poor network capacity and coverage. This is

however an individual choice that cannot be extrapolated to the entire selected population, but it does however bring to the fore, some of the frustrations of the consumers when it comes to mobile broadband, and some of the measures they are willing to take, to show their displeasure.

Only two respondents confirmed that due to challenges with customer services at the incumbent fixed-line operator, they opted to take mobile broadband subscriptions with one of the mobile operators. It appears that our respondents, independent of each other, wanted to apply for broadband access, at different times, with the fixed-line network operator, but their efforts yielded no results. Until such time that they walked into a mobile service provider's service point and in no time they had access to broadband through mobile broadband data cards.

After looking at all the challenges that were raised by the respondents, a question was asked which sought to investigate what the respondents considered to be the biggest stumbling block to broadband access and usage. Respondents were allowed to mention more than one factor. These factors were grouped and out of the factors raised, these four came out on top; Price, Quality of service (QoS), Speed of mobile access, ADSL coverage (Teledensity).

The respondents, as mentioned earlier, felt the cost of broadband is too high including ADSL costs. Secondly they felt that the quality of the

service is questionable especially mobile broadband services, yes; there are pockets of satisfaction, but in the main consumers have serious issues. Generally mobile broadband is perceived to be slower than advertised speeds, and this is seen as a quality of service issue.

The biggest stumbling block to affordable broadband access in South Africa is teledensity. The potential for ADSL growth in South Africa is just about 5 million telephone lines.

4.3.6 Other factors that could improve usage

Table 4.8: Other factors that could improve access and usage patterns

Responses	Education and awareness	Relevant content	Equipment	Price	QoS	Coverage
number	6	3	2	12	10	8
Percentage	17	9	6	34	28	23

Source: Household survey 2010

This question investigated if the respondents had any other issues they feel inhibits their usage patterns and therefore broadband growth in this country. The respondents were allowed to mention more than one factor. The question didn't however specifically request the respondents to enumerate issues that affected access, but the respondents went ahead to even mention such issues. The answers were accommodated in the analysis. Table 4.8 represents how the respondents saw the issues. Even though some of the responses provided were repetitions e.g. pricing. Pricing seems to be foremost in most broadband users' mind, indicating how significant a hindrance it

could be, coverage and network availability. It was also raised once more that the fixed-line incumbent takes time to resolve queries. Only issues which were not discussed earlier in this report will be discussed further.

The three main issues which were identified, as depicted in table 4.8 were; education/digital literacy and awareness, appropriate content and lack of good quality affordable equipment.

The issue of digital literacy and awareness was raised as one of the significant issues that affect usage patterns. Some of the respondents indicated that a South African broadband user or an Internet user can only do so much on the internet and the World Wide Web. One of the respondents wrote “broadband and internet need to be demystified”. For many a user, it is apparent that sometimes when they are online, they don’t have the requisite knowledge and skill to take full advantage of the opportunities offered by the technology they are using. Moreover other respondents indicated that they were not aware of the full benefits of having a broadband access, besides the fact that they can go on Facebook, check cooking recipes and do banking.

It was also raised that there is so much information on the internet, but there should be relevant information. Respondents raised the issue that sometimes one does not find what they are actually looking for, information and services that could add value in their lives and the lives of their communities. Appropriate content is not created, and this affect what people can do on the internet. It is believed that appropriate

content can encourage the use of internet and in turn, broadband access.

Accordingly, the issue of lack of good quality, affordable equipment for personal use was raised. It is well and good for coverage to traverse the length and breadth of the country, but if equipment to access broadband is not available to the citizenry, then the access is futile.

In exploring the broadband market in South Africa, focusing on fixed-to-mobile broadband substitutability, namely the migration from low bandwidth fixed line data access in the early part of the decade to high bandwidth mobile data access in the latter part of the decade and how pricing and quality of service impacted that; the analysis of the results concerned itself with the research questions, which are the following;

The central research question was:

To what extent does the pricing of mobile broadband, data demands and the perceived quality of service influence consumer bias towards either fixed-line or mobile broadband?

In order to respond to this main question, the following sub-questions were investigated:

- To what extent is fixed-to-mobile broadband substitution taking place in South Africa?
- What trends in mobile broadband adoption are observable from historical academic research and market surveys?
- How does the demand for data access (volume, mobility) influence mobile broadband adoption?
- What factors influence user bias towards either fixed or mobile broadband?
- Are there any other factors?

The objective of interpreting and analyzing the participants' responses and to analyse the secondary data available in various studies and market research initiatives was to attempt to answer the research questions above, as a means to evaluating the extent to which fixed-to-mobile broadband substitution is taking place in South Africa, using Gauteng as the setting of the study, and to further explore the impact of price and QoS on this phenomenon. The analysis will further describe other factors that could encourage and inhibit fixed-to-mobile broadband substitution. Furthermore the analysis will be done in a thematic manner, following the themes identified for the study. The participants' responses and the secondary data will therefore be analysed within these broad themes. Other themes and sub-themes may come of the responses in the process of analysis. The analysis will synthesise the responses from the household survey and the results from the various reports used as sources of secondary data, in order to formulate a view of the broadband market.

5.1 Emerging information society and broadband access

During the study, the respondents were asked to specify if they had access to broadband either at work, at home or at another location. This question was asked as part of a group of questions which were aimed at establishing the participants' choice of broadband access. The purpose of establishing what people's choice of broadband access was, and whether they obtained it from work or was their own, was to set the basis for evaluating how much of the access is mobile and how

much was fixed-line. To further evaluate the difference in experiences of consumer who chose any of the access methods or both. This would further allow the government to know where the biggest potential for growing broadband access is, given that one of the major objectives of the newly adopted broadband policy for South Africa is to achieve universal access in broadband by 2014 (RSA, 2010).

The emerging information society has certain requirements when it comes to the use of ICTs. The following metrics are used to measure the development of an information society; Fixed-line penetration, Internet subscription, Mobile penetration and broadband. The overall impression of the study is that, there is a willingness and determination to encourage the development of an information society and therefore to ensure that communities and households have access to all the economically and socially beneficial ICT's. Research has proven overtime that societies that have access to ICT's develop faster than those that do not have adequate access; a case in point is the development across the African continent as compared to developments in the Western Europe and the US.

The government has just adopted a broadband policy document that sets out aims and targets, which all have deadlines, for universal access. The studies reviewed have shown that due to lack of enabling policy broadband access in South Africa has remained low. There is however emerging trends towards a more robust broadband infrastructure in relation to local backhaul and international cables (Goldstuck, 2008 & 2010). The government has also started dealing

with inadequate policies that inhibits growth of the sector. This will go a long way in ensuring that services are available and prices go down.

The household survey and the studies reviewed indicates that South Africa has a broadband access problem, as much as there is growth which in the past two years was on double digits, over 10% (Goldstuck, 2010), it is clear that the said growth takes place in particular classes of society and therefore it is not universal, there are however pockets of success. Our household survey revealed that there are still perceptions out there that internet and broadband is for certain individuals. Access to broadband is paramount in any state that is serious about development.

Given the area that was chosen for the household survey; which is a predominantly middle-income suburb in the city of Johannesburg Metropolitan Municipality, it was found that the majority of the respondents had access to broadband. This however does not represent the rest of the country or even the province. The most important aspect to note is that 56% of our respondents had broadband access through their employers, either a mobile data card or access thorough the company's high bandwidth leased lines from Telkom. Only 14% of our respondents had access at home. The majority of which were supplied by their employers with mobile data access cards, mentioned that due to the convenience and flexibility offered by mobile broadband, they would in future consider obtaining one of their own.

The figures above do support the figures raised by Stats SA, (2007) in their community survey, that about 14.2 percent of the city of Johannesburg citizens had access to the internet at home. The distinction here is the community survey talked about the internet and this study refers to broadband. It is advisable for the role played by employers in building an information society to be recognized. The internet and broadband market in South Africa is growing not too much because of households, but generally because of access made possible by South African corporates and SMEs. Therefore due to high levels of informal employment and unemployment, the efforts of corporate South Africa in improving access to broadband have very low impact, and access remains low. This low access may have a negative impact on the citizens' participation in the economy and the governance of their city and the country.

Goldstuck, (2010) made the point that in 2009, mobile broadband overtook fixed-line broadband, in this case ADSL as the primary broadband for the majority of broadband users in South Africa. This was corroborated by the findings of the household survey, which found that there are more individuals using mobile broadband as their primary data access method than those that use ADSL. The reasons given by the majority of the respondents were around availability and mobility.

Research has to a certain extent proven that mobile broadband was seen as easily available and easy to install, some of the respondents made the point that they walked into a mobile broadband service provider's premises and a few minutes later they walked out with a mobile data access card, giving them access to a resource they had tried to obtain from the fixed-line network operator. Hamilton, (2003) agreed that mobile is easier to install than fixed-line. It appears the perception that applying for a fixed-line broadband facility is cumbersome, is real within society. Gillwald & Stork, (2008) made a similar point that there 5% of a sampled population had claimed that they had applied for fixed-lines and these lines had never been installed. The strength of mobile according to some respondents and literature is in its ease of installation.

It would appear mobility is generally the deal breaker here, again given the sample that was selected for this study. IT is evident that given the fact that as Castells, (1999) asserts, work has become mobile, and not stationery. It is therefore the reason why corporates would rather ensure that all its key resources has access to a mobile broadband device, sometimes even a mobile phone with broadband access to ensure that they can do work anywhere anytime. This is said to improve productivity and performance. There are a number of multinationals who have set up office in Johannesburg specifically and they would normally be running other functions in other parts of Africa mostly or even in the East. It is therefore quite advantageous to have

access that is mobile in order to complement the kind of work that one does. From the household survey it emerged that mobile broadband was the preference of many corporates. It was however possible that the idea was to use it to complement fixed-line when employees are not in the office. Goldstuck, 2010 points out that just over a third of South Africans using mobile broadband also use another form of connectivity as their primary form of internet access. He makes the point that as our household survey showed, most of them have access at their place of work, using corporate networks which are inked to the internet via high bandwidth leased lines. According to Goldstuck, 2010, these users only default to 3G when they are out of town, or accessing their work from meetings, conferences and airports.

Emanating from this study, it appears it is not just work which is mobile. A point was made in the introduction that South Africans are a mobile society, and therefore in creating an information society, South Africa should be thinking about a mobile information society. This as mentioned before based on historical reasons. Historically South African families had to work in big a city, which is still the case today, especially black South Africans. A case in point is Johannesburg; there are people from all provinces of South Africa who have lived in this province for decades, but they still have homes in other provinces. This then means these families will commute between these provinces on a regular basis to go see their families. This does not change the fact

that work is mobile and therefore whether you are visiting one's family in another province, access is still important.

Family lifestyle and circumstances do affect the kind of broadband that one chooses, but it is clear that life in general has become extremely mobile. Goldstuck, (2010) also makes the point that 38% of ADSL users use 3G access as a complement to their primary connection. Broadband consumers do this to further take advantage of mobility even though one has a fixed-line connection.

The biggest inhibitor, besides price, to ADSL growth is the number of fixed-lines to households and business premises. ADSL is definitely inhibited by copper penetration. At most copper penetration is at about 12% of the population, meaning at best, ADSL will only be able to reach 12% of the population. In the developed world e.g. the US, Canada, Australia, the UK, Korea and Japan, fixed-line (copper) penetration is almost 100%. This state of affairs will continue to hamper ADSL growth, until policy makers do something about it. The higher the copper penetration, the easier to roll-out ADSL. General perception in South Africa is that copper cables are generally old and have a limited life span and therefore rolling out a technology on the basis of old infrastructure may not be economically prudent. It is however true that the more people are connected to the exchange for voice telephony, the bigger the potential for ADSL roll-out, which is not the case at this stage in South Africa. Although ADSL as a broadband technology is

important, given its potential, it is important for very few consumers in South Africa. At its current condition and potential, it is not going to benefit the majority of South Africans. There is a researched correlation between development and broadband access (OECD, 2004), given what research has proven, it is not clear if that broadband technology is ADSL, in the South African context.

Given the advantages of mobile broadband, there are however reasons why ADSL still have space in the South African broadband landscape. Goldstuck, (2010) is of the opinion that there is a level where mobile broadband does not meet the requirements of SMEs, when it comes to costs and performance. As much as mobile broadband has overtaken ADSL as primary method of connectivity amongst households and individuals, the same hasn't happened in the SME market (Goldstuck, 2009c & 2010). SME's continue to use ADSL as their primary broadband connection. The household survey confirmed this as two of the three respondents who had access through fixed-line broadband were SME's and four of the six who had dual access were also SME's. SMEs it appears, they will continue to regard ADSL as a broadband technology of choice. SMEs generally have tight budgets and need a tight control on spending and it appears that when it comes to containing telecommunications costs, fixed-line broadband is better. It is also worth noting that the respondents mentioned that the connection is a bit more reliable and therefore there are not too many interruptions as compared to the sometimes erratic mobile connection.

This was even shown by the statistics that as ADSL entrenched its position in the SME sector by growing its market share from 63% in 2007 to 73% in 2008, mobile broadband lost 3% of market share, moving from 11% in 2007, to 8% in 2008 (Goldstuck, 2010). SMEs generally use their access to interact with their suppliers and customers. This happened at the point when mobile broadband, especially 3G overtook ADSL as a primary connection method for the majority of broadband subscribers. This may be an indication that a number of SMEs tried mobile access and decided it did not work for them, then went and revived their fixed-line connections, the study did however not focus on this point. ADSL seems to be dominating in industries that may be based in suburban areas where ADSL connection is in existence; 100% of all sampled legal entities use ADSL. IT also dominates in software development houses, employment agencies, hotels and communications companies. On the other hand mobile broadband has made inroads in industries that may be based in areas where fixed-line connectivity doesn't reach or where one has to go to an operational site on a regular basis; e.g. whole sale trade, advertising, mining and construction, even in these industries, penetration is still very low. It appears that mobile broadband is used, predominantly in the SME market, where fixed-lines are lacking.

The value of any internet connection is on the information and knowledge accessed through that connection and utilized by the consumer, to either the benefit of the consumer or the society at large.

That is why literature differentiates between access and usage. According to Gillwald & Stork, 2008, there are few people who have access to the internet, and even fewer people use it. Gold stuck (2010) confirms that there are 1, 494, 000 individuals who have access to mobile broadband, but there are only 930 000 users. A consumer will be able to derive value from the connection. From the study and reviewing the literature, it is starting to emerge that so long as there is no appropriate content, it will be easy to encourage access, maybe, but usage will be limited, and in a long run it may affect access. Consumers are naturally willing to pay for a service that they derive some value from.

The literature highlights a number of services that consumers may want to access; e-commerce related services, e-government services, e-education and e-health services. These services are what makes broadband worthwhile. Given that a number of individuals sampled for this study were purposely chosen from an organization where they are employed, the dominant purpose of a broadband connection, as per our respondents, was for accessing work systems outside normal working hours. This was also observed amongst the sample from Melville. This supports Goldstuck, (2010)' assertion that about 250 000 mobile broadband users in South Africa are corporate users i.e. they obtain their access though their employer. At this stage the biggest purpose of a broadband access is work, and again given the fact that biggest ADSL growth is among SMEs. Whether mobile or fixed-line,

broadband connectivity is used for enterprise economic activity more than it is for primarily personal development. Some of the other uses are general internet access and emails. South Africans seem not to be using a lot of other services made available by a broadband connection e.g. VoIP.

South Africans use a number of internet based services, but generally the services accessed are not bandwidth intensive, unlike the first world countries like Australia, Japan and the US who commonly use services like; VoIP, Video on demand, Audio streaming, downloading huge files, and consistently using interactive services. South Africans predominantly use social networking sites, particularly Facebook. Several of our respondents admitted that they spend 80% of their time on the internet on Facebook. Other internet based services include, shopping, banking and news updates. In South Africa there are a lot of information services that one access on the internet, but very high bandwidth interactive services. Our study showed that only 17% of the sampled population use VoIP regularly. This may be lack of awareness or Goldstuck, (2010) would put it; one needs as least five years of internet use experience to be fully conversant and comfortable with the technology. The biggest internet growth was only in 2008, meaning the majority of internet users don't have five years as yet and therefore low usage of certain services. Broadband access and use increased substantially in the same period.

One of the biggest advantages of having individuals spend time on the internet is the potential advertising revenue for online publishers. Results have shown that people are spending time on the internet, especially as broadband access increases, predominantly mobile broadband. This study has shown that one of the most popular internet based services is social media. Online publishers according to Goldstuck, (2009b), are unanimous that social media and networks are a great opportunity along with video sharing, reader-generated content and citizen journalism, services which are used minimally by South Africans. The idea is to ensure that there is relevant and timeous content in order to encourage internet use and therefore access mechanisms like broadband.

5.2 Problems associated with broadband connection

Over 90% of the sampled population agreed that there are connection problems that sometimes affect broadband and internet use. Almost halve of the 90% believe that the problems are serious and regular enough to frustrate, the other half believe the problems are not that serious and therefore doesn't warrant a mention. If halve of the population say they are serious, then the problem deserve attention from the network operator. From the study, it became clear that SMEs predominantly use ADSL, and their problem is that the coverage is not there in other places where they would love to set up connections, and normal South Africans whom even though they would love to have a

mobile device, but they find the costs too high, can't access ADSL. The community survey makes a point that fixed-line voice telephony have been in decline since early 2000's (Stats SA, 2007). This decline in fixed-line numbers negatively affect ADSL growth as said earlier. One of the other problems that subscribers experience is the loss of connection due to copper cable theft. In certain areas it happens more than in others and that create operational problems for small businesses in those areas. What exacerbates the problem is that as per the respondents, it usually takes the fixed-line operator longer than it's comfortable to repair or replace the cable. It's during those periods where a backup 3G card becomes useful.

The general problems with mobile connectivity are firstly price, followed by coverage and network capacity, then long term contracts. Most of the respondents; those with mobile connectivity and those without, raised the issue of price as one of the major inhibitors of mobile broadband usage. It appears access is not affected by price to the same extent as usage. Mobile network operators generally report on the coverage of their data network, which is quite significant. The majority of the country is covered by these networks, yet there are still areas which are not covered adequately. On some occasions network capacity problems are experienced within big cities, this was expressed by most of the broadband subscribers. Some of them expressed that the extent of the problem have pushed them to trying and accessing data only during off-peak periods. This might work well for the

operators as they have tried to introduce deals that encourage users to use their networks during off-peak periods in order to alleviate pressure from the network during peak periods. The unintended consequences of this may be that it discourages consumers to use the product or may reduce the amount of time they spend on the internet, which is quite important for the internet market, then defeating the whole point of broadband. It is also important to emphasize the fact that the importance of information, in the information age, is based on its relevance and timeliness, and as such, one would want to download or upload information timeously.

QoS is therefore one of the areas the operators and the regulator need to take seriously and address. The respondents felt that the operators; both fixed-line and mobile did not deal with QoS issues timeously. One of the important issues the respondents raised was the issue relating to the advertised speed of broadband. Even though it is said to be a best effort approach and not guaranteed, respondents felt that it never occurs that they achieve the download and upload speeds advertised by the operators. Consumers generally felt like they are not getting the service they are being charged for, especially in relation to mobile broadband speeds. In order to encourage continuous and long term usage, one would expect the maximum throughput and speed to the customer to be the same as the one documented and advertised or as close to it as possible.

5.3 Pricing of Services

Research has established that widespread and affordable access can contribute to productivity and growth through applications that promote efficiency, network effects and positive externalities, which accrue benefits to business, government and consumers (OECD, 2003). Broadband networks are therefore an important platform for the development of knowledge-based global, national, regional and local economies. The more citizens can afford to be part of these networks the better for any society; the more members of society are left outside these networks, the less the network externalities and therefore few people benefit from the networks. This may as a result increase the digital divide between the rich and the poor.

By looking at the studies conducted in South Africa since the advent of broadband, in particular between 2005 and 2010 and looking at the results of the household survey, broadband connectivity is not affordable to an ordinary consumer. Goldstuck, (2010) makes a point that even though ADSL is cheaper than 3G; it is still not affordable to the man on the street. By looking at the growth patterns of the ADSL penetration it is clear that it is slowing, and it is possible that this is directly attributable to price.

The study looked at the relationship between income and usage. There was a strong correlation between usage and income. Usage increases

slightly as the income increases, which further highlights the fact that the poorer one is, the likelier it is that they will be left outside the networks of the information society, which are now computerized and information is stored and transmitted through the telecommunications and Information technology networks. The study could not identify a strong correlation between incomes and maybe type of access whether mobile or fixed-line, this was primarily because the majority of the sample were senior managers from the CoJ and that would have distorted the results. Most of the respondents, besides the ones from the CoJ were on a mobile package, subsidized by the employer, and therefore even if the costs do not accrue directly to the user, the employer also set the limit, as in the case of the Coj, further emphasizing the high price of the service.

The majority of the users admitted to have set a limit on their packages with the operators, they generally try to only use the in-bundle data, and as soon as it is depleted, they don't use the technology any further. This further emphasizes the feeling of the users in relation to the price of the service. Consumers on pre-paid made a point that they would normally purchase data bundles only when there is a pressing need to do so.

Literature and further research has proven that telecommunications prices had come down between 2005 and 2009 (Goldstuck, 2010), nevertheless, south Africa still hasn't caught up to the developed world

and other countries similar in economic and social characteristics. Literature also has shown that telecommunications prices have come down in the developed world and data has become quite affordable. South Africa has to look at measures of lowering broadband prices so as to benefit the majority of South Africans. Currently there is growth in mobile broadband, but trends show that it will plateau quickly because there are few individuals who will be able to afford it, and as soon as those have access, growth will abruptly stop.

5.4 Other issues

Some of the other issues that were raised as inhibitors to broadband growth were education and awareness, lack of appropriate content and lack of good quality equipment. In the broadband policy, the government only acknowledges that digital literacy is one of the main inhibitors but there are no details on how this will be solved. This challenge was also raised by Gillwald and Stork, (2008) that generally as services become more complex, it negatively affects usage. Broadband and internet needs to be demystified. It will be difficult for an average South African broadband user to be able to know and understand how to use most services, without having been showed how that should be done.

Content should be relevant and responsive. Results have shown that online advertising is growing because there is audience and there is

relevant information. Other services will also grow if there is relevant, timeous information that the user can use for ones' benefit or a societal benefit. There should be applications and content for all levels of society so that all citizens can be part of the network as South Africa continues to build an information society. This will be futile if there is no appropriate equipment to access the network. The majority of the people with access to broadband and therefore the internet and all the other services made possible by broadband, use company equipment like; laptops, 3G enabled cell phones, data access cards etc. This was not only the case for the respondents who were purposely selected from the CoJ, even those who were surveyed in Melville, the majority of them (10) had company sponsored mobile data cards. All the SMME's have access which is primarily for business but they make it available for personal and household use as well. This sometimes limits what individuals can access and do on the internet because of organizational policies. It is therefore a requirement that as South Africa plan to achieve universal access in broadband should think about good quality equipment to support the objective.

Introduction

The results have been recorded and analysed to derive meaning from them. It is therefore important to extract and reflect on the key issues that have been raised by this study in an attempt to answer the research questions. This chapter will therefore look at the issues that emerged from the study and offers recommendations. There are some areas which were not a primary focus of this study which are recommended as areas of further research.

6.1 Fixed to Mobile substitution: Pricing and QoS

It can be concluded that, in answering the central research question, QoS and data demands do influence consumer bias towards mobile broadband. The aspect of quality of service here the customer service that is supposed to enhance the customer experience. When it comes to the service related to network availability and capacity, the general impression is that the quality around the mobile service does not always affect customer requirements. This however does not appear to inhibit mobile broadband growth as the results of the study; the household survey and review of other pieces of research and market studies point to a growing mobile broadband market and the slowing growth of the ADSL market.

Mobile broadband is growing at a fast rate as compared to ADSL. There are pockets where ADSL is still dominant like in the SME space. However most of the consumers in these spaces would still have a mobile connection as a backup to the primary connection which is generally an ADSL connection. Literature reviewed revealed that in many markets around the world, mobile voice has generally been used as a complement to fixed-line voice. This particular analysis can be extrapolated to broadband in those markets. The other feature of some of these markets is that mobile voice is a complement among the older generation but among the younger generation it is a substitute, to an extent that for fixed-line operators to maintain customers and increase revenues they introduce services that converge mobile and fixed-line, either at a platform level or at service level. In South Africa it is evident that mobile voice has substituted fixed-line voice, and a similar trend may be developing in broadband.

6.1.1 Pricing

From the study, it has emerged that broadband service in South Africa are quite expensive when compared to the developed world or other countries similar to South Africa in economic and social characteristics. Fixed-line broadband is still a bit cheaper than mobile broadband and therefore manages to keep other individuals and households who would have opted for mobile broadband. There has been an admission by all the respondents and also the studies conducted between 2005 and 2010 that mobile broadband is unaffordable to the ordinary South African. Given this perception out there in the market, consumers still

opt for mobile broadband instead of fixed-line. It is however important to note a point that was raised in the previous chapters, that, consumers would pay for a service that they believe they derive some kind of value from. It appears consumers are willing to pay a very high price for the benefits of mobility even when there is a cheaper option.

This may be beneficial for a few individuals who can afford it, but for the South African broadband market this may not be sustainable, because the fewer the people on the network and the majority are left outside, the little the network externalities benefits and therefore almost everyone who joins the network pays a premium. It will therefore be beneficial for the prices of broadband, especially mobile which is a popular choice and had a bigger potential to reach the entire country, to be reduced in order to accommodate the majority of the citizens in the information society networks. High speed internet is the feature of the emerging information society and therefore it is important for it to reach all corners of South Africa.

6.1.2 Quality of service

The overwhelming majority of the respondents agree that there are numerous problems with both fixed-line and mobile broadband connections. The two issues raised with mobile connection, besides price, and contracts are coverage and capacity, these issues are combined in what this study refers to as quality of service. The

challenge with mobile broadband appears to be the capacity of the network to accommodate all the users and therefore resulting in a number of dropped calls or broken internet connection when one is in the middle of a session. In this case, a consumer can always wait for a few minutes or until off-peak and then try the service again.

On the other hand the biggest challenge with fixed-line broadband relates to a physical connection, which generally would require a technician to come on site. One respondent raised the issue of cable theft, which sometimes takes Telkom a bit longer to attend to the breakdown in service. It appears that other consumers then choose to go for mobile as the problems generally are solved a bit quicker. Even though there are quality of service issues in regard to mobile broadband connections, consumers still choose mobiles, especially in the past three years, more than fixed-lines.

6.2 Fixed-to-mobile broadband substitution

There is definitely a trend emerging, even though there is no absolute answer, especially given the fact that there are pockets of society that still embraces ADSL, more and more individuals are going for mobile broadband. Corporates are also encouraging mobile broadband by making available 3G cards to their staff members who in turn use these cards for personal benefit as well. These individuals end up having to

get their own cards when they leave the employ of that organization, at least that's the impression they making. This definitely is helping the growth of mobile broadband.

6.3 Observable trends in mobile broadband adoption

Research has proven for example that more individuals use their cellphones for banking than those that use computers. This is a clear indication that mobility as a concept has a future in South Africa. It is not only going to be mobile voice, but as studies have shown, the success of cell phone banking is yet an indication that there is a strong demand in South Africa for powerful and easy to use mobile data services. This is further supported by the fact that there are already more cellphones in South African households than any other communications medium. Individuals are already buying prepaid electricity, prepaid airtime and flowers using their cellphones, and the trend is growing.

The question has always been whether mobile broadband is capable of the same throughput as fixed-line. This study did not focus on that, but literature shows that the 4th Generation networks (4G) will be capable of speeds of between 10mbps and 100mbps. Cell C has already rolled out a 4th generation network in certain parts of the country, research will have to be conducted to assess its performance. There is no question that mobile broadband has the same capabilities as fixed-line and even fibre to the premises, but mobile operators and regulators

should come with means to ensure that the quality that is promised to the consumer is delivered and maintained.

6.4 Demand for data and mobile broadband adoption

A point is made that South African society, due to political reasons of the past, is mobile. Individuals have homes in multiple provinces and thus have to commute between these, and because it is the same individuals who want and always on, anywhere connection that is capable of multimedia functions, they can only have that with mobile broadband. Individuals and households prefer mobile because they can carry it anywhere without any administrative and financial problems

Three very important issues have been raised as affecting broadband access in the broader South African population other than the ones discussed above; lack of education or what the broadband policy document call digital illiteracy (RSA, 2010), lack of good quality affordable equipment and lack of appropriate content. These issues need to be addressed in order for benefits of broadband to be enjoyed by all South Africans.

6.5 Recommendations

The study revealed certain implications for policy and regulation. It is important to note that all the studies used for this research were not conducted by policy makers or the regulator and little evidence in policy and regulation exist that suggests that these studies are used to inform policy making and regulatory decision making. Therefore it is recommended that the policy makers and the regulator make use of

these studies and also conduct their own studies in order to adequately inform policy making and regulatory decision making. This will further enhance the process and ensure that the objectives of the broadband policy are met. Below are some of the issues identified by the study that needs to be considered;

6.5.1 Cost of broadband access

It is recommended that through appropriate policy and regulation mechanisms, the costs of broadband should be looked into in anticipation of the implementation of the broadband policy which stipulates the goal of universal access by 2014. It is clear that costs went down a lot in the period between 2003 and 2009, but broadband costs are still prohibitively high for ordinary South Africans. If these costs remain high, the development of the information society will be considerably slow, and may only be possible in wealthier sections of the society.

6.5.2 Quality of service

The operators are urged to ensure that their services meet international standards, because in an information society, major political, business and social decisions are taken using pervasive ICTs. The regulator should also ensure that operators who are at fault are appropriately sanctioned.

6.5.3 Mobility

In the quest of being technology neutral, South Africa should not miss the opportunity of pushing and encouraging mobile broadband as a

primary broadband technology for the country. The potential growth for fixed-line broadband is just over 3 million lines, but the potential for developing a mobile information society is over 46 million lines. Policy makers and regulators should develop mechanisms to grow mobile broadband.

6.5.4 Reward corporates that provides internet and broadband access

It is recommended that the policy makers come up with a mechanism to identify and reward corporates that provide internet access for their employees, even for private use. This is suggested as an outcome of the finding that most of the respondents have a broadband connection which is paid for by their employers. Employers may make a common PC available at a common space, that is linked to the internet, put appropriate controls in place and allow lower level staff, whom naturally would not have access to a PC, to access basic internet based services like banking, emails and certain government services.

6.5.5 Digital literacy

The government should define mechanism to address the problem of digital illiteracy. If everyone has access but no one can use it, it is not going to help the country in developing an information society. The policy makers should detail how internet and broadband education will be introduced in schools and adult learning centres, how government employees, to start with will be transformed into workers of the digital economy, quite capable of executing e-government services.

6.5.6 Content development

Citizens should be encouraged to develop content and share it using ICTs. Policy makers should also develop appropriate content for e-education, e-health and e-government services to ensure that the internet become attractive and therefore broadband as an access mechanism. Policy makers should also ensure that there is an appropriate environment for independent content producers to produce content without fear. Government should have targets of how much of its services should be rendered using ICTs and by when. Each ministry should come up with a plan with deadlines and appropriate sanctions should be developed to deal with non-adherence.

6.5.7 Affordable equipment

It should be clear that it is going to be futile if undersea cables are developed, long haul networks within the country and operators develop state of the art networks as well, but there is no equipment to access broadband services. The government should ensure that affordable equipment is available, if it means subsidies for the poor; it can be done through the Universal Service and Access Fund, managed by the Universal Service and Access Agency of South Africa.

6.6 Future research

6.6.1 Quantifying the extent of fixed-to-mobile substitution trends

Literature and research does show that there is a trend towards fixed-to mobile broadband substitution, but how much is it happening e.g. how many consumers have physically moved from the fixed-line broadband operator to a mobile operator, is still not clear. Therefore future research may focus on the extent, in numbers, of which fixed-to-mobile broadband substitution is taking place.

6.7 Conclusion

What emerges from this study is that there is a trend that suggests that fixed-to-mobile substitution may be taking place in the broadband space, and it appears it is generally aided by quality of service issues as they relate to fixed-line broadband, even though mobile access have its own QoS issues. It appears consumers are willing to pay for mobility, and thus mobile broadband access continues to grow. It is also interesting to note that price appear to have very minimal impact on the growth of mobile broadband, specifically 3G, when one compares 3G services prices to ADSL, but research have proven that if prices were more affordable growth could be bigger and better, for mobile broadband. The research undertaken here has shown that mobile broadband is way ahead of fixed-line and fixed-line growth has slowed down. It appears therefore that South Africa have a better chance of building an information society through among other issues, access to mobile broadband and not so much fixed-line broadband.

7 REFERENCE LIST

Abrahams, L & Burke, M (2010). Viewing evolution of the Information Society: Gauteng information society and e-government, LINK Centre, University of the Witwatersrand, Johannesburg.

Abrahams, L., Burke, M., Elliott, L. & Hero, W. (2010). Social inclusion and e-governance in Gauteng: Grounds for universal household broadband internet service. Unpublished book chapter.

Albon, R. (2006). Fixed-to-mobile substitution; complementarity and convergence, *Agenda* 13(4), 309-322.

Australian Communications and Media Authority (ACMA), (2008). Fixed-mobile convergence and fixed-mobile substitution in Australia. ACMA, Australia.

Banerjee, A. & Ros, A. (2004). Patterns in global fixed and mobile telecommunications development: A cluster Analysis, *Telecommunications Policy*, 28(2004) 107-132.

Babbie, L and Mouton, J. (2001), *The practice of social research*. Oxford University Press.

Benkler, Y (2003), *Freedom in the Commons: Towards a Political Economy of Information*: *Duke Law Journal*, Vol. 52, No. 6 (Apr., 2003), pp. 1245-1276, Duke University School of Law.

Business Leadership South Africa, (2007), *South African Telecommunications Prices*, Occasional paper number 3.

Cai-lan D, & Xiao-yu L, (2006); *The research on the substitution effect between the wireless and fixed telecommunications industry*. The journal of China universities of Posts and telecommunications, vol 13, Issue 3,

September 2006, Department of Economics and Management: Xia'n Institute of Posts and Telecommunications.

Castells, M. (1999), *Information Technology, Globalization and Social Development*, United Nations Research Institute for Social Development, Discussion Paper No. 114, September 1999.

Castells, M (2000), *Materials for an exploratory theory of the Network Society*: British Journal of Sociology Vol. No. 51 Issue No. 1 (January/March 2000) pp. 5–24, London School of Economics.

Cave Martin, (1997), *Cost Analysis and Cost Modelling for Regulatory Purposes: UK experience*, http://lirne.net/2003/resources/tr/chapter_19.pdf.

Creswell, J.W. (2009). *Research Design Qualitative, Quantitative and Mixed Methods Approaches*. 3rd Edition. Sage Publications Inc

De Jaegher, K. (2009), *Asymmetric substitutability: Theory and some applications*: Economic Enquiry Vol 47, No. 4, October 2009 pp 838-855, western Economic Association International.

Department of Communications (DoC), (2006) Budget Vote Speech, National Assembly, Republic of South Africa.

Department of Communications (DoC), (2009). *Strategic plan 2009-2012: Making South Africa a global leader in harnessing ICT's for socio-economic development*. Department of communications, Republic of South Africa.

Dulski, A & Persson M, (Date unknown), *Mobile Broadband – Operator Opportunities*.

Eskelinen, H. Frank, L. & Hirvanen, T. (2008). *Does strategy matter? A comparison of broadband rollout policies in Finland and Sweden*, telecommunications Policy, 32 (2008), 412-421.

Genetics Analytics, (2005). Telecommunications prices in South Africa: An international peer group comparison, occasional paper no 1, South African foundation. Johannesburg.

Genetics Analytics, (2007). Telecommunications prices in South Africa: An updated international price comparison with regulatory recommendations occasional paper no 3, Business leadership South Africa. Johannesburg.

Gillwald, A. (2005), National convergence policy in Globalised world: Preparing South Africa for Next Generation Networks, service and Regulation.

Gillwald, A and Esselaar, S, (2004), *South African 2004 ICT Sector Performance Review*, Link centre public policy research paper no 7, LINK centre, Graduate School of Public and Development Management, University of the Witwatersrand.

Gillwald, A (2007), *Between two Stools: Broadband Policy in South Africa*: The South African Journal of Information and Communication, issue 8. LINK centre, Graduate School of Public and Development Management, University of the Witwatersrand.

Gillwald, A & Stork, C. (2008). Towards evidence-based ICT Policy and Regulation: ICT Access and Usage in Africa, volume 1, Policy paper 2. Research ICT Africa.

Goldstuck A, (2008), *Internet Access in South Africa*, World Wide Worx (Pty) LTD.

Goldstuck A, (2009a), *Online media in South Africa 2009*, World Wide Worx (Pty) LTD.

Goldstuck A, (2009b), *Mobility 2009; Phase 2: The mobile consumer*, World Wide Worx (Pty) LTD.

Goldstuck A, (2009c), *SME survey 2009*, World Wide Worx (Pty) LTD.

Goldstuck A, (2010), *Internet Access in South Africa*, World Wide Worx (Pty) LTD.

Hamilton, J. (2003). Are main lines and mobile phones substitutes or complements? Evidence from Africa, *Telecommunications Policy*, 27(2003), 109-133.

Henten a, & Goedoe H, (2010), *Demand Side Economies of Scope in Bundled Communications Services*: Info vol 12 No 1, 2010, pp. 26-38, Q Emerald Group Publishing Limited.

Hodge, J. (2005). Tariff structures and access substitution of mobile cellular for fixed line in South Africa, *telecommunications Policy*, 29 (2005), 493-505.

ITU, (2003). Promoting broadband: A case of Japan. Workshop for promoting broadband, document: PB/07. ITU, Geneva 9-11 April 2003.

Janssen, M. & Mendys-Kmphorst, E. (2008). Triple Play: How do we secure future benefits? *Telecommunications Policy*, 32 (2008), 735-743.

Lee, Y. & Sung, N. (2002). Substitution between mobile and fixed telephones, *Review of industrial organisation*, 20, 367-374. Kluwer academic publishers: Netherlands.

Leedy P, Ormrod J, (2010), *Practical research: Planning and design*, 8th edition, Pearson Merrill Prentice Hall.

Matsepe-Casaburri, I. (2008). Budget Vote speech by the Minister of communications, National Assembly, Republic of South Africa.

May, C. (2002). *The information society; A skeptical view*. Oxford: Blackwell publishing ltd.

Mosco, V. & Wasco, J. (Ed)(1988). *The political economy of information*. University of Wisconsin press.

MTN, 2008, MTN Annual Report Accessed at www.MTN.co.za.

Nielsen Online, (2008). What happened to South African internet in 2008? Nielsen company. London.

OECD, (2001), The Development of Broadband In OECD Countries, OECD Publishing.

OECD, (2003), OECD Communications Outlook: Information and Communications Technology. OECD Publishing.

OECD, (2004), The Development of Broadband Access in rural and remote areas: Directorate for Science, Technology and Industry.

Office of Communication (OFcom), (2007), The Communications Market 2007: 4 Telecommunications, OFcom.

Picot, A. & Wernick, C. (2007). The role of government in broadband access, Telecommunications Policy, 31 (2007), 660-674.

Reding V, (2006); *The new highways to prosperity*, Paper presented at the "Bridging the broadband gap through EU spectrum policy" conference Brussels,

Rondini M, Ward M.R, & Waroch GA, (2003), *Going Mobile: Substitutability between fixed and mobile access*: Telecommunications Policy 27, pp 457-476, Elsevier Science LTD.

RSA, (2008). Broadband Infracore ACT no 33 of 2007, Government Gazette no 30654, vol 511, The Presidency: Republic of South Africa.

RSA, (2010). Broadband Policy for South Africa, Government Gazette no 33377, Department of communications: Republic of South Africa.

Sawyer, S, Allen, J.P and Lee, H. (2003), *Broadband and mobile opportunities: A socio-technical perspective*, Journal of Information technology 18, Pg 121-136.

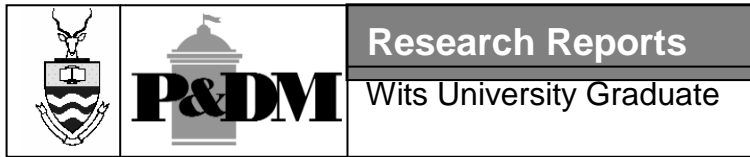
Stats SA, (2007). Community survey basic results: Gauteng, Statistics South Africa. Pretoria.

Stratus Technologies, (2007). How to transform voice over broadband into sustainable profitability.

Telkom, 2008, Telkom Annual report, accessed at www.Telkom.co.za

Vodacom, 2009, Group Interim results, September 30, accessed at www.Vodacom.co.za

8 APPENDIX A: INTERVIEW SCHEDULE



Survey questions for Households, SMME's and Local government employees

Student's Name: Letlhogonolo Moroeng

Student Number: 9401562R

Year first registered: 2006

Supervisor: Luci Abrahams

MM PROPOSAL TITLE: FIXED-TO-MOBILE BROADBAND SUBSTITUTION IN SOUTH AFRICA

Choice of broadband access

1. Do you have access to broadband (a) at home (b) at work (c) at another location?
2. Do you use (a) fixed broadband or (b) mobile broadband?
3. What influences your choice of either fixed-line or mobile broadband?
4. If you have both fixed and mobile broadband, what are the reasons for this dual usage?

(Guide: What do you use fixed broadband for? What do you use mobile broadband for?)

Household income and choice of broadband access

5. What is your after-tax household income per month?
 - (a) (R5000 per month or less)
 - (b) (R5000 – R9999)
 - (c) (R10000 – R14999)
 - (d) (R15000 – R19999)
 - (e) (R20000 and above)

6. How does your income affect your usage of fixed or mobile broadband?

Individual and household broadband usage

7. For what purposes do you use broadband?

8. How does the nature of your work influence the decision to have (a) no broadband or (b) fixed broadband or (c) mobile broadband at home?

9. How does your lifestyle influence the decision to have (a) no broadband (b) fixed broadband or (c) mobile broadband at home?

10. How does your household/family lifestyle influence the decision to have (a) no broadband (b) fixed broadband or (c) mobile broadband at home?

Experience of broadband usage

11. What Internet-based services do you regularly access?

12. What are the main problems you have experienced with (a) fixed broadband or (b) mobile broadband?

13. How often do you experience data access problems?

14. How have these problems influenced your or your household's usage patterns?

15. What do you consider to be the biggest stumbling block in broadband usage?

16. What other factors do you think could improve your broadband usage patterns?

9 APPENDIX B: MELVILLE MAPS

