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EXAMINING THE FACTORS THAT AFFECT THE ROLLOUT OF MUNICIPAL BROADBAND IN TSHWANE

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A research report submitted to the Faculty of Management, University of Witwatersrand, in partial fulfilment of the requirements for the Degree of Masters in Management in ICT Policy and Regulation (MM ICTPR)

March 2013

Abstract

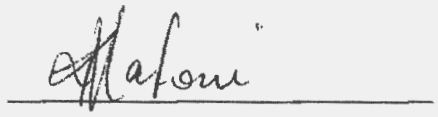
The rollout of broadband through Information Communications Technology for Development (ICT4D) approaches can facilitate socio-economic growth in the country. Effective implementation of broadband programs under the policy guidance of the Department of Communications (DoC) and the Presidential Infrastructure and Coordination Committee (PICC) would enhance the availability of broadband, which in turn could improve delivery of many public and private services. Furthermore, municipalities should be key stakeholdersin promoting broadband rollout, using mechanisms that are suitable for either urban or rural areas.

This research report presents a qualitative case study which attempts to establish the challenges for municipal broadband initiatives that are taking effect in South Africa. The study examinesa particular set of factors that affects the rollout of broadband and investigates how factors such as funding levels, technology adaptation, business models,policy intervention and regulatory effects either promote or inhibit broadband deployment. With attention to a single, in-depth case study, the reportconsiders the challenges that the City of Tshwane Municipality has experienced when rolling out pilot projects and the extent to whichthe success of municipal broadband infrastructure rollout depends on policy and regulatory interventions. The Broadband Policy (2010) adopted by government to facilitate the broadband initiatives has beenreviewed in this study.

The research findings indicate that decisions made in all three spheres of government i.e. national, provincial and local, influence these five factors, thus affecting the rollout of broadband at municipal level.The findings indicated that the Ministry of Communications is reviewing the current broadband policy to include more detailed guidelines and ICASA is reviewing the regulatory framework. However, it remains unclear whether the importance of the five factors articulated here will be acknowledged in these revisions.Therefore, the recommendations in this report are directed to the policy maker, the Department of Communications and the ICT Policy Review Panel,to take cognisance of the factors that affect municipal broadband rollout. A coordinated inter-governmental approach on broadband initiatives is required to deliver high speed communications infrastructure to citizens.

Declaration

I declare that this report is my unaided own work. It is submitted in partial fulfillment of the requirements of the Degree of Masters in Management (in ICT Policy and Regulation) in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.



Lebogang Jiya

March, 2013

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ACRONYMS

2G	second generation mobile telecommunications system
3G	third generation mobile telecommunications system
4G	fourth generation mobile telecommunications system
ADSL	Asymmetric Digital Subscriber Line
ANC	African National Congress
AT&T	American Telecommunications and Telegraph Pty
BBI	Broadband Infraco
BEE	Black Economic Empowerment
BI-GIC	Broadband Inter-Governmental Implementation Committee
BPL	Broadband over Powerline
BRIC	Brazil-Russia-India-China
BRICSA	Brazil-Russia-India-China-South Africa
CCC	Customer Care Centre
CoT	City of Tshwane
CSIR	Council for Scientific and Industrial Research
DSL	Digital Subscriber Line
DBSA	Development Bank of Southern Africa
DPSA	Department of Public and Administration
EASSy	East African Submarine Cable Marine System
ECA	Electronic Communications ACT
ECNS	Electronic Communications Network Service License
ECTA	Electronic Communications Transactions Act
e-SI	e-Skills Institute
EU	European Union
FCC	Federal Communications Commission
FTTx	Different types of access to fibre optic networks including Fibre to the note (FTTN) Fibre to cabinet or curb (FTTC) Fibre to home (FTTH) Fibre to premises (FTTP) Fibre to business or building (FTTB)
GB	Gigabyte
Gdps	Giga Bits per Second
GDP	Gross Domestic Product
GDS	Growth & Development Strategy
GHz	Gigahertz
GPRS	General Packet Radio Service
GSMA	Global Mobile Systems Association
GSM	Global system for mobile communication
HSDPA	High-speed Download Packet Access
HSPA	High-speed Packet Access
HSUPA	High-speed Upload Packet Access
ICASA	Independent Communications Regulator for South Africa
ICT	Information Communication Technology
ICT4D	ICT for Development
ID	Identification Document
IDP	Integrated Development Plan
IPTV	Internet Protocol Television
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunications Union
JBNP	Joburg Broadband Network Project

Kbit/s	kilobit per second
KHz	kilohertz
LAN	Local Area Network
LEC	Local exchange carriers
LLU	Local Loop Unbundling
LTE	Long-Term Evolution (mobile communications standard)
MAN	Metropolitan Area Network
MB	megabyte
Mbit/s	megabit per second
MEDUNSA	Medical University of South Africa
MEU	Municipal Electric Utilities
MHz	megahertz
MFMA	Municipal Finance Management Act
MNVO	Mobile Network Virtual Operator
MPCC	Multiple Purpose Community Centre
MPLS	Multiprotocol Label Switching
MSA	Municipal System Act
NAF	National Aggregation Plan
NDP	National Development Plan
NeSPA	National e-Skills Plan of Action
NEPAD	New Partnership for African Development
NGN	New Generation Networks
NPV	Net Present Value
OECD	Organisation of Economic Cooperation and Development
OSPN	Open Source Private Network
PFMA	Public Finance Management Act
PICC	Presidential Infrastructure Co-ordinating Commission
PPP	Public-Private Partnership
PSTN	Public Switched Telecommunications Network
QoS	Quality of Service
RDG	Rapid Deployment Guidelines
RF	Radio Frequency
RFP	Request for Proposal
RIA	Research ICT Africa
ROI	Return on Investment
SAT3/SAFE	South Atlantic 3/South Africa Far East
SAT3/WASC	South Atlantic 3/Western Africa Submarine Cable
SEACOM	Southern and East Africa Cable System
SIP	Strategic Integrated Plan
SITA	State Information Technology Agency
SMME	Small Medium Micro Enterprise
SNO	Second Network Operator
SOE	State Owned Enterprise
Tbit/s	terabits per second
TV	Television
UK	United Kingdom
USA	United States of America
USF	Universal Service Fund
USO	Universal Service Obligation
VANS	Value Added Network Services
VDSL	Very High Speed Digital Subscriber Line
VoIP	Voice over Internet Protocol
VSAT	very small aperture terminals (satellite)
WAN	Wide Area Network
WBG	World Bank Group

WBS	Wireless Business Solutions
Wi-Fi	Wireless Fidelity, a wireless local area network
WiMAX	Worldwide Interoperability for Microwave Access
WISP	Wireless Internet Service Provider
WTO	World Trade Organisation
xDSL	includes different types of digital subscriber line, including ADSL and VDSL

Chapter 1: Municipal broadband in South Africa

1.1 Introduction

There is a growing need to rollout broadband in both developed and developing countries to support the economic growth. Access to broadband enables the social and economic amalgamation and this in turn will promote business efficiencies, will broaden the scale of opportunities for countries, will also widen the provision of government services to its citizens and the citizens can benefit from the knowledge economy they participate in. The broadband divide is still a concern in developing countries such as South Africa whereby the rollout seems to be inhibited by various factors. The low distribution of broadband networks, slower speed and the costs involved could be attributed to the factors affecting the roll-out of broadband.

The significant key performance indicator of broadband penetration indicates whether there has been growth both in demand and supply. The OECD has collected data on broadband penetration since 2001 and this will be further explained in detail in the subsequent sections of this report. There is a trend that has emerged whereby municipalities and local governments are providing municipal broadband at affordable prices to their citizens and businesses at large. However, there has to be an investment in the broadband technologies and networks. Therefore, this research paper will be qualitative case study that examines the factors that affect the rollout of municipal broadband in the Gauteng Province concentrating on Tshwane municipality. There will be an emphasis on how policies and regulations are promoting or inhibiting this. The broadband policy of South Africa has been playing a guiding role in facilitating the municipal initiatives that include the rollout of broadband in the country.There could be conclusions drawn to identify the potential areas of improvement by municipalities or local governments to ensure an efficient way of rolling out broadband.

This case study will be presented as follows;

Chapter 1 - This chapter gives a background and overview of municipal broadband in South Africa, the overview and evolvement of the telecommunications sector in South Africa.This chapter introduces the concepts that the research will all be on the macro environment and stating the global trends and also highlighting the status quo in South Africa. The problem and purpose will be suitable in this chapter as they are derived from the analysis that concludes that there is a problem in this field of study.

Chapter 2 - This chapter is about literature review. It also highlights the conclusions drawn from the literature review based on the findings that informs the current understating about the research for example the municipal broadband rollout framework. The factors that affect the rollout of municipal broadband globally are identified and also described to guide the analysis in chapter 5.

Chapter 3 - The qualitative case study approach is followed in this study, therefore this chapter presents the valuation analysis which serves to address the number of questions concerning the research; it introduces the methodology, its approaches and the data collection analysis to be followed.

Chapter 4 - This chapter illustrates the results and findings of the research; the results from the face-to-face semi-structured interviews and the review of official documents. The results are presented according to the number of questions that were posed in Chapter 3 to understand in depth the factors that affect the rollout of municipal broadband in South Africa particularly in the City of Tshwane.

Chapter 5 - A narrative analysis presents the events from a point of view; therefore this chapter gives a perspective on the literature review regarding the factors that affect the municipal broadband in Chapter 2 and the findings of the research in Chapter 4 providean analysis to illustrate the level of advancement in the study and highlight the strengths and weaknesses of the findings.

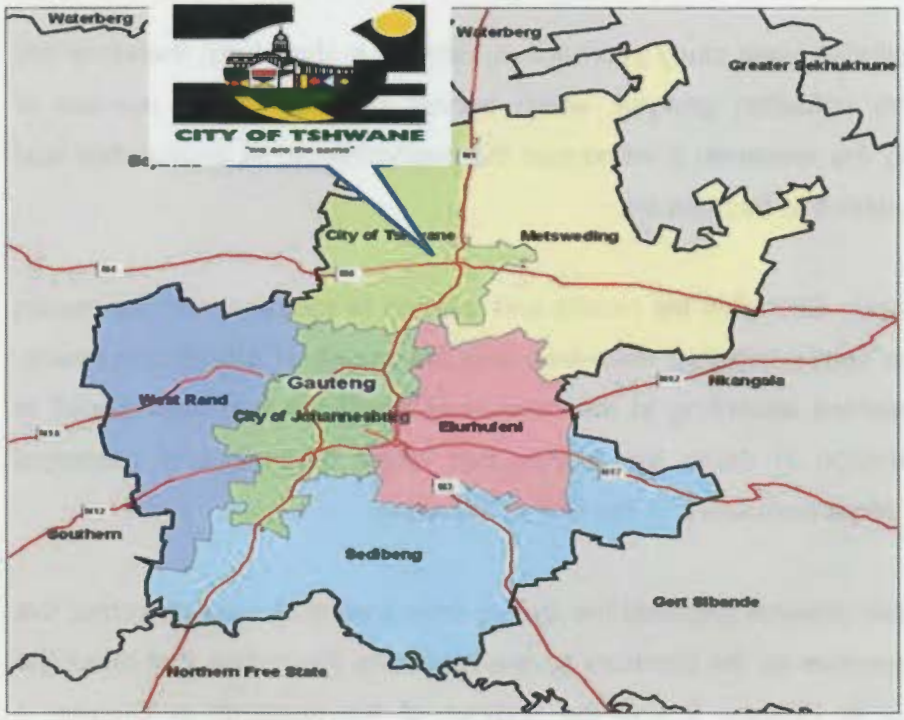
Chapter 6 - This chapter presents the recommendations based on the findings of the research; it seeks to address the clearer perspective of the problem and provides creative solutions. This chapter also provides a conclusion after the research and indicates whether the purpose of the research to examine the factors that affect the municipal broadband has been achieved.

1.2 Background

South Africa is a medium sized country with a total land area of 1,219,192km^2. There are 9 provinces which vary in size and population. The smallest province with high population is Gauteng (Gauteng is a Sesotho word which means 'a place of gold')with an estimated 11,19million people. Gauteng is highly urbanised and contributes 33% to the national economy and a remarkable 10% to the GDP of the entire African continent

hence it is known as the economic hub of South Africa. Most of the population, about 97% lives in the urban areas. Figure 1 below shows the location of the City of Tshwane within the Gauteng Province.

Figure 1: Map of Gauteng Province



Source: City of Tshwane, 2011

Gauteng has three metropolitan municipalities; City of Johannesburg Metropolitan Municipality, Ekurhuleni Metropolitan Municipality and City of Tshwane Metropolitan Municipality. The City of Tshwane was established in December 2005 and has three district municipalities; Metsweding, Sedibeng and West Rand and they all have local municipalities. The City of Tshwane (CoT) is one of the 6 metropolitan municipalities in South Africa. The CoT economy is driven by the industrial development in the areas of manufacturing; however in the recent Gauteng Employment, Growth and Development there has been a re-alignment to the high valued production such as information technology, telecommunications equipment, research and development.The municipality contributes to the total Gauteng economy through the automotive industry and metal production. What is important to note is that there has been a significant transformation in the economy due to the Smart City program. The program that is run nationwide by various municipalities and its goal is to facilitate the implementation of projects that drive the economic development. Smart City initiatives reside under the Economic Growth cluster of the province thus the economic policy has to be an enabler for investment in

cities. There has been challenges for the program such as shortages in scientific and technological human resources i.e. engineers, technicians and scientists due to attractive offers by other countries and the learners' enrolment in science and technology is slow (CoT, 2011).

The reason to study the factors that affect the rollout of municipal broadband in Tshwane Municipality is mainly driven by the reasons that Tshwane municipality has laid 470km of fibre optic cable. The broadband network is primarily deployed for connecting schools, hospitals and clinics. The City of Tshwane has made more advances than other metros from acommunicationinfrastructure point of view and started earlier than others in the early 2000's. It plans to establish a Smart City office at the Innovation Hub and will focus on providing facilities to schools, hospitals and clinics. There is also an intention to rollout free connectivity however the challenges include the content development once the schools are connected and the integration of the Smart strategy and programmes for various government services that include emergency services, safety and security structures. There is also an intention to implement e-administration that could be facilitated by leading Information Technology solutions such as SAP whereby a fully integrated transactional system is implemented to support budgeting, performance management and organisational monitoring (Abrahams, 2010).Tshwane municipality has piloted both infrastructure and technological initiatives; it will be the purpose of the study to find out what has driven the decision to pilot on technology and infrastructure, what business models were adopted, what funding did the municipality receive if any? Furthermore, what were the challenges and lessons learned during these projects?

Tshwane is historically the administrative capital city of South Africa. It also houses a number of embassies of international governments; there are about 105 diplomatic missions in City of Tshwane. The city has the highest educational level in the country and has 4 universities with the research institutions such as Council for Scientific and Industrial Research (CSIR) to support this higher learning.It is thus appropriate that it was reconstructed as a virtual city where citizens and visitors can interact easily in regard to activities of the city. Moreover; the visitors which are mainly diplomats can also be able to engage with their countries at ease (Abrahams, Bhyat & Bakker, 2007).

It is then imperative that Tshwane as a Metropolitan Municipality migrates to a high speed, high bandwidth environment for citizens and visitors mainly for the purposes of businesses, schools, hospitals and academic and research institutions. South Africa is not particularly a big role player in the economies of the World however it can play a role

in enhancing its competiveness through telecommunications and internet accessibility. The affordable high-speed broadband can enable participation in local and global economic information and transaction chains. According to Abrahams et al. (2007), South African government has attempted to create an environment of easy access to internet services by means of Multi-Purpose Community Centres (MPCCs). There are communities that faced challenges regarding the infrastructure hence the perceived failure. In the case of universities and research institutions; there is a need for high bandwidth to connect and collaborate globally with various researchers globally. The general demand from business is also putting pressure on the internet based services. The municipalities are then coerced to lay down the high speed networks through municipality funds to be able to attract businesses and be competitive and Tshwane is not immune to that demand. The City of Tshwane has been competing to attract businesses and be competitive globally. Municipal broadband can provide the foundations for such fast internet services (Abrahams et al., 2007).

The City of Tshwane developed the City Development Strategy in 2004;which focuses on the short, medium and long term horizons. It is worth noting that in the strategy, the City acknowledges thechallenges and improvements in the socio-economic demographic perspective of Tshwane thus the partnership with the national, provincial and local stakeholders is critical to the implementation of the projects identified as catalyst such as developing the knowledge economy including the Tshwane digital hub (CoT Development Strategy, 2006).

1.3 South African Municipal Broadband

There have been inroads made in South Africa regarding the municipal broadband and this is demonstrated by the commitment the metro municipalities have through their strategies and the integrated development plans that outline their envisaged projects to be implemented over a period of time. The different approaches of the metros will be addressed in this section in order to draw attention to the growth or at least an intention by the municipalities to leverage on the broadband technology as an enabler. The metropolitan municipalities to be addressed are eThekwini, City of Johannesburg, City of Cape Town and Ekurhuleni. Most municipalities adopted the Smart City concept and they ran with the initiative under their own programs.

1.4 eThekwini Metropolitan Municipality

According to the IDP 2012-2013, eThekwini Municipality makes provision for ICT infrastructure development through programs that have an impact on the economic growth such small, medium and micro enterprises (SMME) development. The objective of this program is to ensure that communities are diversified when it comes to business opportunities. This should also ensure that there is fair competition, increased productivity, innovation, boosting employment amongst other outputs (eThekwini, 2012).

The municipality established a company called MetroConnect to rollout broadband across the city. They used the Open Source Private Network (OSPN) as a technology to provide wholesale,carrier class services of high bandwidth and high speed. Dimension Data managed the network and to supply the Internet Service Provider (ISP) and public entities. There were plans to implement wireless services to bring customers on to the network and connect public entities such as universities and hospitals. At the time of the report's publication; there were several projects that were underway, the Metro Services Portal, Rural broadband and Residential Quad Play whereas the SmartXchange technology innovation node and business incubation centre were prioritised as the city's high speed backbone(DBSA, 2009).

1.5 City of Johannesburg Metropolitan Municipality

It is stated in the City of Johannesburg (CoJ) IDP 2012-2016 that there will be subproject, ICT Integration and Collaboration running under the program Financial Sustainability of the municipality. The municipality will leverage on ICT technologies and partnerships such as broadband and a budget of R90million has been allocated to this. Ageing infrastructure and lack of competitiveness in economic growth has been cited as risks that will be mitigated by the roll-out of broadband in the city (CoJ, 2012).

There have been several initiatives in the municipality to roll-out broadband but this has been faced with challenges. The city initiated what is called Joburg Broadband Network Project (JBNP) to the tune of R500million. The JBNP specifically explores various telecommunications technologies considering that the city owns its platforms and infrastructure and also the private telecoms network licence. The idea is to link Tshwane, Ekurhuleni and Joburg under the G-link network which is the name of project to rollout broadband in the city (DBSA, 2009).

1.6 City of Cape Town Metropolitan Municipality

The Western Province has the broadband strategy and the ICT infrastructure is stated as an independency for government's planning and implementation of services. This will encourage the information sharing amongst departments and enable the creation of a single aggregated view of the citizens and businesses alike. The City stated in its Annual Report (2006/2007) that the city has established its own Broadband Municipal Network which is envisaged to reduce the city's telecommunications costs and will be affordable for citizens and businesses(DBSA, 2009).

The City of Cape Town municipality is clear about the broadband roll-out and cost allocations of the project;are stated clearly in the Integrated Development Plan (IDP) 2012-2017. The City has 5 pillars that drive development programs; Opportunity City, Safe City, Caring City, Inclusive City and Well-run City. Broadband is mentioned in both opportunity city and well-run city. The opportunity is described as the city that enables economic growth and creation of employment for the citizens and to achieve this, the city realises that the infrastructure should be sustainable. Investing in broadband infrastructure will increase the capacity of the market hence the roll-out of MyCiTi network is integral to this realisation. The well-run city pillar includes projects that will enhance the competitive environment for the city hence installing the broadband that is accessible and affordable to the citizens so as to draw from economic opportunities. R500 million has been allocated for the projects. The city has identified broadband penetration as a key indicator for the economic and social infrastructure performance measurement and also that it is linked to the gross domestic product and employment growth. The City requires skilled people, access to computers and access to high-speed bandwidth fibre optic cables to achieve the high performance measure. The programme fibre-optic network's objective is to install a fibre-optic communication network within Cape Town (City of Cape Town, 2012).

1.7 Ekurhuleni Metropolitan Municipality

Ekurhuleni Municipality, like the City of Cape Town, has identified ICT infrastructure as a dependency for most of the development that needs to take place such as transport, research and development, community safety. The metro also put this as an inhibitor for rapid technological growth particularly in the environment of high-tech hubs such as OR Tambo International Airport. There has been R78million set aside for ICT infrastructure development. The IDP also states that this will support Gauteng 'Smart Province' vision and economic growth in the metro (Ekurhuleni, 2009).

The Ekurhuleni 2025 Growth & Development Strategy (GDS) put the application of ICT infrastructure as the key focus area. It further states that the 'insufficient telecommunications infrastructure and services will seriously hamper sustainable economic growth' hence it is crucial that the metro continuously ensures improvement of local services. The metro should also work closely with the City of Johannesburg and City of Tshwane in promoting the smart province concept and attracting the ICT development and investment. This partnership also includes the role players in the ICT industry such as Telkom and cellular network operators. Ekurhuleni has the Information and Communication Technology Advisory Panel that advises on technology and communication and also recommends priorities and resources for achieving the ICT agenda. The following projects were implemented under the ICT budget; the first phase of Fibre Optic Cable project that seeks to connect the nine city councils with high-speed fibre, deployment of wireless broadband in Customer Care Centres (CCCs) and digital villages that provide the staff with high speed connectivity to Ekurhuleni Metro network, the internet Kiosk for libraries to enable citizens to interact with government and various business institutions at no cost and lastly the telephone and data infrastructure has been integrated via Cisco VOIP phones. This has resulted in savings for the metro as all calls that are internal to the metro are routed to a central computer server (DBSA, 2009).

1.8 South African Telecoms Sector

The 2010 South African broadband policy's vision is to ensure universal broadband is achieved by 2019. This could be achieved by having access to broadband services directly or indirectly at a public or private point. The policy also takes cognisance of the role of municipalities' contribution in rolling out broadband to the citizens. The local government's role is to define the requirement for broadband services in the municipalities to enable provisioning of infrastructure. There has been an improvement in some areas of the country mainly the urban areas but still no 100% satisfaction on the connectivity or delivery of service. The broadband development is governed by the Electronic Communications Act (ECA) which provides the legal framework for the communications technologies in South Africa, the Independent Communications Authority of South Africa (ICASA) which enables the effective and independent regulation of the ICT sector, the Inter-Government Relations Framework Act which sets the interaction and relationship between the three spheres of government and the Electronic Communications Transactions (ECT) Act which sets the framework for electronic transactions and verifications thereof.

There are two channels of communications in South Africa, the internet and mobile. The mobile or wireless technology became pervasive around 2008 due to the demand for communication by the public and this also witnessed a growth in the profit margins for the network operators. Currently, South Africa is going through the broadband evolution. Telkom which is partly owned by government has created a significant network infrastructure and the new incumbents are also investing heavily on new infrastructure (DBSA, 2012).

The telecommunications market in South Africa has two major role players, Neotel and Telkom and the mobile network operators are Vodacom, MTN, Cell C, Virgin Mobile and Telkom Mobile, 8.ta. The underserviced area licenses (USAL) were awarded to 14 small operators to provide telecommunications to areas with 5% teledensity and with limited commercial viability. The same operators about 14 of them were then granted Electronic Communications Network Services (ECNS) Licences under the Electronic Communications Act, 2005. This allowed the operators to build their own network infrastructure. There are also 250 Internet Service Providers (ISP) licensed to provide telecommunications and other Value-Added Network Services (VANS) such as leased licenses, dial up access, data network services and subletting of telecommunications facilities. The availability of spectrum has been a challenge for small network providers in that they could not venture into wireless provisioning. ICASA, the industry regulator has embarked on spectrum resource allocation however it is moving at a slow pace. On the other hand, Telkom SA as an incumbent of a fixed line data and broadband infrastructure has a monopoly therefore making it difficult for the new entrants. It has later been established through research that Telkom prices are higher than other countries on the same scale. Neotel has not been able to penetrate the market as Telkom direct competitor on pricing instead its offerings are more on new technologies.

Due to the slow rollout of broadband at the national level; the municipalities have embarked on public-private partnerships to build, operate and maintain the broadband network. They offer the citizens and visitors affordable services and eventually the transfer of assets will be agreed upon. Metropolitan municipalities have invested in telecommunications assets for internal communications and have ownership of fibre networks, wireless networks, street light poles, storm water drains and pavements. The municipalities are developing policies to create an environment for laying high bandwidth and greater penetration of broadband through strict guidelines to protect the erosion of public land. The high priced market for both voice and broadband as previously mentioned relative to income has been associated with the high interconnection rates

charged by operators to terminate calls on each other's network. The Communications ministry as a policy maker and the regulator for the industry, ICASA, intervened in the reduction of the interconnection fees. (Abrahams & Newton-Reid, 2008)

A state-owned broadband company, Broadband Infraco, was appointed on the basis that it will remedy the roll-out of backbone infrastructure in the country. The commercial strategic intent of Infraco is to deliver a return that will be self-funding in terms of future expansions. It was created to manage the national fibre grids that were operated Transtel through the railway lines throughout South Africa and the fibre network operated by Ezi-tel through Eskom power lines (DBSA, 2012). The broadband penetration in the country is not at the level of the other similar countries such as Hungary and Turkey also the mobile services have significantly grown and still not affordable to many (Gillwald, 2007). The failure of the South African sector reform policy has added to the constraints of private investment into the ICT sector. The regulator has also made the environment unfavourable to operate i.e. the market entry and the high set up cost. Furthermore the conflict of interest during the formation of the state-owned Infraco under the ineffective regulation has not assisted the situation (Gillwald, 2007).

1.9 Broadband Market

The South African telecoms sector comprises of fixed-line market, mobile market and the undersea cable market which includes the internet service providers. The fixed-line operators are Telkom, Neotel and Dark Fibre Africa; mobile operators are Vodacom, MTN, Cell-C and Telkom (8ta); the undersea operators are Telkom, Seacom and Eassy. There is another national grid which is managed by FibreCo, this include Cell C, Internet Solutions and Convergence Partners and it connects the Dark Fibre Africa local grid with other regional grids (DBSA, 2012).

In 2009, the role players in the telecoms market were allowed to build network infrastructure when they have an appropriate licence. Previously, they could only lease facilities from Telkom at high prices since it was a monopoly (Abrahams & Goldstuck, 2010). The market of value added services has internet access and services and wireless applications services. The undersea cable systems are serving most part of South Africa. The Eassy and Seacom landing points are on the KwaZulu-Natal North coast linking South Africa to the Middle East; UK and India. The SAT3/SAFE system landing points are atMelkbosstrand and Mtunzini, linking South Africa to Europe and the Far East (Abrahams & Goldstuck, 2010).

Vodacom, MTN and Neotel have joined forces to share the costs of digging up the trenches that will host national grids. There is at least 20% of the cellular towers that are available and this will service the data demand considering the smartphone and video growth in the market. Cost is still the major challenge in infrastructure development. There are new emerging players to extend the reach in urban areas or areas of high business density and demand e.g. Metrofibre is running its own grid to Dark Fibre Africa clients and also i3 Africa is also doing the same. There is still Greenfields in most targeted areas as there is no fibre there (DBSA, 2012). Table 1 below shows the investment that has been in various infrastructure projects in South Africa by private and public sectors.

Table 1: Major fibre infrastructure investments

Company	Scope	Coverage
Telkom	The major national grid covering 140,000km	National
Broadband Infraco	The former Transtel/Ezi-tel national grid	National
Dark Fibre Africa	Laying down of fibre to resell capacity to telecoms company	Urban Centres
FibreCo	National grid between major urban centres	National
Neotel/MTN/Vodacom	National grid between major urban centres	National
City of Cape Town	Urban grid extending to Western Cape province	Municipal
eThekwini	Urban grid	Municipal
City of Johannesburg	Urban grid	Municipal
MetroFibre	Extends DFA network to customers	Urban - Johannesburg
I3Africa	Extends eThekwini network to customer premises	Urban - Durban

Source: DBSA, 2012

The broadband market in South Africa, the commercial operators fixed and mobile in the current form is stipulated in Table 2 below;

Table 2: Existing market structure: Dominant Network dynamics

Portion of Network	Wholesale	Estimated Market Ownership	Retailer/reseller
International connectivity	Telkom + Eassy + Seacom (undersea cable and satellite) other/satellite	95% 5%	Telkom, VANS, e.g. UUNET, Internet Solutions
Long distance within SA	Telkom, PTNs such as Broadband Infraco, Link Africa, Neotel, Gateway Communications	90% 10%	Telkom, VANS
Local Loop wireline	Telkom Other	98% 2%	Telkom
Local loop wireless	Sentech (Mywireless) WBS (iBurst) Other	60% 30% 10%	Sentech WBS VANS/WISPs
Cellular 3G	Vodacom MTN	90% 10%	Vodacom Service Provider, Other Cellular Service Providers
LTE (4G)	Vodacom, MTN, CellC, 8.ta	30%	Cellular Service Providers

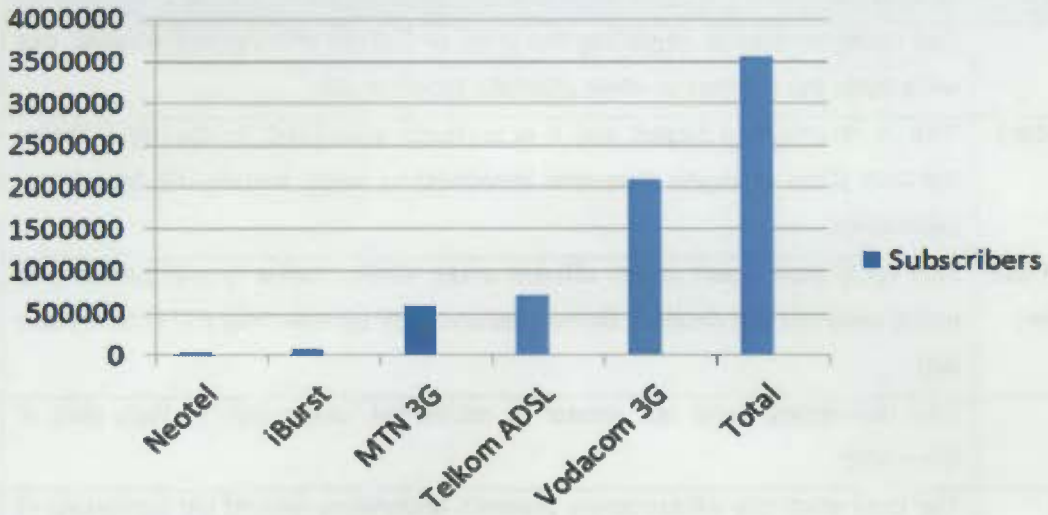
Source: Naidoo, Kaplan & Fransman, 2006 and Research ICT Africa, 2012

According to Naidoo et al., (2006) Telkom dominance is clear; the second network operator will struggle to dominate the broadband market. The various players compete for the same customer however the product offerings are not directly comparable. What distinguishes the competitive edge is the technology at various levels of the network and the pricing of those offerings. The above table shows the estimated market share in the different network classes in 2006. The size of the broadband market is not easy to

identify, therefore the number of people with access to internet access is used as an indicator of the market size. There are estimated 4.5 million people i.e. about 10% of South African population which has access to the internet via their respective work. There are 800,000 dial up residential access to the internet. In some instances these dial-ups have been replaced by broadband connectivity. There are more than 20mil mobile users in South Africa. It is estimated that the mobile broadband will increase the number of broadband connections those that are on ADSL and fixed wireless. Broadband satellite is also available in South Africa and Sentech and Orbicom are the network providers. This service is mostly targeted to big business than the household internet connections.There have been significant changes since 2006 whereby network infrastructure has evolved such that there is 4th Generation Network (4G LTE) in the market as indicated in the table above. Vision 2020's goal is to achieve 100% broadband access by year 2020, currently there is 9 to 15 percent connectivity amongst the population. There is a need for South Africa to strike a balance between quality, speed and access to achieve the Vision 2020 goal (Research ICT Africa, 2012). The Research ICT Africa (RIA) report illustrates the mobile usage, the services and products that are offered by the cellular operatorsin South Africa.

Figure 2 below shows the broadband subscriber number per network or technology. It also shows how ADSL has not grown to an extent of the 3G technology whereby Vodacom is holding a market share. The 3G wireless technology has grown 4 times more than ADSL because Telkom is reluctant to invest further by laying down the copper cables that in turn gets stolen for other industry benefits (DBSA, 2012).

Figure 2: Broadband subscribers by service provider



Source: Goldstuck , 2010

Table3 below shows the number of internet users using the internet at the end of 2010; the primary access of the internet is still ADSL mostly for business, academic institutions and hospitals. There is an intention to unbundle the local loop whereby all telecommunications operators will have access to Telkom infrastructure that will enable them to offer fixed line services.

Table 3: Internet access in South Africa at the end of 2010

Unique primary wireless b/b users	Primary ADSL users	Cellular only	Dial-up internet users	Corporate users (adjusted for mobile b/b users	SME users (through office ADSL)	Academic users	Total users
2 100 000	700 000	1 000 000	250 000	1 550 000	600 000	600 000	6 800 000

Source: Goldstuck, 2010

1.10 Broadband Technologies

Naidoo et al., (2006) and RIA (2012) further illustrate the technologies that separate the network operators in the South African broadband penetration; the table below summarises the technologies and also shows the significance on the international market.

Table 4: Broadband technologies in South Africa (Historical and Current)

Technology	Comments
DSL	The major concern is regarding the price of Telkom offering and whether this will sustain the wireless or other alternate technologies
Cable Modem	This is no installed based and it is currently prohibited. In the near future, Sentech plans of digital terrestrial broadcasting might include the broadband capabilities
FTTH (Fibre to the home)	This could play a part in few affluent areas where market is deregulated and metro networks are created. Some business park estates offer FTTH as a value add
Satellite	This technology does not appeal to residential usage due to high cost of ownership
Powerline	The local electricity infrastructure presents uncertainty around the ownership of municipalities and SNO. Once the electricity infrastructure is resolved this can have a significant impact on broadband development
Broadband fixed wireless	The WIMAX (802.16) technology standard has taken the broadband market to the next level. This has made an impact on broadband development as most network operators are offering this to their customers
3G (mobile broadband)	This isa viable alternative for fixed wireless and fixed line users if the price is right. Vodacom has adopted the Vodafone 3G strategy. This has grown significantly as the market has been driven by the subsidised handsets.
Carrier Class Ethernet	No current activity
Wi-Fi	This is mainly in hotspots and in South Africa the limitations are mainly on the availability of mobile devices such as laptops. There has been an increase of cellphone handsets as alternatives for mobile devices
WIMAX	Telkom and Vodacom tested WIMAX as a fixed wireless solution. The technology has been rolled out and used by network operators to offer their services
LTE (4G)	All mobile network operators; Vodacom, MTN, CellC, 8.ta have been providing services to their respective customers and it is for free

Source: Naidoo, Kaplan & Fransman, 2006& Research ICT Africa, 2012

According to Abrahams, Bhyat & Bakker (2007) the technology decision has mainly been dependent on what is called the last mile. This is a link between the individual homes and businesses and the switches to the metropolitan networks. In Johannesburg there have been pilots to test the last mile using any technology suitable for the infrastructure and budget. These technologies as per the table above included the Wi-Fi,

Wimax,and Broadband over Powerlines (BPL) and recently LTE. This gives the companies an opportunity to prove their business models and technologies. The broadband over powerline is an intriguing concept as it has lucrative advantages mostly on the demand side whereby data capturing and billing by municipality personnel will be improved. The drawback of this technology is that it is costly to deploy and the service providers are not obligated to participate or sponsor in the deployment thereof. It will be in the best interests of the municipality to repay the service providers who will invest in BPL. On the other hand, the energy supply can also create an unattractive environment if the supply is interrupted and the telecommunications get impacted. The service providers find the wireless technology most cost effective and easy to deploy however as a last mile this technology is unreliable as it gets interrupted by the electro-magnetic interference (Abrahams et al., 2007).

The mobile network operators have increased the subscriber base to more than 44 million. The mobile market has four mobile operators and one mobile virtual network operator (MNVO). The two major role players Vodacom and MTN who have 80% of the South African market combined; have subscribers in other African countries. In 2006, Cell C and Virgin Mobile entered into a partnership as virtual mobile operator (MNVO). Virgin Mobile has less than 15% even after focusing on the youth market and international market. In 2009, Telkom launched the fourth mobile operator, 8.ta (RIA, 2012).

Even though the price for services for all network operators is on the high side; they are committed to keep abreast with technologies so as to provide a wider range of services to the subscribers. The internet landscape has also evolved over the recent years; the user base has also grown past the 5million mark. The internet growth has put the demand of bandwidth under pressure particularly in the business and academic arena. There are currently 5 broadband providers in South Africa, i.e. Telkom, Neotel, Vodacom, MTN and iBurst, Wireless Business Solutions (Ovum, 2012).

1.11 The Research Problem: Municipal Broadband

There have been studies done to illustrate that backbone infrastructure contributes to the economic development of the country. Some countries such as Australia have included broadband infrastructure in their economic stimulus packages and have action plans to achieve this (Zhen-Wei Qiang, C. (n.d.)). In 2007, South Africa promulgated the Broadband Infraco Act which established the state-owned broadband agency and its

main responsibilities are to rollout backbone infrastructure to provinces and major urban centres at an affordable cost, rollout infrastructure to underserviced areas and provide access to international networks. In 2010, the broadband policy for South Africa also recognised the benefits of broadband development and has identified key priority areas that will enable realisation of benefits, namely, (i) ensuring universal access through spectrum availability and most importantly access to international networks, national backbone networks and local networks; (ii) creating an enabling environment for economic growth which will stimulate competition through affordable services (iii) increasing the usage and uptake of broadband by all three spheres of government.

This study proposes to examine the factors that affect broadband rollout in municipalities using the case of the metropolitan municipality of Tshwane in Gauteng Province. There will be a conclusion drawn on policy and regulation based on these factors.

There are factors that affect the successful roll out of broadband and failure in any of these factors may impede the rollout and therefore impede economic development in the country. Referring to the broadband conceptual framework (Bouwman et al, 2006),there are two main challenges in broadband deployment that need to be overcome:an efficient decision-making process to rollout broadband speedily and the delays that might arise if specificinfluencing factors are not effectively promoted. This problem pertaining to decision-making and delay was observed in the case of the City of Tshwane, but the nature of the problem is not understood, hence the need to conduct the research.The supply side issues related to broadband rollout require municipalities to decide how toaddress key factors,includinginfrastructure network andtechnological adaptation, and funding related issues, and business models adopted, while policy and regulation must provide the enabling framework for municipalities. Tshwane municipality has piloted both infrastructure and technological initiatives,hence it will be enlightening to find out what has happened in the decision making process and how the challenges have been addressed.

1.12 Purpose Statement

The purpose of this research is to examine how the key factors namely, technology adaptation, funding levels, business models, policy interventions and regulatory effects affect the decision-making to rollout out municipal broadband infrastructure and the cause of delaysin the urban or semi urban areas of Gauteng, using the City of Tshwane Metropolitan Municipality as a case study. The technology adaptation is examined

because it is the underlying element that hosts the various user applications that enable connectivity. The funding levels are also examined due to the costs that are attached in laying down the fibre which in turn determines whether the user will be able to afford the service or not; this will guard against the user absorbing operator costs. Municipalities are faced with this challenge as they are not revenue generators; they provide services to citizens. The business models are examined because for any rollout of broadband mainly fibre optic requires return on investment by operators and sustainability. The paper also examines the policy interventions and regulatory effects that require improvement withrespect to municipal broadband roll-out. The intention of the study is to provide policy makers, Ministry of Communications, ICT Policy Review Panel and the regulatory body, ICASA, appropriate recommendations that will influence this process towards effective policy making that would create an enabling environment for efficient rollout of municipal broadband in South Africa.

1.13 Research Questions

The central question in this research is 'How are municipal broadband initiatives taking effect in South Africa'? The following questions will be investigated in order to answer the main question:

1. What are the strengths and weaknesses of municipal broadband rollout between 2003 and 2012?
2. How do factors such as funding levels, technology adaptation and business models effectiveness promote or inhibit broadband deployment in metropolitan municipalities such as City of Tshwane?
3. What factors are important to encourage municipal broadband adoption in South Africa?
4. What are general challenges and lessons learned to be drawn from the Tshwane municipality piloted infrastructure and technological initiatives?
5. To what extent does the success of municipal broadband infrastructure rollout depend on the policy and regulatory interventions?

1.14 Limitations of research study

The scope of this research is limited to Tshwane municipality in Gauteng Province.
The following topics fall outside of the scope of this investigation:

- The impact of broadband on socio – economic development of community.
- Policies that are not related to broadband rollout

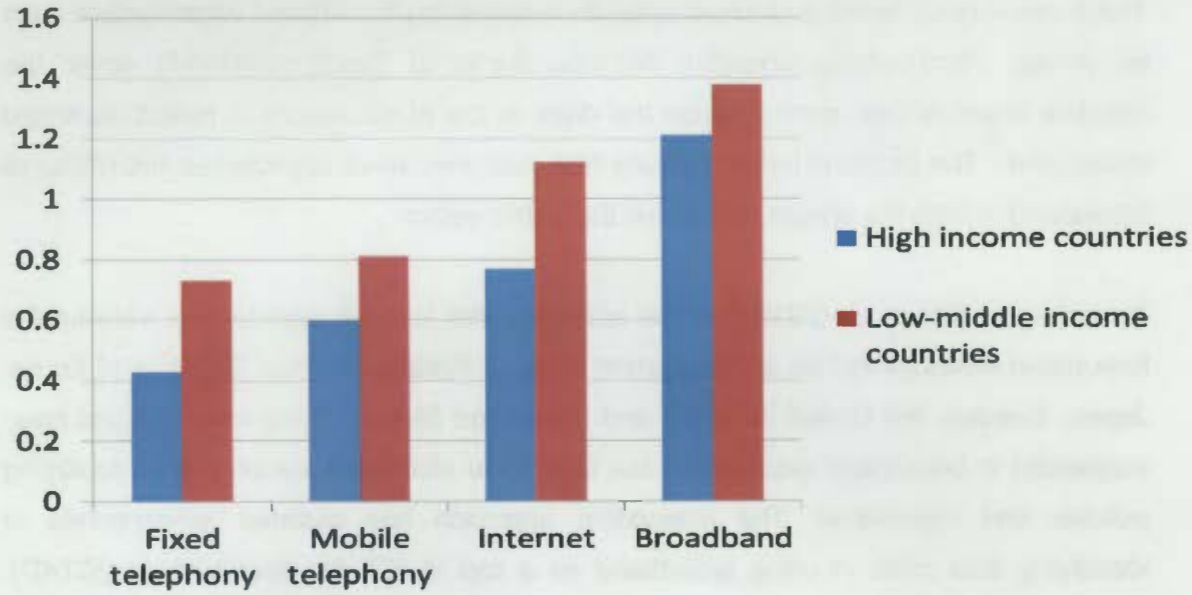
Chapter 2: Review of literature on municipal broadband

The theoretical background of this research is developed from different sources that discuss the rollout of broadband. The sources include journals, articles, reports and books. The international sources have been considered to give a view on global trends and regional policy and regulatory frameworks. The academic literature that one comes across is basically responding to the question 'does municipal broadband matter'? The response to this question can be reference on the broadband rollout framework where the end user adopts the broadband and subsequently sees a gain in socio-economic welfare and also supplier gaining competitive advantage. The decision phase that is in the rollout broadband framework will be in line with the research problem.

Broadband by definition refers to the amount of capacity (or speed of data transfer) provided on the telecommunications network (Umino, 2002). According to Umino (2002) broadband communications create the foundation of information society and can impact on economic and social development. Broadband is classified as an enabler for high speed, always-on connection and two-way support across industrial sectors such as education, health, trade etc. Windows of opportunities are formed and the digital divide is minimised through the establishment of economic relations that come about using ICT. Platform for change in the way economy operates will have an effect on the creation of jobs or loss of jobs, improvement in the quality of work; businesses will find it easier to operate anywhere and the skills will be enhanced by the requirement of ICT (Wolf, 2001).

The growing number of developing countries is seeking broadband development. The countries are also moving from defining broadband as network connectivity with a specific speed but as an ecosystem that is inclusive of the networks, the services that the networks carry, the applications they deliver and users or consumers. The transformation of all these components has been influenced by technology development, business growth and market development. Furthermore the definition includes the supply side which caters for access of networks and services and the demand side which caters for adoption of broadband (Kim, Kelly & Raja, 2010).

Figure 3: Growth Impact of Telecommunications



Source: Kim , Kelly & Raja , 2010

In the above Figure 3, Kim et al., (2010), found that in low and middle income countries every 10% point increase in broadband penetration has accelerated growth by 1.38% points; in the same study McKinsey states that 10% in household broadband penetration boosts the country's GDP from 0.1 to 1.4% and on the other hand for a similar study; Booz and Company found out that 10% of broadband penetration in a specific year has correlated to 1.5% labour productivity growth over the upcoming 5 years

The World Bank (2009), the year in review regarding the world's economic growth indicators, states that broadband is a key driver for economic growth and that it has a major impact in people's day to day lives. The trend is that more companies are utilising broadband to improve the productivity through remote monitoring, logistics management and online procurement. The governments for various economies have featured the broadband investments in their fiscal stimulus plans. In 2009, Australia had committed around US$33bn while the United States had set aside US$7.2bn for rural broadband development. Broadband has been viewed as a substantial element because on the supply side it stimulates investment and employment whilst on the demand side it creates the opportunities for entrepreneurship which benefit the economic growth (Kelly et al., 2009).The studies that have been done by research houses such as McKinsey & Company and Booz & Company have found that the increase on broadband penetration accelerates the economic growth.

2.1 Global Approaches of Broadband Infrastructure Rollout

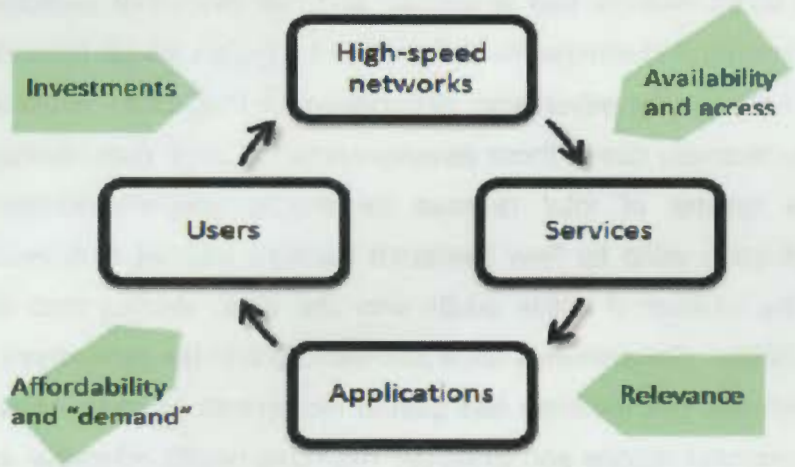
There are various forms and approaches to establishing broadband infrastructure such as private infrastructure whereby the incumbents of fixed/mobile/Wi-Fi cover the lucrative areas of the country hence the drive in the public sector to rollout municipal broadband. The sections below indicate how countries have approached the rollout of broadband in both the private sector and the public sector.

According to Kim et al. (2010),the few countries that took an approach of viewing the broadband development as an ecosystem such as Finland, France, Republic of Korea, Japan, Sweden, the United Kingdom and the United States. They have not just been successful in broadband deployment but they have also been successful in deploying policies and regulations. The ecosystem approach has assisted governments in identifying their roles in using broadband as a tool in ICT for development (ICT4D). Broadband is more than just a supply of access to networks and services as telephones models are traditionally known; thus most governments are focusing on the growth in ICT infrastructure and development of the ICT sector.

Networks: Broadband connectivity has expanded tremendously globally. The number of fixed broadband subscribers reached 465 million by September 2009 from 286 million in December 2006 and 128 million subscribers are from BRIC countries i.e. Brazil, Russia, India and China. Similarly, the wireless broadband subscriptions have expanded in the same breath. In September 2009, there were more than 570 million high-speed mobile subscriptions of people using third generation (3G). Technologies such as Wimax are also utilised for wireless connectivity. Development in technologies has enabled networks to reach more people at lower costs. In developed countries fibre-optic is moving closer to homes and offices and on the other hand in developing countries the spread of wireless is more prevalent than wire line.

Figure 4 below demonstrates the broadband ecosystem which is interconnected, multi-layered of high-capacity networks, services, applications and users.

Figure 4: Broadband Ecosystem – Connecting the elements



Source: Kim & Kelly & Raja,2010 cited World Bank Broadband Policy (2009)

Services: The operators are dependent on the network infrastructure to provide services to people. Services such as data, video and audio are offered however with the convergence there is no clear segmentation on the services. All these services are carried over Internet Protocol data packets and even in this area there is a shift to next generation networks such as IPTV. There broadband has enabled telephone networks allowing subscribers to watch television broadcast using IPTV over the internet, YouTube videos are examples. Through convergence it is not easy to distinguish what is data, video or audio service in the video repository websites. Broadband data networks also enable other services of voice such as Skype. Demand for bandwidth is expanding and it will continue to grow. The OECD suggests that bandwidth requirements for various types of digital content such as online games, video on demand and video conferencing range from 2 to 14 Mbit/s. In economies such as China and Korea the internet traffic has crossed 20 Gbit/s per capita. As the demand for bandwidth grows; there is also a decrease in price. In Ireland the price for ADSL connection fell 74% between 2005 and 2008. In Turkey the decrease was 70% and Peru 17%.

Applications: These are software programs designed to deliver content to users. These are becoming the centrepiece of the ecosystem. These used to be confined to users PC or Laptops users but these days through technology advancement; they can reside on the "cloud" – another innovation which represents the Internet and other networks and

broadband connectivity allows users to connect to clouds using multiple devices to access the same services or information while keeping costs low of both software and data distribution. Social networking has taken the world by storm, the world has shrunk in a way that it is mind boggling whereby people publish content and communicate at ease. Facebook is one social network that is popular and has more that 200million active users. This is becoming a challenge for older business models where there is a trend to move to social networks for advertising, newspapers or magazines which are experiencing a decline in revenues due to these developments. In 2007, data revenues accounted for about a quarter of total revenue for mobile telecommunications companies'worldwide. A study done by Pew Research Centre's Internet & American Life Project found that the number of online adults who use video sharing sites and applications doubled in 2006. Governments have also kept up with the evolvement of applications; the e-government phenomenon has gained momentum whereby citizens are in touch with the government policies and strategies regarding health, education and economic activities via the internet and most importantly they are engaging on issues and becoming digitally literate.

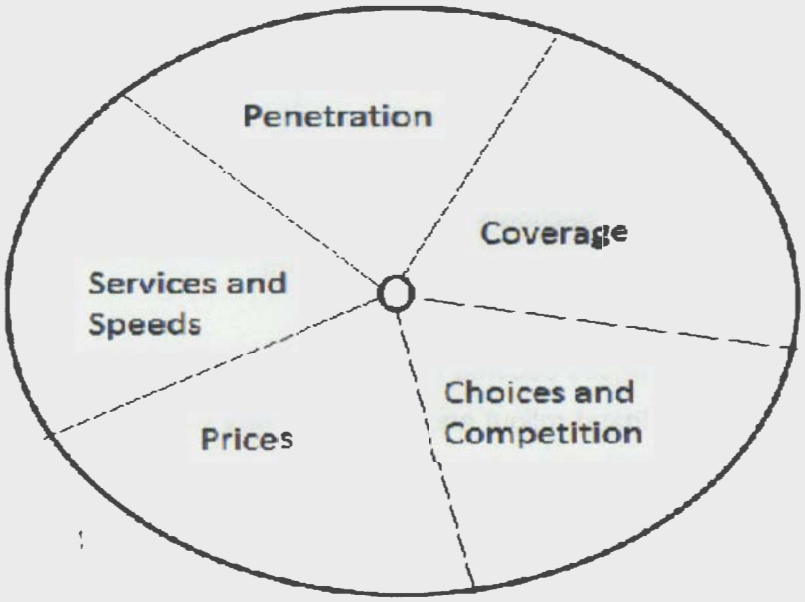
Users: Broadband is useful for various reasons. Broadband services improve business users' connectivity and in turn strengthen business performance. One study in Latin America showed a direct benefit brought about broadband deployment in the areas of business and process engineering speed and timing, process automation and data processing. The service industries are the most users as they are customer centric. Broadband users are also creating new content and consuming new media. The share of American Internet users who have social network connectivity has quadrupled in recent years. Twitter, an application that allows users to broadcast short messages allows cross-platform communications and has estimated 6 million users. It was formed in 2006, yet it is the most powerful tool for organising political and business gains across the world (Kim et al., 2010).

2.2 Broadband Markets Evaluation, Subscriptions and Usage

The OECD has collected data on broadband penetration since 2001 which is the significant key performance indicator whether there has been growth both demand and supply. There are at least five criteria that countries can use to evaluate or gauge the broadband market development.

The following figure 5 indicates the five criteria that are used by various countries and factors such as social and economic are also considered.

Figure 5 : Five criteria for evaluating Broadband Markets



Source: OECD Report, 2008

According to the OECD Report (2008), data penetration, speed, price and usage of the internet highlight how countries have promoted competition and also how they have encouraged direct and indirect investment. Coverage statistics demonstrated how governments have worked with private sector to increase connectivity. Governments have also implemented policies to ensure that rural or remote areas are covered.

Economists have struggled in the past to collect data so as to do empirical test for supply and demand as a result they opted for penetration as a determinant for demand and supply. In 2007, eight countries; Denmark, Netherlands, Switzerland, Korea, Norway, Iceland, Finland and Sweden led the OECD in broadband penetration. Denmark, Netherlands and Switzerland surpassed the level of 30 subscribers per 100 inhabitants whereas the others were showing growth of 28 subscribers per 100 inhabitants. Benchmarking broadband penetration assists governments to weigh the performance of the markets in their countries and over a period of time. The slow growth can be an indication of market deficiencies such as policy making and implementation thereof.

The coverage criterion is driven by the geographic conditions such as land mass, terrain and dispersion of population in an area. Australia as an example, experiences difficulties in the backbone infrastructure due to geographically large terrain and dispersed population not all technologies can enable high coverage levels. Switzerland on the other hand is a small country but yet difficult to reach high coverage due to the difficult terrain which has extensive mountain ranges with remote villages. Despite the challenges, in 2006, Canada has reached 78% coverage of households in rural areas; USA has 96% of households using high-speed cable modem. Operators base their decision to rollout broadband on geographical conditions whether it is economically feasible. Most OECD broadband subscribers receive their services from the network that was built before the development of DSL and cable modem.

Factors such as competition and prices become more important to an operator. Prices are a strong determinant of broadband rollout and the prices vary from one operator to the next or from one country to another. Broadband is affordable in most OECD countries. In 2007, the average monthly price of broadband subscription in OECD was less than 2% of monthly per capita. The trend has been to distribute services amongst income groups and this has increased coverage as more people are accessing the services within their affordability scale. Broadband has also affected the prices of other related telecommunications services such as voice telephony. Furthermore, unbundling of copper telephone lines has also added to the reduction of prices as this has increased competition. In Switzerland, subscribers are benefiting from the unbundling of local loop as their country is the top performer in terms of broadband penetration. Speed and services also determine how countries are performing in relative terms to others.

The competition factor is a driver of lower prices and this in turn has an effect on the services and speed at which they are delivered. In OECD countries, the average DSL speed has quadrupled from 2 Mbit/s to 9Mbit/s since 2004. There is still a difference between the rural and urban areas regarding speed, even though there has been an improvement as operators upgrade their networks. The European Commission found out that the speed in rural areas is 512kbit/s whereas in the urban area is 1000kbit/s which is significantly higher. Broadband in the OECD countries is still dominated by DSL connections which amount to 63% of the network. The bandwidth capacity has been increased to accommodate newer signals for high-definition television (HDTV) and furthermore the speed of wireless internet connections over mobile networks such as 3G technologies has also increased. In 2007, countries such as Japan, Korea, Sweden,

France and Finland advertised the fastest broadband connections at 1000Mbit/s at apartment buildings.

Governments have insisted that the bandwidth availability be advertised truthfully to the consumers. There have been debates on how to categorise broadband in the future whereby the level of infrastructure-based broadband competition is clearly defined in the broadband markets. The typical markets for broadband for infrastructure have been DSL and cable and the wireless internet technologies including 3G which has evolved. The consumers have been limited to using the low bandwidth applications and still rely on wired connections for bandwidth intensive services. The strongest new infrastructure-based competition has come from fibre networks built by new entrants who can attract consumers by offering speeds greater than cable or DSL. Competition issues for unbundling the local loop in most countries is a national debate. There has been progress in unbundling in many countries but more can be done to improve competition in the market. In most OECD countries; consumers are allowed to access broadband from competitive operators via wholesale arrangements.The USA has chosen the infrastructure based competition in broadband markets due to the concerns that unbundling creates investment disincentives and limits the rollout of new networks (OECD, 2008).

2.3 Global Overview of Municipal Broadband

Local governments have been on the drive to deploy the infrastructure that promotes economic and social development by way of municipal electric power systems, water, roads and rails provisioning. In the 21st century, information and knowledge economies are provided via the electronic infrastructure which includes the computers, data and the transmission thereof. Broadband has become the necessary utility for delivery of services such as commerce, education, health and entertainment. According to Abrahams et al. (2007), there is a worldwide trend for municipalities and local Governments to provide municipal broadband as a basic service to residents and businesses. They also state that the global trend is to develop 'ubiquitous cities' – Korean and Japanese connotation that denotes the vision for an urban future where people conduct their work or social businesses efficiently, conveniently at an affordable price. This is achieved through the roll-out of mobile or wireless broadband technologies or fibre rich networks.

Wu (2004) and Han (2003), state that government can benefit at the initial phases of broadband rollout when setting up a standard or new technology required seeing this to fruition. The question will be 'Should broadband be defined as a public infrastructure in which the government invests or as a domain for market parties to lead?' They further explain that the European rules such as market distortion, governance, unfair competition and the violation of state's support will be impacted. The matter poses regulatory issues such as interconnection between network operators, unbundling the local loop, and at the service level issues of convergence between broadcasting and internet services over broadband (Wu, 2004; Han, 2003).

According to Tapia, Maitland & Stone (2006), there should be incentives for deploying municipal broadband. Municipalities may play a dual role in deploying broadband as both consumer and provider. This can strengthen the economic development outlook of municipalities, the digital inclusion of citizens could be promoted and the efficiencies of government services could be improved. Municipalities have focused on providing wireless broadband as one of the cost effective methods of deployment. They should still undertake projects that have the potential of generating revenue by making broadband accessible to business and residents at a fee. There could be projects that offer free Wi-Fi in public areas such as parks, libraries, pedestrian malls to attract businesses to these areas. The municipality might not see any revenue however it will realise cost savings and efficiencies. In United States (US), the regulatory body, Federal CommunicationsCommission (FCC), has regulated spectrum in some areas and has proactively removed obstacles to widespread deployment such as only governing wireless devices that operate in an unlicensed spectrum. In this way the municipality is able to leverage both licensed and unlicensed spectrum reserved for public to support a metro-scale wireless network. This low barrier to entry and the low cost of infrastructure becomes the incentive for municipality to provide broadband services to citizens that cannot afford (Tapia et al., 2006).

2.4 Broadband Economic Development and Impact

According to Bar and Park (2006), the debate by the opponents of Wi-Fi municipal broadband in the US has raised three objections; (a) the competition is not fair due to the usage of public assets by private carriers which is limited to the cities (b) the government's limited technological expertise or competency may create issues when selecting technology (c) the limited knowledge of government in what drives competition in modern society may create the distortion in alternatives in the market place.

Furthermore; government can play the following roles to balance the interventions regarding policy making, regulation, technology selection most especially Wi-Fi deployment and business modelling;

- Usage of city-owned structures: the main protest here is the free access that the municipalities have to deploy Wi-Fi via ideal antennae sites. It is important to examine the conditions that both private and public are suitable to gain access to these facilities
- Network usage: the fact that the municipalities stand to be the principal users of the Wi-Fi network is debated as in most cases the municipalities lack expertise therefore it will be advisable that the analysis is done to determine efficient ways of insourcing in or outsourcing the Wi-Fi infrastructure and its operations.
- Network funding: the municipal involvement in subsidising or funding of the Wi-Fi networks is not favourable as it questions the rationale of tax-payers' money. The arguments could be posed to examine the conditions by which the private carriers are subsidised; the social aspects such as bridging the digital divide should be included in the evaluation and the patience of the carriers to wait for the return on investment in the long-term
- Price regulation: the municipalities justify the need for their involvement in pricing regulations in that there is a social obligation role that they are playing in ensuring that the citizens have access to telecommunications services. The social and telecommunications policies mechanisms need to be analysed and developed to include all citizens whereby even subsidies can be provided at the citizens' level e.g. vouchers can be provided for internet access (Bar et al., 2006)

The US states including Pennsylvania, Texas, Virginia and Missouri endorsed legislation that prohibits municipal provision of broadband internet services whilst on the other hand the state of Nebraska permits municipalities to provide the services. The Bills have been passed in the US such as prohibiting the municipalities to provide services if the private company has similar services and also instructing municipalities to allow private companies to provide services to the citizens (Tapia et al., 2005).

It is important to draw attention to the lessons of how the community views the economic benefits of municipal broadband mostly the impact it has on demand side that is triggered by technologies or business models as mentioned above. This study was conducted in the US, Canada and Mexico. There has to be a focus on wireless network

to encourage local business stimulation. The broadband speed and access needs to be utilised to do campaigns and portals for government participation or facilitation of economic development. There has been a need to do a reality check on the activities that need public participation in presenting the telecom network vision in a particular area. The economic aspect of municipal broadband should be driven by the economic development department and the local economic agency. There should be an assessment made through the economic development agency on the impact of municipal broadband costs. Businesses should be consulted on their needs or expectations of the municipal broadband network. The roll-out of broadband should be viewed as an enabler for home businesses and entrepreneurship.

The above mentioned further illustrates the co-evolution of municipal broadband with demand and supply. South Africa can learn from these lessons that demand side whereby availability of content and services are equally important as the supply side of developing backhaul communications infrastructure (Settles, 2007).

2.5 Business Models

According to Lehr, Sirbu & Gillett (2006), there are three justifiable ways why the municipal entry into the telecommunications services matters namely; (i) market failure, (ii) local government providing infrastructure as a basis service (iii) utilising the economies of scope or scale presented by investment opportunities. Market failure rationale promotes the government intervention in that the private service providers have limited resources to enter the market and that the deployment of broadband is costly relative to the revenue that might be generated. The communities that suffer are those with less development (poor) and those that have high cost (low-density rural communities). Hence the deployment of broadband in the urban areas is more favourable due to private markets that are available. The downside of this is that the quality gets compromised yet the prices remain high due to the lack of competitive alternatives. The communities then seek municipally owned providers to expand competitive choices. The existence of market failure implies that the municipality owns and operates a local communications network. Business models are depicted on the conceptual framework as expected revenues by the service providers. Before they embark on the rollout of broadband they need to engage with municipalities on how they can benefit financially. As mentioned above municipalities therefore need to understand what types of business models are viable.

The business models that can be used to drive the market failure include;

(a) *Retail service model* – the municipality owns and operates the infrastructure and therefore offers retail services to consumer. This works mainly in communities that have Municipal Electric Utilities (MEU) with resources that can make it viable even though the wireless technology can have other entities in the community such as hospitals, fire departments participating in retail services. BELD in Baintree, Massachusetts is utilising the retail service model for the municipal broadband deployment. Furthermore, there is a wholesale service model whereby the municipality owns and operates the locals access network; retail Internet Service Providers (ISPs) and other communication service providers use this as a Metropolitan Area Network (MAN) or a backbone (middle mile) local access network or last mile access network. It is important to note that this model could work on dark fibre technologies mainly and might have limitations on issues of pricing to recover costs whilst enabling optimal competition

(b) *Franchise model* – the municipality contracts with the private firm to build and operate the facilities. In most cases the private firms are new carriers that would have responded to municipality's requests for proposal. This model works the same as the cable television service and the wireless service might change the range of players that might be considered and services that they might offer.

(c) *Real estate model* – the municipality provides access to conduit or public right of way. This includes access for stringing or burying cables; whereas in the wireless world it includes location of site antennas. The municipality partners with the private firm to deliver end to end services to consumers. This model creates an opportunity for the municipality to manage resources that are outside plant structures such as antenna sites or conduit. This however may require long-lived, sunk investments that might create bottlenecks if privately provided.

(d) *Coordination model* – the municipality provides a hub for demand aggregation mainly by buyer groups; in this case the municipality is able to exert power and also reduce risks and costs to private firms by demonstrating demand for broadband. In turn the municipality will co-ordinate community networks efforts (WiFi, Wireless Fidelity); help with the new technical options to deploy wireless hotspots through wireless technologies via mesh networking (Lehr et al., 2006).

Ellison (2008), states that in the past city officials used business models mainly for finances and governance. Free markets opposed the notion of municipalities offering broadband services. The three generic models were used; publicly owned (city building and operating the networks), privately owned (build and operation by private operators such as AT&T) and public-private models were in most cases negotiated. This became

the most used model however it had its own challenges whereby economic and technological challenges were transferred to private owners. The private-public model focused more on lease agreements pertaining to rates, offerings (speed not programming), placement of antennae on city owned assets; similar to cable franchising. A non-profit organisation, Wireless Philadelphia which entered into an agreement with private operator, EarthLink, on a private-public partnership was established in Philadelphia, PA (USA). Wireless Philadelphia would operate the network and secure funds for the network and EarthLink would build, own and operate the network at no cost to the city but would generate sales from providing other operators with bandwidth (Ellison, 2008). According to Tapia et al. (2011), the private-public partnership creates competition landscape which brings about the decrease in broadband costs for both consumers and operators. This further improves the funds allocation for economic development and technological innovations to close the digital divide. Philadelphia started the wireless broadband project in 2004 and San Francisco it is midway whereas Chicago is in the initial stages. Like Philadelphia, the other two cities have signed private-public partnership agreements. The two main aspects of the projects; the digital inclusion programs and funding mechanism are stated in the Request for Proposals (RFPs) sent out to the market (Tapia et al. 2011).

According to Bouras et al., (2009), the municipal broadband business model has three levels and this is what Greece has selected as the business model; namely a) implementation and supply of passive equipment by municipal enterprise b) implementation and supply of active network equipment by a single supplier or consortium of suppliers and telecommunication supplier [could be public-private partnership] c) provision of services by multiple service providers in a competitive environment. This model at the municipal level poses challenges regarding finances whereby there is no guarantee that the suppliers will make profit when the economies of scale is not fully exploited and the suppliers will not find it lucrative (Bouras, et al., 2009).

2.6 Funding Levels

There have been studies that suggest that the roll-out of broadband does not only depend on policy and regulation spearheaded by governments; that there is also a financial element that if ignored, broadband rollout will be threatened. As mentioned on the conceptual framework,costof setting up the network can influence the rollout of broadband whether the providers are able to afford or not. It is therefore important that both municipalities and providers engage in agreements of funding if so desired.The

World Bank Group (WBG) in conjunction with regional organisations such as NEPAD; contributes towards the investment in national broadband initiatives to ensure open competition amongst cross-border countries, international gateways, regional licenses (Guislain et al., 2005). These projects are typically long term and the operators including mobile operators benefit due to cost effective interconnection, present an opportunity for value added services such as e-commerce or e-government, improves the internet speed, improves economic development initiatives and alleviate poverty (Guislain et al., 2005).

The USA national framework broadband policy which is explained by Weiser, P (2008) illustrates how most European countries have been championing broadband adoption and this has been through the commitment to competition and an educated population that is eager to use variety of broadband applications. The European comparison to the USA highlighted in the Organisation for Economic Cooperation and Development (OECD) shows a growing concern regarding public policy and purely because broadband serves as a platform for economic growth. The report further indicates how the political and policy leadership of the USA has failed to appreciate the importance of broadband technology and has missed opportunities to promote the development of catalyst projects in the non-profit and private sectors. Cisco director of technology and communications policy Jeff Campbell said, "in a world where technology and knowledge are the key competitive advantages, broadband infrastructure is going to be increasingly important to a healthy economy" (Weiser, 2008).

Gillwald (2005) states that there are several models that can ensure that the financial constraints or burden that operators experience is lessened by (a) introducing competitive subsidies, government intervening by creating funds for small operators e.g. Kenya and Chile; (b) telecommunications Cooperatives; the US, Scandinavia, Bolivia have co-ops that are owned by local municipalities and subscribers also own equity and there have been improvements in the teledensity; (c) Build-Operate-Transfer model has proved to be working in Ghana, Philippines and Thailand whereby the private sector invests in public infrastructure and accrue revenue for a certain period of time (Gillwald, 2005).

2.7 Technology Adaptation

Broadband is commonly referred to as 'high-speed, high-bandwidth Internet access'. It transmits data typically more than 200kbis/s. It carries multiple signals such as video,

data and audio by dividing the total capacity of the medium into multiple, independent channels (Abrahams et al, 2007).

There are two most noticeable types of broadband according to Foley, P (2006) and these are as follows;

(a) *Digital Subscriber Line*, this is a high speed internet access over a coaxial cable often offered by the television operators over copper telephone wires offered by local exchange carriers (LECs). The mobile and fixed wireless is over satellite radio spectrums.

(b) *Broadband over Powerlines (BPL) also known as the third wire,* this uses existing electrical power lines as a transmit high-speed communication coupling it with low power radio frequency (RF) energy onto alternating current power lines. Unlike satellite, fibre or wireless technology, BPL leverages on existing infrastructure for transmission, no new wire needs to be installed. It can be accessed from any electrical outlet in each house without additional wiring. Examples of commercial deployment of BPL in the US are Cinergy in Cincinnati, Ohio and the municipal utility in Manassas, Virginia (Foley, 2006).

Gillett & Lehr & Osorio (2006) state that municipal electric utilities (MEU) are playing in the space of telecommunications services. They grow into two most important pathways of telecommunications i.e. infrastructure and services by way of public ownership of the last mile facilities and electric power company into telecommunications. Municipalities are also key adopters of next generation technologies in the form of fibre-to-the-home (FTTH) and broadband wireless (e.g. WiMax, Worldwide Interoperability for Microwave Access) systems. The MEUs are now at the centre of local government in promoting broadband internet access. In the US, homes are served by local telephone company or cable television company using its own wire line infrastructure. There has been a limited entry into last mile telecommunications by power companies however MEUs are showing higher expansion into last-mile telecommunications services than the investor-owned electric companies. There has also been a shift in policy making whereby the trend in the US is that the last-mile telecommunications is no longer a natural monopoly that could be provided by a public utility. Furthermore, this has been justified as the technology and industry economies evolvement (Gillett et al., 2006).

In another study that Lehr & Sirbu& Gillett (2004) undertook; they allude to open access as a phenomenon beyond last-mile network. Open access models vary along regulatory and business dimensions. Voice and data services interconnect with the larger

telephone and internet networks while video services collect programming from local distribution. In the US, Tacoma, Washington State, (WA), the municipal operator manages the backhaul link to Seattle, Washington State, (WA) and shares with the 3rd party Internet Service Providers (ISP). Whereas in Blacksburg, Virginia (VA), the operators do not provide the last-mile network instead they administer a neutral point of interconnection among local commercial providers so that less backhaul capacity is required. The municipalities did not necessarily start projects at the same time; this has been brought up by the changes in the industry and the technological innovations and experiences learned from other communities e.g. in Kutztown in Pennsylvania municipality, when they could not find service providers who were willing to provide retail services over their proposed FTTH network; they then provided service themselves(Lehr et al., 2006).

2.8 Policy Making Intervention

According to Santorelli (2007), the market failure is mentioned when debates are heated around municipal broadband deployment. Market failure can be due to monopolistic behaviour whereby consumers are charged a monopoly price and this could be excessive. Whereas in a competitive market the prices are not above the cost of production and the consumers are able to afford the goods and services at a competitive price. In the case where economies of scale are prevalent in the market such as broadband delivery; it can induce market failure. It is then prudent that policies are introduced to enhance competition. The conditions that need policy intervention in the telecommunications sector are as follows; (i) high prices due to market power of the incumbent (ii) the competitive interactions of firms resulting from the competitive policy (iii) prevailing service quality levels and number of choices for consumers (iv) direct regulation of retail prices

According to Foley (2006), the FCC Policy Statement applies to all broadband providers however if the internet access provider blocks its subscribers access to a site, service or application; it is not automatically barred. The petition was filed by United Power Line Council in the US requesting that the FCC issue a definitive ruling that the BPL is not a telecommunications service. This service faces the technological constraints however given the forever present deployment of the electrical grid, BPL has the potential to be both a major competitor in the broadband and provide efficiencies through smart grid management. Policies therefore have to provide the regulatory certainty in BPL deployment and advancement (Foley, 2006).

There are still policy and regulatory questions asked according to Mandviwalla & Jain &Fesenmaier& Smith & Weinberg & Meyers (2008) regarding the municipal wireless networks considering that they operate over the public radio spectrum. They face the regulatory constraints and licensing requirements. The unresolved policy questions include: Are Municipal Wireless Networks an example of government competing with private sector? Does free access to public facilities provide municipalities an unfair advantage to compute with ISPs? Should public funds be used to support wireless networks when often stakeholders are city government which do not have internet service? Is there a new uniform legislation to handle wireless network?

2.9 Regulatory Intervention

According to Ellig (2005), regulation determines which services are priced below costs and which ones will the consumer be overcharged for to be able to subsidise others. Regulation has the effect on prices, quantity of service, consumer welfare and overall economic welfare. The goal of regulating broadband is to broaden the deployment of technologies across a country. The outcome indicators of this goal are (i) increased access to broadband services (ii) increased access to devices across multiple platforms such as DSL, cable modem, satellite and terrestrial wireless (iii) increased number of unlicensed or licensed wireless devices. In the US, the FCC distinguishes between high-'speed lines' which offer services in excess of 200 kilobits per second in at least one direction and 'advanced lines' which offer the same speed but in both directions. Hence there are different regulations for broadband provided via DSL and cable modem. DSL is considered as a telecommunications service and therefore is subject to price regulation. Whereas cable modem is considered information service therefore the price regulation does not apply (Ellig, 2005).

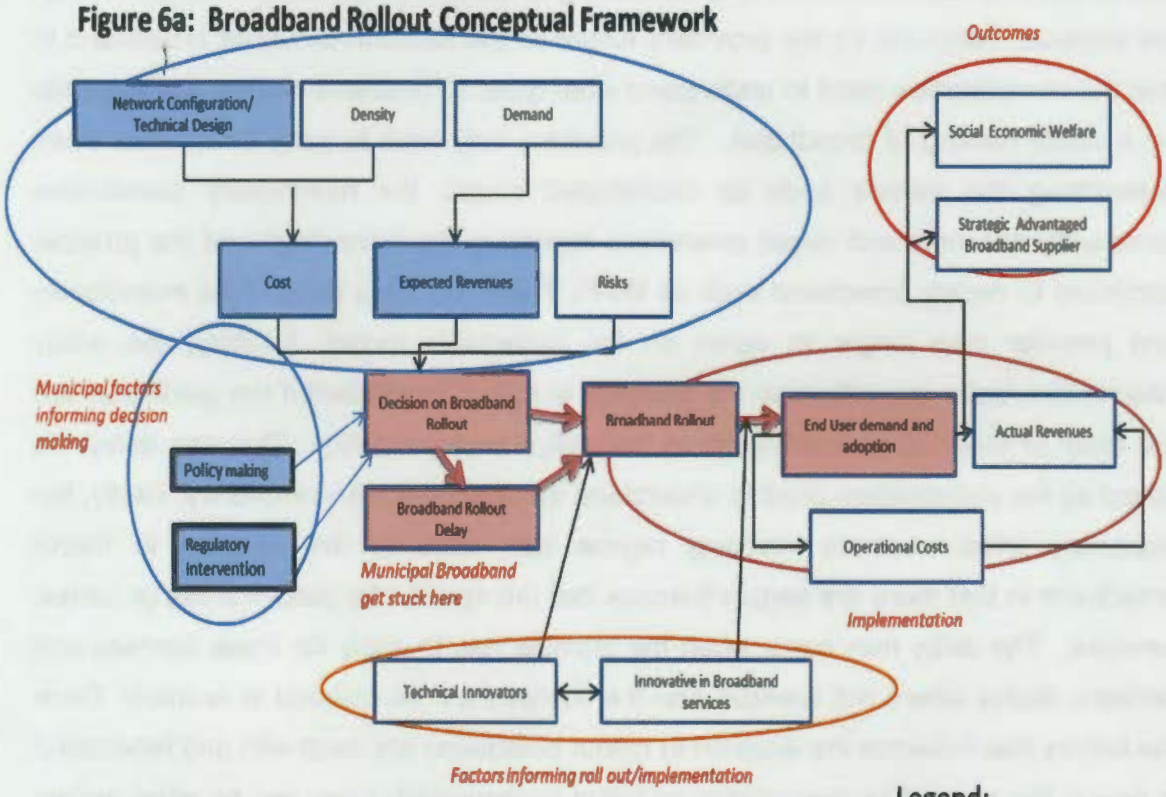
The state-level regulatory framework can have an impact on the deployment of municipal broadband whether it is more or less encouraging to private-sector deployments. The state-level differences in regulatory treatment of localities maybe an important factor driving or constraining municipal entry into communications. The regulations that give municipality discretionary authority are more conducive (Lehr et al., 2006). The regulatory body influences the deployment of municipal broadband for example for the Municipal Electric Utility (MEU) would find it difficult to provide telecommunications service because they areinfringing on a different sector environment, the energy sector (Gillett et al., 2006). The licensed radio service users

both private and public sectors (public safety) ensure that the radio frequency energy from the BPL signals on power lines does not interfere with the radio services. Foley (2006) also added that most systems operate 2 MHz – 80 MHz range and the Federal Communication Commission (FCC) in the US has established rules to govern operational, administrative and certification for BPL systems operators (Foley, 2006).

2.10 Conceptual Framework

According to Bouwman et al (2006), consideration has to be given to broadband as a relative concept and that the availability of bandwidth at a certain place at a certain time; thus broadband has different connotations. It has, however, been noted that the definition of broadband may differ from one writer to another as research is undertaken for different purposes hence the development of the Conceptual Framework (Bouwman et al, 2006). Figure 6abelow demonstrates the conceptual framework of what is perceived to be;

Figure 6a: Broadband Rollout Conceptual Framework



Source: Bouwman, Finjvandraat & Van de Wijngaert, 2006

The model presented in Figure 6a above focuses on the initial phases of the decision making process. The circles and the commentaryon the framework depict the researcher's perspective on the phases. The factors highlighted in blue influence the

decision to rollout broadband and also can influence the delay in rolling out broadband. There are other factors that are not originally in the framework, the policy intervention and regulatory effects that have been included in the framework. There has to be a clear indication of factors that affect the decision to rollout municipal broadbandand the implementation of the actual rollout. The research emphasises the factors that affect the decision to rollout municipal broadband. First, the factor that can influence the decision is the cost that will be incurred to set up the network and municipalities can decide on what funding levels the providers require and a delay may occur if the process between providers and municipalities' internal processes takes longer to finalise the decision. Secondly, the network design/configuration is technologically driven and may also influence the decision to rollout broadband. Providers might require certain standards to follow and the area where the technology is best suited needs to be identified.

The technology adaptation factor can cause a delay whereby the providers need to seek permission to rollout broadband and the issuing of the permit/license is delayed. Thirdly, the expected revenues by the providers influence the decision to rollout broadband in that the municipalities need to understand what types of business models are available for a viable running of broadband. The providers may seek to carry lower risks when determining the models such as coordinated model; the municipality coordinates community networks and raises awareness regarding the technology and the provider continues to deploy broadband such as Wi-Fi. There can be a delay if the municipality and provider take longer to agree on the acceptable model. Fourthly, the policy intervention factor can influence the decision to rollout broadband if the guidelines are not clear or there is no monitoring on the policy implementation. This can delay the rollout as the stakeholders need to understand the impact of non-compliancy. Lastly, the regulatory effect such as licensing regime can influence the decision to rollout broadband in that there are certain licenses that are specific for certain areas or certain services. The delay may occur when the provider has to apply for these licenses and perhaps deploy where not licensed and the licenses will be revoked to re-apply. Once the factors that influence the decision to rollout broadband are dealt with and broadband is now in the state of implementation or being implemented; there can be other factors such as operational costs for maintenance or new technologies for network improvement. The above mentioned factors bring about the user adoption of broadband during implementation and the outcomes on social economic welfare and growth in broadband supplier base (Bouwman et al, 2006).

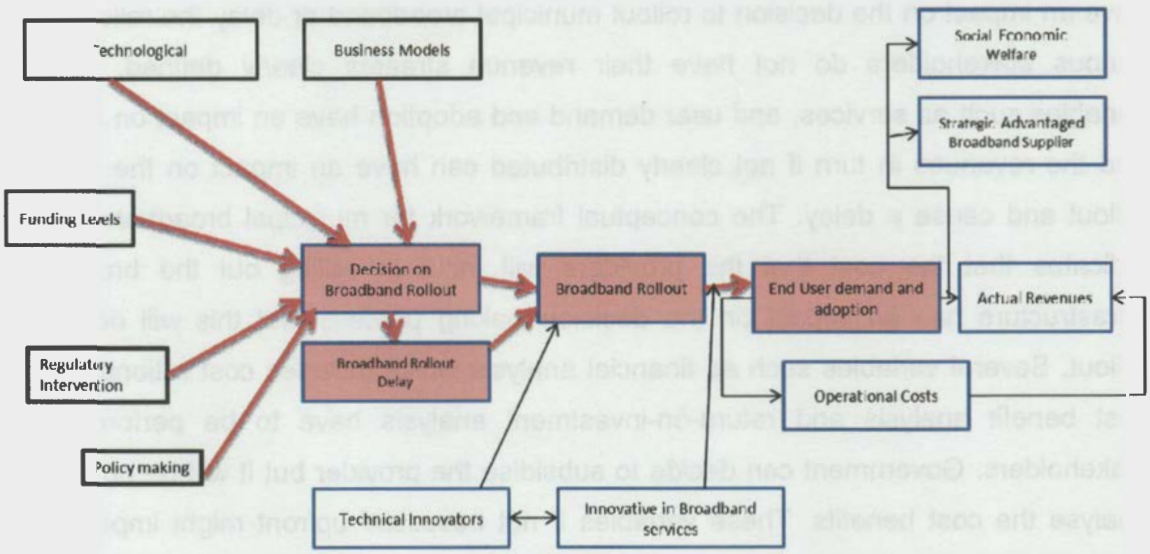
Furthermore Bouwman et al (2006), states that the rollout of broadband addresses problematic goals (mainly on the supply side) such as network provisioning though upgrading current networks, building new networks, opening new markets for new customers, offering good quality of service (QoS), offering wholesale services to customers can be options for telecommunications organisations.

2.11 *Conclusion of literature review*

Despite the understanding that the private sector is able to fast track the rollout of broadband due to sufficient resources such as funds, skilled labour, the literature review shows that the factors that promote or inhibit the rollout of broadband could be policy and regulations frameworks of South Africa. The literature shows the factors regarding funds, regulation and policy that could play a role in making or breaking the broadband rollout framework. Gillwald's literature above affirms the need for government as a policy maker (provision of subsidies) and the independent regulator (protecting the consumer and at the same time promoting competition) to address demand and supply aggregations as emerging strategies to boost broadband adoption. The technology factor as explained in the literature is one element that should not be ignored when rolling out broadband to communities; as it could also pose challenges.

Figure 6b below stipulates the adapted conceptual framework for the municipal broadband rollout as per (Bouwman et al, 2006) conceptual framework.

Figure 6b: Adapted Broadband Rollout Conceptual Framework



Source: Adapted from Bouwman, Finjvandraat & Van de Wijngaert, 2006

The adapted conceptual framework clarifies the factors that affect the roll-out of municipal broadband from inception which is depicted by the decision making step whereby municipalities engage with the market to identify or choose appropriate business models to utilise; identifying the need for funding or to establish whether there will be a need to fund the projects. Technologies can also be considered when making a decision to rollout broadband and the understanding of this can differ amongst service providers or operators e.g. there are many technologies that can be used to upgrade networks. Technological innovations, development of standards and available spectrum licenses can be problematic or they can be solutions hence when decisions are made fluid participation of all actors is important. Participation of different actors for the different situation can be addressed through decision making process. Furthermore it then clarifies the services to be offered and quality systems or technologies to be implemented. In South Africa, as mentioned above; the mobile network operators have increased the subscriber base to more than 44 million and this has brought about competition and the operators are finding the industry lucrative hence the commitment to keep abreast with new technologies to provide a wider range of services to the subscribers. When the study is done to determine the factors that affect the roll-out of municipal broadband in Tshwane Municipality; relationship will be drawn to indicate whether the steps of the conceptual framework have been followed and whether they were effective.

The conceptual framework indicates that the expected revenue by the providers is due to the adoption of broadband by the consumers hence the business models as a factor have an impact on the decision to rollout municipal broadband or delay the rollout if the various stakeholders do not have their revenue streams clearly defined. Various variables such as services, end user demand and adoption have an impact on revenue and the revenues in turn if not clearly distributed can have an impact on the network rollout and cause a delay. The conceptual framework for municipal broadband rollout indicates that the cost that the providers will incur in rolling out the broadband infrastructure has an impact on the decision-making process and this will delay the rollout. Several variables such as financial analysis which includes cost rationalisation, cost benefit analysis and return-on-investment analysis have to be performed by stakeholders. Government can decide to subsidise the provider but it will be prudent to analyse the cost benefits. These variables if not assessed upfront might impede and delay the decision making process.

Chapter 3: Research Methodology and Methods

This chapter examines the research question and the research methodology the study will follow. The research question has the sub-questions that will need to be investigated to conclude the analysis. The research methodology to be conducted will be a qualitative approachand its purpose will be to explore the municipal broadband rollout. This method will be applicable to the research because itdiscusses factors that affect the rollout of broadband such as funding levels, technologies selection, business models, policy directives and regulation effects and also interprets the strategy and practice pursued by a metro municipality hence the philosophy followed will be interpretivism. Data collection methods used will include the semi structured interviews. In an attempt to explore the factors that affect the rollout of municipal broadband the interviews will include municipal personnel, the service providers to the metro, policy makers and regulatory body. The research is aimed at understanding the experiences taking place at the metro level and therefore reviews a case study of one such metro, namely Tshwane Metropolitan Municipality.

3.1 Research Question

As discussed earlier the rollout of municipal broadband in South Africa is faced with challenges and factors that can inhibit or promote its accessibility. The purpose of the study is to examine these factors exclusively at the municipal level. The analytical framework of the rollout of municipal broadband to be utilised will follow the five key themes as discussed in the conceptual framework and further explained in the literature review; business models, funding, technology, policy formation and regulation.

3.2 Main Research Question

The main question of this study is 'How are municipal broadband initiatives taking effect in South Africa'?

3.3 Research Sub Questions

The main question has five sub questions that are required to shape the outcome in responding to the themes of the study as stipulated above.

1. What are the strengths and weaknesses of municipal broadband rollout between 2003 and 2012?

2. How do factors such as funding levels, technology adaptation and business models effectiveness promote or inhibit broadband deployment in metropolitan municipalities such as City of Tshwane?
3. What factors are important to encourage municipal broadband adoption in South Africa?
4. What are general challenges and lessons learned to be drawn from the Tshwane municipality piloted infrastructure and technological initiatives?
5. To what extent does the success of municipal broadband infrastructure rollout depend on the policy and regulatory interventions?

3.4 Qualitative Methodology

A qualitative methodology will be conducted as opposed to quantitative methodology. This is a method whereby the researcher utilises qualitative data to find answers to the questions throughout the study. This approach will seek to gain insight into the respondents' knowledge and experience regarding factors that affect the roll-out of broadband in the City of Tshwane. It will further examine the perceptions of individuals understanding of the policy making and the regulatory effects of broadband in the municipal, provincial and national levels. It is important to understand whether the respondents who are experts in the field both from private and public sector are aligned to the government's agenda of roll-out broadband that is accessible and affordable to the citizens and how influential in their respective environments. The qualitative approach will assist the researcher to assess the broadband roll-out theoretical framework whereby the factors are pre-defined. The data will come from important documents and the interviews. According to Creswell (2003) qualitative research generally encompasses knowledge claims based primarily on open ended questions, constructivist and collecting respondents' meanings, focusing on a single phenomenon, validation of findings and interpretation of data. The semi-structured interview guidefor the interview questions is divided into sections so that there is a category and focus on a single view. The qualitative researcher regards the data collected as meaningful and relevant so as to utilise the ideas instead of variables from the people interviewed during data collection process in depth (Neuman, 2011).

The qualitative methodology is thus the more suitable approach as it emphasises on the natural settings and drawing context on the viewpoints. This normally takes the shape of the interpretative approach as in most cases the data has to be interpreted or analysed based on situations created by human interaction. This in turn gives flexibility

to the researcher to direct where the study should focus if the results or findings are not expected as such. The interpretative approach is more related to qualitative methodology as it is more for an understanding than to measure the results or findings (Babbie & Mouton, 2000).

According to Neuman (2011), there are three research studies which are positivism, interpretative and critical social science. The positivism study is more concerned with the testing and confirmation of certain laws as per the specific theory and it is quantitative in nature. The limitation of positivism is that it ignores the social aspects of the individual; their feeling and the way they think (Neuman, 2011).

3.5 Research Design and Population

Leedy&Ormrod (2001) asserts that there are different types of research designs, namely; case study, ethnography, phenomenological study, grounded theory study and content analysis. It is essential that the correct research design is chosen to ensure it answers the research problem or question at hand, as substantiated by Babbie & Mouton (2000).

This research will primarily use the research design of case study. A case study method is applicable when there is unique or interesting story to tell about individuals, organizations, institutions, event processes etc. (Babbie & Mouton, 2000). This method gives a story behind a result or consequence by capturing what happened to bring out the result. The particular individual, process or event is studied in depth over a given period of time by collecting extensive data through various instruments such as interviews, observations, documents, past records or electronic media (Leedy&Ormrod, 2001). Case study method is thus suitable to explore the factors that affect the roll-out of broadband in Tshwane municipality because the areas of interest or units of analysis are the business models, funding levels, technology choices, policy directives and regulatory effects.

Furthermore, case studies are prevalent when investigating many features in depth, of a few cases over duration of time (Neuman, 2011). In this paper factors affecting the municipal broadband in Tshwane over the period will be explored.

Yin (2002) defines case studies as the 'empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident'. History and not necessarily current situations deals with the intertwined situations between context and

phenomenon. Survey as a collection method may be limited in investigating context however other data collection methods such as interviews are able to contextualise the phenomenon. It is important that the researcher defines the type of case study and according to Yin (2002), there are three types of case study, namely, explanatory, descriptive and explanatory (Yin, 2002) and each one of them has five components; the research question (s), the proposition or intention, the unit of analysis, data collected link to the intention and the interpretation of the findings.

On the other hand, Stakes(1995), states that there is no exact time when the data collection starts which makes the case stronger in that there were preliminary studies done and knowledge of other similar cases and the perceptions formed regarding those. The impressions can later be refined as the data collection unfolds. The qualitative study therefore uses an opportunity that there is available information and that it was recorded in documents or is based on the knowledge of the individuals and that there will be few new meanings gathered. The researcher is at liberty to draw conclusions from meaningful data and those are based on experience (Stakes, 1995).

Consistently guided by the conceptual framework adopted in this study, semi-structured face-to-face interviews and emailedinterview guides and document analysis will be used to conduct the case studies. Case studies bestow researchers with the flexibility of using multiple research instruments and finding many layers of data by utilizing multiple research instruments (Babbie & Mouton, 2000).

The design of the research is influenced by the Smart City project in Tshwane Municipality and its piloted initiatives that have been deployed such as the PLC signals (*Broadband over power lines (BPL)* that have been injected into the power network in the Rooiwal community and also the Ulwazi e-learning partnership that is aimed at creating the link with the Tshwane area to promote shared learning and knowledge.

Babbie & Mouton (2000), state that the population for study is the group of people who will be interviewed to get the views in order to draw conclusions. The researcher needs a sound understanding of theory so that it is possible to appreciate which of the conditions are not perfect whilst conducting the study. The researcher selectsthe theory that is present and the factors which are present from the informants that are knowledgeable and who would yield a balanced picture of the study (Babbie & Mouton, 2000). The population for this study will be members of the regulatory body (ICASA) for the regulation effect factors, members of government (Department of Communications) for the policy impact factors, the members of the municipality (City of Tshwane) for the

factors that affected the roll-out in general, the members of the commercial community (Service Providers such as iBurst, Vodacom, Broadband Infraco) for business models and implementation involvement, the members of the government (Department of National Treasury) from a funding levels perspective and also Subject Matter Experts who have been involved in the broadband initiatives from a management point of view.

Refer to Table 5 for the organisations and experts that were interviewed, for the sake of confidentiality that the names of the respondentswho signed the consent form would not be published and should be noted that in some instances they were not representing the views of the organisations they worked for as they were also bound by the conditions and terms of employment with their respective organisations.

Table 5:Respondents, Organisation and Government Sphere (Level)

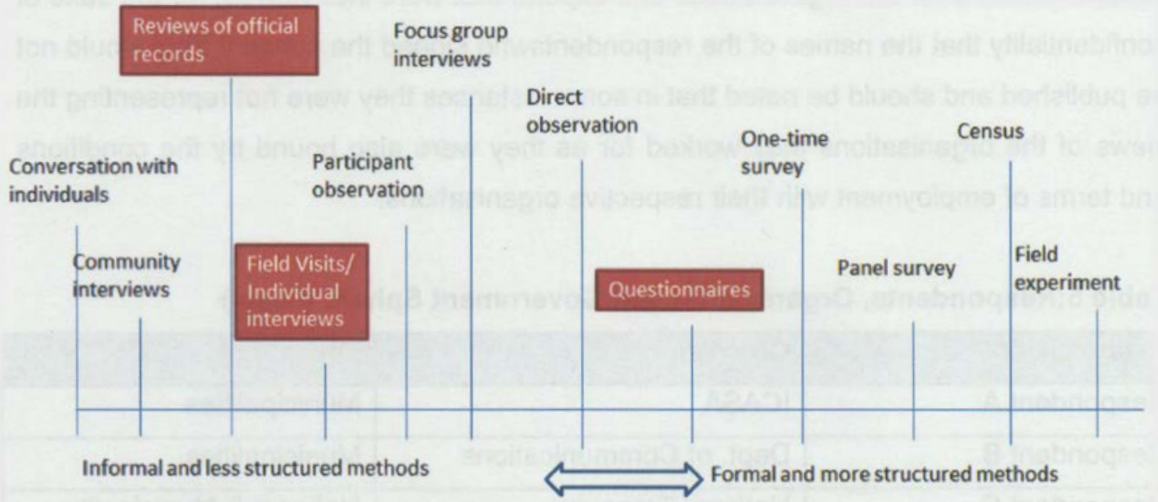
Respondent	Organisation	Focus
Respondent A	ICASA	Municipalities
Respondent B	Dept. of Communications	Municipalities
Respondent C	National Treasury	National & Municipality
Respondent D	Vodacom	National & Municipality
Respondent E	iBurst	National & Municipality
Respondent F	Cell-C	National & Municipality
Respondent G	Bytes Technologies	Municipality & City of Tshwane
Respondent H	Innovation Hub	City of Tshwane
Respondent I	City of Tshwane	Municipality & City of Tshwane
Respondent J	e-Skills Institute	National
Respondent K	Subject Matter Expert	Municipality & City of Tshwane
Respondent L	Gateway Communications	National & Municipality
Respondent M	Link Africa	City of Tshwane
Respondent N	Broadband Infraco	National

3.6 Data Collection

There are several data collection methods. Diagram 5 below demonstrates the informal structured methods and formal structured methods (Kusek& Rist, 2004, pg 85). The semi structured methods tend to provide in depth qualitative data such as interviews and

reviewing of official records and the formal and more structured methods tend to provide quantitative data such as surveys, experiments and census. The semi-structured data collection methods will be utilised for this qualitative study i.e. the reviewing of official records, individual interviews and semi-structured interview guidevia email. Refer to highlighted methods in figure 7 below.

Figure 7: Data Collection Methods



Source: Adapted from Kusek & Rist, 2004

Neuman defines data as "numerical (quantitative) or non-numerical (qualitative) information and evidence that have been carefully gathered according to rules or established procedures" (Neuman, 2011). The procedure to collect data for this qualitative case study will be though two sources of data, primary and secondary. The primary data relies on interviews that will be conducted to generate ideas that will form a natural setting, face-to-face or telephonic. The secondary data relies on important documents accessed through libraries and resource centres such as regulatory reports, policies, corporate reports and industry websites.

The interview method is most flexible source of data collection as it makes it easier for the researcher to probe deeper into the topic and formulates ideas as the study is in progress. The questions are formulated in accordance to the stakeholder sources and there is flexibility in redirecting the questions according to the industry knowledge or subject knowledge. The researcher in turn will analyse the data to have an understanding and therefore a conclusion (Kusek& Rist, 2004).

The *primary data* will be targeting the supply side of the broadband rollout framework whereby operators such as Vodacom, iBurst, CellC management or the Service Providers who provided wireless broadband for Ulwazi project such as Bytes

Technologies, CSIR Innovation Hub and Universal Service and Access Agency of South Africa will be interviewed face-to-face and a semi structured interview guide will be used to conform. The interviews will attempt to identify the challenges of rolling out the municipal broadband programmes including regulation, policy or infrastructure (public works). The Department of Communications, National Treasury Department, Broadband Infraco, state owned enterprise for broadband, ICASA and Subject Matter Experts appointed in ICT organisations providing advisory services to government or service provider will be interviewed and where it is impossible to have face-to-face sessions a semi structured interview guide will be used.

The above mentioned sources are selected due to the expertise in the field and involvement in the pilot projects of Tshwane municipality. The questions in the interview guide will be categorised according to the nature of involvement i.e. service provision, regulatory body or policy makers. The research questions vary according to the categories above.

The *secondary data* will be the extensive document analysis and the existing documents such as policies, regulation, reports on programs or projects. The Broadband Policy (2010) will be used to gather the guidelines that have been put forward for municipal broadband under local government sphere. The Infraco Act will articulate the boundaries of which the broadband technology should be rolled out and it should also enlighten the necessity of such legislated environment and also indicate the relationship between Infraco Act (2007) and Electronic Communications Act (2005). This information will be critical to assess the factors that might impact on the rollout of municipal broadband which can be perceived or factually inhibiting or promoting the adoption of broadband ultimately. The datasets will be gathered from the Tshwane Municipality and will include information from pilot projects and initiatives such as Ulwazi e-learning whereby school children are connected and currently using the infrastructure. This analysis will be mainly the supply side of municipal broadband rollout.

This process will determine the framework followed to identify relevant data in regard to the five factors of interest and other factors operating in this environment. The research outcome will be to establish the factors that affect the broadband rollout considering the new knowledge that came about during the research and the conclusion will also be drawn to what extent the regulations or policy impact on these factors. There is also anticipation of referrals within the industry.

3.7 Data Analysis

Qualitative analysis does not utilise a well-established body of formal knowledge from mathematics and statistics. The data are relatively context-based, vague, and may have more than one meaning. The researcher does not have to describe specific and verifying formulas. The researcher develops explanations that are closer to the context and they are detailed and demonstrate the processes in a casual manner. This analysis enables the researcher exclude explanations that are deemed not relevant or present contradictory evidence (Neuman, 2011).

Data analysis outlines the flow of information and its presentation throughout the study conducted as there are various contexts from various sources. Leedy and Ormrod (2001) state that there are few steps that need to be considered when analysing the researched data; (a) organising the specific facts about the case, this could be arranged in a sequence of events (b) categorising the information into meaningful themes (c) interpretation specific information derived from documents that could be related to the case (d) combining the themes of a single view to identify the patterns that could lead to other ideas (e) synthesising and generalising the overall outcome of the study to draw conclusions and set a tone for future studies (Leedy&Ormrod, 2001).

This study will take a form of narrative analysis which is a type of data analysis that presents the events from a particular point of view. This analysis refers to how people organise their views, understand and present experiences from everyday practice (Neuman, 2011). The interviews will assist the researcher to qualitatively analyse data from the interviews and summarise the statements made by the interviewees to interpret accordingly.

The analysis will seek to identify the factors that promote or inhibit broadband deployment in metropolitan municipalities such as City of Tshwane on funding levels, technology adaption and business models effectiveness. The analysis will also establish whether the municipality has utilised the business models effectively. The analysis will seek to establish the extent to which the success of municipal broadband infrastructure rollout depends on the policy and regulatory interventions, establish whether there are any factors that can encourage the adoption of municipal broadband in South Africa. Most importantly the analysis will seek to understand the lessons learned and challenges that were experienced during the pilot initiative to roll out broadband in Tshwane.

The data analysis process will entail summarising the textof the interview responses and also use thematic approach (create themes or patterns) to draw similarities or differences so as to write clear interpreted statements. These will be in accordance with the literature review. According to Babbie & Mouton (2000) the analysis includes separating data into manageable themes, relationships and patterns.

3.8 Limitations

The researcher should anticipate the limitations or constraints in regard to the data availability on the subject matter. For instance, data could be changing rapidly given the dynamic environment. It could also be that the interviewees maybe unavailable to provide meaningful explanations.

Chapter 4: Findings on the Municipal Broadband roll-out in Tshwane

4.1 Introduction

This study examines the factors that affect the roll-out of municipal broadband in the City of Tshwane. The findings of the research are based on the conceptual framework alluded to in chapter 1 of this report. The three factors that provide input to the decision of the rolling out broadband are the costs that arise from network configuration which is funding and technology, how this rollout will be done and the expected revenue through business models. In addition the regulatory effects and the policy making are examined to determine the impact they have on these inputs. In addition to the themes explored, other factors affecting municipal broadband rollout emerged during the course of the data collection.

The themes and issues emerging from the interviews and official records/documents to be discussed are; the initiatives of municipal broadband in South Africa during the last decade, the strengths and weaknesses of municipal broadband, the effects of policy and regulation on the successes of municipal broadband infrastructure rollout, the factors that affect rollout of municipal broadband including funding levels, technology and business models and the general challenges of the municipal broadband rollout as piloted in the City of Tshwane. Where there are any sub-themes, they emergedthrough the interviewsand provided more insight into an issue or theme. The researcher also probed further to reach an understanding of the context and the rationale that it could be that the problem is beyond what is on the conceptual framework. The technology factor seeks to gain an understanding whether this could inhibit the roll-out mainly around issues of standard and compatibility and associated costs. The technology theme has a sub-theme which focuses on the costs/price of laying the infrastructure (fibre optic network)and as technologies such as Wi-Fi and licensing rights could be costly to maintain or on the skills gap amongst the various service providers of various offerings.

The funding is one of the themes that could explain the lack of resources in the municipality to roll-out broadband in the City of Tshwane or it could also shed light on whether funding models are not in place or misunderstood or disregarded. The business model theme, like the funding theme establishes the sustainability of the metro and embarks on the long-term strategy that will benefit both the public and private sectors. The remaining themes, regulatory effect and policy making are more for mitigating risks for the consumers/citizens and the suppliers/service providers and to intervene when there is a market failure.

4.2 Interviews and Review of official documents

The research guide for the semi-structured interviews was set up in a way that the theme questions are posed to the relevant stakeholders and that the conceptual framework components are addressed. The questions seek to gather as much information as possible from the interviewee as they were open-ended to receive elaborative responses. The official records such as the websites and annual reports of various organisations contained valuable information whereby the strategies and missions are articulated and could therefore be utilised to understand the context and to guide the interviews. In order to understand municipal broadband, it is also necessary to understand the key elements of the broader broadband context.

4.3 Key Finding: No clear guidance on municipal broadband

The key finding of the research regarding municipal broadband, using Tshwane as a case, indicatestwo years after adoption of the Broadband Policy (2010) most role players still think, decide and operate at a national perspective and not at the municipal perspective! There is still confusion as to what the role of municipalities is in rolling out broadband to the communities and City of Tshwane demonstrates this confusion. The definition of municipal broadband is understood differentlyby most actors; there is a tendency to define broadband using technologies as a guide such as wireless, fibre-optic etc. and depending on what services are being offered. Telecoms operatorsthink that municipalities are competing for service offers or that there is a duplication of efforts in some instances.

The following findings will also highlight this confusion whereby the findings will tend to lean more on national perspective.

4.4 Finding 1: Strengths and weaknesses of broadband in the last decade in SA

There has been an adoption of broadband in South Africa however it has been at a slow pace. The respondents alluded that the government has several interventions even though they still think that the approach is still uncoordinated as stated in the broadband policy. Respondent B indicated that there is an on-going process whereby national government involves the private sector seeking advice or expertise on ICT matters. Some of the interventions include the introduction of Broadband Policy adopted in 2010, the Broadband Infraco with the Broadband Infraco Act established in2008 and the Universal Service and Access Agency of South Africa was established as early as

2006.As much as different institutions serve different purposes there seems to be a disconnection from a delivery point of view. The general view of respondents is that they are acknowledging the institutions that are put in place for intervention purposes however they (institutions) seem to be remote where it matters most, on the municipal level. They also cautioned on the duplication of effort that arises from the involvement of these institutions. Respondents(D, E, and F)indicated how municipalities lack financial resources to implement the rollout of municipal broadband yet they are in the forefront of service delivery. The City of Tshwane and like any other metropolitan municipalities, receives a streamlined budget from provincial government allocated under the traditional IT budget mainly to maintain IT operations and IT equipment.

RespondentM highlighted the on-going concern regarding the government's non co-ordinated approach when it comes to the different spheres of government i.e. national, provincial and local or municipal level. The main challenge throughout the past years has been in regard to budget allocation. The other is thepower segregation is not clear whether or not the national government is driving the broadband strategy or the other levels are and if this is the case, whatthe jurisdiction of each is. The following sections will cover the weaknesses and strengths of the roll-out of broadband in South Africa. The change of leadership in government has also played a role in that there is no continuity on most of the decisions that have been made. If that is the case, this puts the municipalities in a comprising position because they are at the end of the value-chain and the service delivery is impacted.

4.4.1 Formation of Broadband Policy

The respondents recognise and realise the importance of the broadband policy as a guideline but they also acknowledge that it could be improved to include municipal broadband guidelines. Some respondentsraised issues regarding the definition of broadband(Respondent D, E, F and G). Currently the broadband policy defines broadband as "available, multimedia capable connections with a download speed of at least 256kbps". The sector has raised issues regarding this definition as it seems out-dated and the government is not exploring other technologies that could easily not fall in that category and that the citizens already have these speeds on their smartphones with 3G etc. There is also Wimax and LTE (advanced) technologies so with this in mind, the speed should then be considered when one is. People are downloading videos and they watch TV though their phones. RespondentC is concerned that the policy was not thought out well enough because issues like latency were not considered.

The Broadband Policy (2010, pg. 17) states the roles of national, provincial and municipal government spheres and the municipal role is as follows;

- to implement and align existing policies with the national Broadband Policy;
- to define the requirement for Broadband services in the municipalities to enable the provisioning of infrastructure;
- to develop and align existing broadband strategies in line with the national and provincial Broadband Policies;
- to ensure the provision of electronic communication network services in cooperation with the provincial and national government
- to connect the local government and its entities with Broadband services and enabling the distribution of e-government services to drive the demand for Broadband and promote uptake and usage
- investing in the development of local content support uptake and usage of broadband services

Respondent B from Ministry of Communications also acknowledged that the policy needs to be improved hence there is a drive currently to review the policy and matters such as the definition to be inclusive of other advanced technologies will receive attention. There have been workshops whereby different government departments are consulted such as National Treasury from a funding perspective, Science and Technology from research and development perspective, Trade and Industry from a foreign investment point of view, Public Works from a digging of trenches perspective (rights of way), Cooperative Governance to ensure that the policy implementation is carried out at provincial and municipal level and the Public Enterprise as the matters affect state owned enterprises such as Broadband Infraco, Eskom and Transnet. Both the private sector and public will be consulted to air their views on the policy that seeks to be clear on the municipal strategy and implementation plan.

The issue of market structure guidelines that can encourage competition in the industry was raised by the Respondent D saying that this can assist to describe the operators' involvement and the regulations to be followed. This also goes hand in hand on what the roles are of the stateare as a user, developer or financier, etc., state owned institutions, regulatory body and the private sector.

4.4.2 *Formation of Universal Service and Access Agency of SA (USAASA)*

The respondents are acknowledging the effort that government is making and one of these is the formation Universal Service Agency which was formed in 1997 terms of the Telecommunications Act of 1996 to promote universal service and the ICT access. The name was subsequently changed to Universal Service and Access Agency of South Africa (USAASA). It serves under the Department of Communications. Section 6 of the Act states that the agency will encourage private sector to initiate programs that provide universal access such as developing websites for the citizens and section 9 of the Act further emphasises the need of government working closely with Small, Medium and Micro-sized Enterprises (SMME) to establish or facilitate websites that enable their electronic transacting requirements (USAASA Strategy Plan, 2012 -2015). The respondents mostly from the private sector are not satisfied that this is not forthcoming and the main concern is the lack of leadership at the institution and the lack of business continuity. This will assist the SMME to obtain information about markets and products in their various industries hence USAASA's strategy is to facilitate interventions in ensuring that the rollout of broadband as a means of access is affordable and that there is equitable access and usage to citizens at large. Respondents pointed out that once again the focus is on the national level yet the municipalities should be engaging with SMME as service providers and USAASA oversees the whole engagement.

The Agency assists in evaluating and monitoring the implementation of programmes including the rollout of municipal broadband especially in the rural areas of South Africa. The agency has been involved in setting up telecentres in rural areas enduring the universal access to the citizens using SMME but there is a disconnection whereby municipalities are less involved. There has been a realisation that the agency sometimes delays in the disbursement of levies and also in the provision of underserviced licenses. There is also an understanding by the respondents that the initiatives of the tele centresfaildue to the lack of monitoring.

4.4.3 *Formation of Broadband Infraco*

Respondents in the private sector indicated how the rollout of broadband will close gaps in socio-economic development of the country. There is a strong need to recognise that broadband will also close the digital divide. There are however mixed feelings in regard to as to why Infraco should be a government institution or that it should cease to exist because there private service providers perceived as competition. Broadband Infraco was formed whilst government still has a stake in Telkom.

Respondents from the private sector then argue that the government is creating barriers of entry for other role players because the mandate of Broadband Infracois to provide wholesale infrastructure. ICASA issued license in 2009 after the amendment was made in the EC Act to make provision for Infraco's licensing. There are two areas where Infraco plays a role; the laying down of fibre optic network for national long distance hence the partnership of Eskom to transmit via the Powerlines and Transnet to transmit via railway lines, the network fibre for the Marine Cable deployed between South Africa and the United Kingdom (BBI Annual Report, 2012).

Respondents D &F indicated that municipal broadband can leverage on the infrastructure that crosses remote or rural areas where there is still a challenge with under-served communities. This still has a reliance on the assessment of the status of the fibre by Telkom to demonstrate whether it is suitable for usage.

4.4.4 Licensing regime - allocation

Respondent A indicated thatSouth Africa has a converged licensing regime/structure which means that the operator can provide multiple services in one. Through the Electronic Communications Act of 2005 the levels of competition were increased howeverthere are still two role players Telkom and Neoteloperating using Public Switched Telecommunications Network (PSTN) and there arefour major mobile operators, Cell-C, MTN and Vodacom and recently added is 8.ta. Other respondents, mostly mobile operators think that this is the best decision to have a converged licensing framework as they are now improving their broadband network capacity to provide higher data speed and quality services to their customers by using new technologies such as Wimax. The new licensing framework also brought about the competition framework that introduced the interconnection, leasing and essential services measures. Respondent A indicated that there is no problem with backhaul spectrum for capacity purposes. ICASA has found that the operators are not amicable to rolling out 3G services mostly to rural areas. The Authority has made available to the market 2.6 GHz and 800MHz access bands which are internationally accepted and they are aligned to broadband rollout Vision 2020 strategy of the country (Broadband Presentation, 2012)

Respondent A highlighted that the regulator has to increase the capacity and also improve the perception that the regulatory body is not efficient. RespondentsF, D, and M and N) regarded network capacity as one of the components required for high speed; spectrum allocation is not the issue. The Respondents from the mobile operators, (D

&C)were not particularly having issues with the spectrum allocation however they indicated that with the smartphone, video downloads, evolution there will be more mobile bandwidth needed. The Department of Communications (DOC) from a policy making point of view and the Independent Communications Authority of South Africa (ICASA) are managing the allocation of broadband from a regulatory point of view. This does not impact the municipalities as they are not licenced as carriers/network operators.

Respondent A indicated that ICASA has to be technologically neutral in licensing framework so that the electronic communications market is open to competitive offerings from different service providers; there should be more licenses provided to reach the rural areas of South Africa. Respondent B indicated that DOC had decided to do an audit on the availability of spectrum and who owns what. This is yet to happen. Another point that was brought about by Respondent Aindicated that ICASA is considering the auction method of buying spectrum and leasing spectrum. If this gets underway, South Africa might experience the industry that is dynamic and innovative, offering more to citizens. The allocation of spectrum will increase the capacity and the competition will be conducive as there will be more players. The role of the municipality has not been thought of in this regard, it can be deduced that if they get licences as service providers they will be regulated.

4.4.5 Competition – Pricing Regulation

Respondent K indicated that the fixed line connectivity pricing is very high and not all citizens have the resources to use it. Neotel on the other hand does not necessarily lay fibre in the rural areas where there is a dire need. This has not just affected the ordinary citizens even the competitor Neotel has been struggling to gain the market share. The fibre optic cables seem to be the easiest to deploy yet costly but pays off in the long run. What seems to be the challenge is that no operator is willing to take the sunk costs. Respondent I indicated discussions with Telkom regarding this matter, trying to pursue Telkom to make an assessment whereby the old fibre can be used. Telkom did not have the capacity and they needed to know what the incentive would be. The City of Tshwane could provide broadband that has more bandwidth than the current Wi-Fi if they were using fibre-optic cables. Respondent G confirmed that the bandwidth is a concern e.g. if one person downloads music video in the library, the rest of other people do not get access due to unavailability of the service. USAASA seems to be struggling to convince the SMME to venture into these programs as they are not affordable and

USAASA's uncoordinated approach backfires as they do not involve municipalities and see where there could be synergies.

Most respondents agree that competition is needed in telecommunications sector. Competition requires all incumbents to lower the prices of the services to be competitive and perhaps even be competitive internationally and in return, this can yield foreign investment into the country. On the other hand there is a competition on the mobile broadband whereby MTN, Vodacom and Cell-C have been competitive in offering their customers the best value for money. The operators have been deployingWiMAX and it has been their focus toextract as much revenue from the platform as possible. The HSPA service is more expensive than DSL which is offered by Telkom mostly however it is slightly less than WiMAX. There have been other value add services such as roaming when one is out of the country, discounted prices for smartphone usage. The respondents acknowledged that appropriate regulation of pricing of services can promote competition. The City of Tshwane opted for Wi-Fi after the pilots had been concluded because it is cheaper and available.

4.4.6 Local Loop Unbundling - Regulation

Most respondents are critical of the market share in the fixed line market. They agree that South Africa has two fixed line operators but when you look closer it is actually one, Telkom, and Neotel. The lack of competition has promoted high prices charged by Telkom and they managed to mould their offerings to further alienate competitors during the waiting period of approving Neotel as a second network operator. There has been a need to unbundle the local loop so as to make provision for a competitive environment whereby pricing is not as high as it is currently. This will allow the other operators to install their own improved equipment on the Telkom phone exchange and permit the operators to provide broadband services to the users directly. If the City of Tshwane is licenced as a network operator they will be able to install their licensed equipment on the Telkom infrastructure and pay for the usage.Respondent D indicated that there could be problems switching between Telkom and new operator whereby the connection is a different technology and there could also be associated costs. This is when the regulation or policy guidelines play a role for fair competition and protection of the consumer.

Respondent B indicated there was a Local Loop Unbundling Committee that has been created by the Minister of Communications to deal with matters of having Telkom as a

last mile network however there should be regulation that ensures implementation and commitment to share the network.

All respondents commend South Africa for having an independent regulator for the telecommunications industry. There is still debate whether ICASA is independent or not because from time to time there seems to be interference by the Department of Communications which is supposed to be more focused on policy making and planning, this can be another topic on its own.Respondent E mentioned that ICASA was supposed to investigate and obtain the location and availability of the ducts of Telkom so that the other network operators can deploy the fibre networks and sharing the costs. The project was supposed to take effect in 2011 but little has been done in that regard because Neotel ended up laying down fibre optic cables mostly in urban areas.Respondentl added that the City of Tshwane has old cables that the city is not sure whether the cables are up to date and operational. The City rolled out Wi-Fi hotspots, quick, easy and cheap connectivity to the communities because of lack of capacity to assess the fibre. This demonstrated that there is a need to have shared municipality infrastructures, LLU and cost containment.

4.5 Finding 2: Effects of policy and regulation on the municipal broadband rollout

All respondents indicated that both policy and regulation are integral to the development of ICT in South Africa and what is most important is to guard against regulating too much that there is no room for innovation because the system is too rigid. The non-government respondents criticise the South African regulatory body, ICASA for not having enough capacity or resources to manage the country's rapidly growing industry mainly around issues of monitoring. Respondent K added that licencing framework still remains the big concern for organisations that are starting up as the prices are not meant for small enterprises. There is also a gap in the broadband policy whereby there are no documented strategies of how the rollout of broadband at any government sphere level will be done. The policy states the clear roles of national, provincial and municipal government however it is not clear on the services they can provide.

The Broadband Policy(2010, pg. 17) states the roles of national, provincial and municipal government spheres and the municipal role played follows:

- to implement and align existing policies with the national Broadband Policy;
- defining the requirement for Broadband services in the municipalities to enable the provisioning of infrastructure;

- to develop and align existing broadband strategies in line with the national and provincial Broadband Policies;
- ensuring the provision of electronic communication network services in cooperation with the provincial and national government
- connecting the local government and its entities with Broadband services and enabling the distribution of e-government services to drive the demand for Broadband and promote uptake and usage
- to invest in the development of local content support uptake and usage of broadband services

The rollout of broadband in general is regulated through ICASA and there are three legislative frameworks that govern this; a) Electronic Communications Act, 2005, which sets provides the framework for the convergence of technologies in South Africa b) ICASA Act ,2000, enables the effectiveness and independence of ICT regulation c) Electronic Communications Transactions (ECT) Act, 2002 which sets the framework for electronic transaction and verification thereof and d) the Inter-Governmental Relations Framework, 2005, which sets the framework for spheres of government.

Respondent K indicated that the convergence of technologies promotes the demand regarding the bandwidth and could also encourage the drop in prices of various products and services and the environment can be competitive for more industry players. This development has been the case in the mobile segment of the industry, whereby there has been a growth in broadband connections for both ADSL and 3G.Respondents E and M commented that the ECT Act is broad or vague in that it does not specify what needs to be deployed or implemented by the municipality.

Respondent I mentioned that one regulatory effect is the inter-governmental jurisdiction and the uncoordinated effort of rolling out broadband from a policy point of view and also indicated that technology wise, the Wi-Fi broadband is not protected, it istherefore necessaryfor ICASA to detect this interference. This requires sophisticated systems and hopefully it is possible to do that and report for action.

Respondent H indicated that government is committed to broadband rollout initiatives and to illustrate this the Department of Communications commissioned BM/IT which is a research institution to come up with the monitoring tool on the rollout of broadband in the country (national, provincial and municipal level); this commenced in 2011 and was

going to be a 2 year contract. The report will be presented to the Department of Communications and thereafter it will be made public.

4.6 Finding 3: Factors that affect the rollout of municipal broadband

The first set of questions under the overview section prompted the factors that affect the rollout of broadband in the national and municipality levels. All respondents indicated that there seems to be more activity on the municipal level than there is at a national level or provincial level which is how it should be because that the service delivery level. The twist on all this is that there are no allocated funds for municipal broadband specific projects; the budget is allocated under infrastructure strategic initiatives(roads, water, energy etc.) and thereafter various municipalities decide where the capital could be injected and in which of the initiatives take priority.

4.6.1 Business Models

Business models are depicted on the conceptual framework as expected revenues by the providers which influence the decision to rollout municipal broadband. As mentioned above municipalities need to understand what types of business models are available for a viable running of broadband.Respondent C indicated that there is no prescribed business model for rolling out broadband in the country or at the municipal level however there has been a norm of adopting Public Private Partnership (PPP) model. The National Treasury in partnership with the Department of Trade and Industry facilitates this method. South African law defines PPP as a contract between a public sector entity/municipality and a private entity, in which the private entity undertakes substantial financial, technical and operational risk in the design, financing, building and operation of a development. Department of Treasury further explains the types of PPP's to be instances whereby the private entity carries out the municipality function and instances where the private entity uses the property of the municipality for commercial purposes(National Treasury, PPP Manual).

The payment for services rendered could be processed through the municipality or the private entity can acquire payments from the recipients of the service directly. This model has also corrected the economic state of the country by contributing towards the Black Economic Empowerment (BEE) policy that the government has put in place. This has assisted government to address issues around equity, job creation and skills development amongst the black communities. It is not smooth sailing for municipalities to embark on PPP models as they are also governed by different legislative frameworks

such as Municipal Systems Act (MSA) and the Municipal Finance Management Act (MFMA) and under this Act there are specific regulations; section 309 which deals with PPPs specific matters and regulation 868 which deals with municipal procurement. The National Treasury is continuously reviewing the guidelines of PPP's to suggest a simpler and efficient process for municipalities. There is a specific business unit within the department which deals with municipal guidelines in partnership with the Department for Provincial and Local Government.

The City of Tshwane adopted the PPP model whereby private companies assume the financial, technical and operation risk. Bytes Communications Systems, Korea Telecom, Ericson, Vodacom and Telkom were awarded the work to deploy pilot programs in City of Tshwane. The power line connectivity was through Korea Telecom and Eskom had to give rights of way in Rooiwal and the Wi-Fi deployment was conducted by Vodacom and Telkom in Hatfield. Respondent G indicated that Bytes Technologies won the pilot evaluation and they are currently the service provider for installing Wi-Fi hotspots in public buildings such as schools and libraries. They had to go through the procurement process of selecting a suitable service provider for Wi-Fi technology and there is no formal business model in place.

4.6.2 Funding Levels

The one thing that the respondents indicated throughout the interviews was lack of resources mainly funds to rollout municipal broadband as it is costly to lay down fibre optic network. It is not the cables themselves but the labour/civil work intensive exercise the municipalities have to embark on. Respondent C confirmed that National Treasury does not have any specific funds put aside for broadband initiatives and specifically for municipality. City of Tshwane is funding the Wi-Fi broadband initiative from the IT budget. The municipalities use their decision on where they will get the funds from and normally funds are allocated under infrastructure initiatives and there also grants for specific programmes. There is neither national strategy nor requirements from the National Treasury on how funds will be allocated on municipal broadband initiative, yet municipal broadband has been identified as a catalyst for Smart Province/City concept in the country.

Respondent A gave an indication that there is currentlya drive to change the Broadband Policy to be more specific around the guidelines of funding also to look at the cost model which will be effective from the regulatory point of view. There is a Rapid Deployment Guidelines (RDG) document that ICASA will publish soon, currently under review.

Respondent A mentioned that ICASA also did a benchmark exercise on the price of broadband and BRIC (Brazil, Russia, India, and China) countries were researched for comparison. The outcome of the exercise was that the price of broadband in South Africa is marginally higher than of its counterparts, hence it is important that government finds smarter ways of funding the municipalities like the City of Tshwane which has the 'Smart City' initiatives as top priority. This will ensure that the City with the service providers rollout municipal broadband at a faster rate. Respondent I mentioned that there is no clear guideline on the licensing regime for the municipalities hence this confusion whether they are users or service providers of the network and whether there are revenue generators as private sector operators. This funding need could be minimised depending on the operating model.

Respondent C indicated that Government has formed a Presidential Infrastructure Co-ordinating Commission (PICC) and its objective is to transform the economic landscape of the country and to create jobs and to strengthen service delivery and most important is the support of the integration of African economies. The PICC came with infrastructural gaps in regards to water, electricity, roads, sanitation and communication. There are 18 Strategic Integrated Projects (SIPs) that have been identified to support the economic development and to address service delivery in poorest provinces. Each SIP includes a specific infrastructure component and programmes and the integrated approach on the implementation plan. The rollout of broadband has been prioritised under SIP 15 which is for the expansion of access to communication by the citizens. There will be a provision of broadband coverage to all households by 2020, 7 years from now, establishing the core points of presence in district municipalities and the extension of Infraco fibre networks throughout the country to penetrate deep rural areas. Other SIPs rely on broadband technology to be successful therefore the funding of the SIPs will be co-ordinated and priority will be put in place (DBSA, 2012).

4.6.3 Technology Adaptation

Respondents from the private sector think that there is no major challenge regarding the technologies to be deployed is the approach or the selection without doing feasibility studies on the environment poses a challenge. The Wi-Fi technology for instance is not regulated and it is quick to deploy however because it is an open frequency there could be interference from other networks. Respondent G indicated that the benefit of this technology is that there are no licenses needed. For the City of Tshwane the challenge is the adoption of Wi-Fi by the citizens. There was no campaign to run awareness

programmes. The young people go to the connected libraries and download job advertisement for employment. This is indeed indirectly placing the City in the Smart City position,

Respondent I indicated that the broadband over powerline (BPL) technology is not reliable as sharing of resources with Eskom becomes an issue in regards to clarity. The pilot was useful for the City of Tshwane as it assisted in making a decision to go Wi-Fi an easier route. The other issue is that the technology was not easy to configure. RespondentM indicated that the City of Tshwane does not engage with other service providers that are experts in the market regarding technologies or suitable technologies that could be explored. Telkom fibre optic cables laid down across the country do not mean that any technology out there will be compatible with them hence feasibility is important. The plug and play might not be the reality. ICASA does not regulate technologies as it is supposed to be technology neutral.

4.7 Finding 4: Challenges and lessons learned from City of Tshwane projects

There are several challenges that the City of Tshwane experienced during the pilot projects, broadband over powerline technology and Wi-Fi technology tested; which eventually led the City of Tshwane to choose the Wi-Fi technology using Multiprotocol Label Switching (MPLS).

4.7.1 Procurement Process/Red Tape

The City of Tshwane has a massive optic fibre that runs through most of the urban areas in the municipality yet there is minimal activity to rollout broadband due to processes to acquire the service providers to implement. The PPP model that the municipality adopted requires the municipality to go through lengthy and not such an efficient procurement process. Mostrespondents' views on procurement are that it should not take longer than 2 months to award the work. A process that should take 1 – 2 months now takes 6 months or more. The inefficiencies of the process frustrate service providers. In general, this exposes to the City of Tshwane to unnecessary perceptions of corruption in the system.

4.7.2 Telkom backbone infrastructure

Telkom still holds the majority of the backbone infrastructure in most parts of the country. Most respondents indicated mentioned that it is not surprising that Telkom also has entered the wireless broadband due to lack of competition on the fibre optic network

using ADSL technology. The wireless broadband infrastructure is not costly to install and also does not take long period to be operational. This has in turn caused Telkom to abandon the last mile upgrades in the rural areas. The second network operator does not have capacity from resources point of view to lay down the fibre optic network which is costly. The municipalities like the City of Tshwane are affected in a sense that they need to utilise the outdated infrastructure.

4.7.3 Cost of infrastructure

The cost of infrastructure still remains the most challenging issue, largely the telecommunications equipment is still in foreign currency as it is mostly imported and the installation thereof requires municipalities to source the professional services overseas which is also in US dollars. The Telkom monopoly has caused the country to grow at a limited pace on the skills on different products for broadband.The respondents also indicated that the South African discrepancies on the economic environment also contribute as there a limited purchasing power of local operators to strike cheaper deals. In the City of Tshwane, the Korea Telcom provided the equipment to enable the power line broadband connectivity. There were cost incurred in foreign exchange and the local competencies to operate the tools were also limited therefore professional service has to be sought.

4.7.4 Bandwidth Availability

All respondents agree that the availability of bandwidth is also a challenge for South Africa, again in this instance Telkom controls the access and pricing making it difficult for the competitors. Some of the VANS service providers enter into leasing contracts for international circuits for call centres. This does not necessarily mean that the cost is dramatically reduced; it just means that Telkom carries the risk. This still perpetuates the non-competitive telecoms environment. The City of Tshwane has a call centre to manage emergency services such as power failures, police, hospital services, etc. Other call centres in the city are privately owned if there is no connectivity due to traffic of the internet, this can be fatal if emergencies are not be reported on time.

4.7.5 SITA's role

The respondents also mentioned that the last mile and backhaul are major challenges to enable the Smart City concept. This is a national drive and all provinces are mandated to improve the lives of the citizens they serve. Some of the programs are being implemented by service providers that seem to be interested in benefiting their own

strategies and plans therefore not addressing the real needs of the citizens. Government has a State Information Technology Agency (SITA) that is supposed to implement the government's networks and the municipalities insisting to deploy such networks without the involvement of the agency. The municipalities are stating the long and drawn out bureaucratic process which is politically driven and the services that are overpriced as problems that inhibitthe engagement.

SITA was formed in 1999 under the SITA Act of 1998 and reports to the Department of Public Administration under the BathoPele principles. SITA's main service is to consolidate and coordinate the state's information technology resources in order to save costs through economies of scale and to increase service delivery capabilities of all 3 spheres of South African government; national, provincial and local levels. Departments are not legislated to utilise the services of the agency. SITA's mandate is to serve all government's departments. This mandate seems to have evolved over time and this differs from one stakeholder to another. This then is twofold: SITA might be infringing on other service providers space and it could easily be why there is a misalignment because SITA's purpose or service offering is not understood or is misinterpreted by various stakeholders (SITA website).

Respondent K indicated that the City of Tshwane should be able to utilise the services of SITA to co-ordinate its effort to rollout broadband and the services pertaining to it. The e-Government strategy and implementation of Gateway project was to achieve the connectivity of citizens and access to government's services such as Identification Document (ID) application status query via the web portal and 24hr call centre. This was a phased approach; the second phase was to enable citizens to apply the ID application online or social grant application online. Thereare various channels of connecting to the web portal; through the internet, mobile devices and Multi Purposes Community Centres (MPCC) across the country. This project took a while to complete as there was mismanagement of duties in the early stages of the project however it was finally launched in 2004; currently a citizen is able to go to the portal via mobile devices and MPCC for information regarding government activities or developments and uses a different portal for receiving a service such as applying for social grants. It is important that SITA gets involved in the collaboration of projects as the demand uptake is eminent. It will then be fulfilling one of its duties to coordinate and consolidate the IT resources of national government.

4.7.6 Municipality Skills Shortage

Throughout the interviews conducted, the respondents indicated that skills of people involved in ICT programs poses a challenge in the delivery of broadband deployment. This is demonstrated in both the private and public sectors and in addition, the three spheres of government (national, provincial and municipal). This is at different levels of participation; from the leadership level to the ordinary person who is digging the trench in the street laying fibre. According to respondent J, as the demand grows to rollout broadband so is the need to upgrade skills of the work force. There is a need to understand the meaning of e-skill competency, ICT competency and digital competency. The Department of Communications has the e-Skills Institute (e-SI) as an entity under its management to harness the Information Communication and Technology skills potential across South Africa. This will in turn address the socio-economic challenges that the country is experiencing in service delivery most especially at the municipal level where it is needed the most. The creation of wealth for all citizens of the country and South African fitness to compete globally are desired.

It is stated in the NeSPA (2012), that the institution has positioned itself as an organisation that provides ICT skills for the nation's employment readiness, identifying the effective ways in e-governance of the country, improving the service delivery and socio-economic development. It also works hand-in-hand with the research and development institutions throughout the country. Participant L asked the question, "How does the e-Skills Institute intend going about this when it seems like an uncoordinated effort considering that is under the policy maker rather than the implementer, Department of Communications?" The institute indicated that there will be a focus on socio-economic issues across Government, Education, Private entities, Organised Labour and Civil Society. Respondent J clarified that the approach that is utilised by other countries to put together the independent specialisation into structures and programmes and to be able to evaluate the processes thereafter will be used to combat this challenge. It is stated in the e-Skills Institute Plan of Action (2012) that it is going to aggregate the resources in all stakeholder groups and define the programs according to a national need and this will cascade to municipal level as identified. These programmes will deal with policy making; proof of concept, delivery and evaluation of impact and resources will be sourced from various partnerships such as State Owned Enterprises (SOE), Corporate South Africa, Education Department and Civil Society.

There are also suggestions that the e-skills should become compulsory subjects at school in all public schools to promote the e-literacy. Children from a young age or primary school should be encouraged to follow careers in ICT sector. The department of Education should take a lead in developing a curriculum that will suit e-skills and that they should allocate funds for ICT research and development at higher learning institutions. Municipalities have an opportunity to identify learners in the community to apply for these learnership or they could enter in agreement with the private sector to sponsor the determined youths so they can plough back their e-skill. The private sector should beincentivised to run learnership programs for the youths who have just finished tertiary learning and the municipalities should be able to absorb them in their respective programs.

The National e-Skills Plan of Action (NeSPA) (2012-2014) emphasises on meeting timelines for an accelerated socio-economic realisation and the job creation sustainability for the coming years. Table 6stipulates the recommended actions by the e-Skills Institute on the NeSPA 2012;

Table 6: NeSPA 2012 Recommended Actions
1. The development of a centralised National Aggregation Framework (NAF) to address and assess the impact of e-skills policy making, proof of concept and the evaluation thereof
2. Conduct the e-Skills audit across the State Owned Enterprises(SOEs), relevant departments such as National Treasury, Monitoring and Evaluation so as to enhance the collaborative effort against the National Development Plan (NDP)
3. Align the relevant e-skills activities with the institute and establish the process of resource allocation and resources should be seconded to programmes where necessary
4. Developing Knowledge Society in partnership with the Department of Higher Education and Training and the Department of Public Service and Administration (DPSA) to achieve the model aggregated learning
5. Create a plan and mechanisms for the aggregated resources and the assessment of e-skills initiatives to establish the impact of socio-economic impact

Source: NeSPA, 2012

4.7.7 Municipal broadband competitive environment

Respondent Kindicated that the regulator can play a role in monitoring the price structures of Telkom that are seen as anti-competitive behaviour. There has been growth in the wireless broadband market and competition in that area seems to be under control. The mobile broadband will soon dominate the market and ADSL will be utilised less; therefore the regulator has to find a balancing act. The City of Tshwane rolled out

the Wi-Fi technology in some areas of the city such as Hatfield; the drawback here was the interference of other networks and the speed was not satisfactory.

4.8 Conclusion

There have been consistent views raised by the respondents during the interviews and the data collected from secondary sources as policies and guidelines affirming the views have been consistent too. The factors that affect municipal broadband seem to be known and addressed by various stakeholders such as Ministry of Communications which has initiatives running under its auspices such as e-Skill Institute. There is also a revelation that the roles of South African governments' spheres are not clearly understood by the role players in the broadband space. There is an awareness that South Africa has to adapt the global competitiveness and therefore is required to introduce more improvements and put systems in place to change the lives of ordinary citizens.

The following chapter will entail the analysis of the findings and relation to the themes or factors that affect the rollout of municipal broadband to become clearer. Factors that have been identified such as; the technology adaptation on the municipal level has been a challenge and lack of skills in some instances has been identified. The funding levels which have a serious bearing on whether it is prudent for the municipality to operate the infrastructure whilst in its nature it is not a revenue generation entity but a government service provision entity. In addition, the cost involved in laying the infrastructure communications network is phenomenally expensive. The business models that enable partnership in rolling out broadband and the guidelines that govern have been identified are factors that can potentially inhibit the broadband rollout if not managed properly. The regulation effects also play a role in the rolling out of broadband on the pricing and the capacity allocation. The policy guidelines also need to be reviewed to clearly define the role of municipality as a player in the broadband service provision. The themes identified in this chapter will form a base in the following chapter.

Chapter 5: Analysis of findings on factors that affect the municipal broadband roll-out in Tshwane

5.1 Introduction

The research has provided the insight on municipal broadband in South Africa, the factors that affected the rollout of broadband in the City of Tshwane as a case study. The main question was to establish how the municipal broadband initiatives have taken effect in South Africa? The study allowed the researcher to have an understanding of the role of broadband as an ICT for development. It further highlighted how the various elements impact on the rollout of broadband such as funding; the impact of broadband on socio-economic environment of the country; the dependency that other governments infrastructural development has on broadband to access the various governmental departments and other countries. What is important to note is that the analysis will be outlined using national perspective and municipal perspective to illustrate the different levels of understanding of what the municipal broadband is all about. The purpose of this chapter is to discuss and analyse the findings of the themes outlined in Chapter 4 of this report and to align to the literature reviewed in Chapter 2. This chapter will also attempt to identify the correlation of the conceptual framework in relation to the factors that affect the rollout of municipal broadband. The chapter will demonstrate whether the findings support the conceptual rollout broadband model of this study.

The interviews conducted were broken down into roles the respondents have or the expertise they have on the subject matter. The composition of the respondents allowed the researcher to explore other avenues as follow up on the question guide and the respondents were also able to partake freely and because the question were open ended; flexibility is given to more grounds as the responses are elaborative.

The analysis will follow the same theme of the findings as it will make this discussion easier to follow. The interviews have taken shape in being mindful of the respondents' expertise and as well as the institutions they represent. According to Babbie & Mouton (2000) there is an emphasis on the researcher's knowledge of the theory so that the analysis is conducted in reference to that. The researcher should be able to present conclusions based on the theoretical framework. In that way the study has a collaborative approach whereby the researcher and the respondentsshare the same views or understand the study in a logical manner. The respondents are also at ease to follow the process as they have an understanding of what is required or expected of them and in turn will yield a balanced view of the study (Babbie & Mouton, 2000).

As mentioned in the previous chapters that the rollout of broadband in South Africa is faced with challenges. The chapter will present the active participation of government at a national and municipal level, the active participation of the private sector and the active participation of other institutions that might have an affiliation with both sectors in strengthening the case.

5.2 National Factors that affect rollout of broadband

The findings indicated that there are national factors and municipal factors that affect the rollout of municipal broadband in South Africa. The City of Tshwane demonstrated this gap or perspective. The following sub-headings will either analyse the factors and related issues or challenges.

5.2.1 Broadband policy making to include municipal broadband explicitly

There is a Broadband Policy in place for South African broadband rollout which includes all spheres of government. The respondents seem to have different views about the roles of the different spheres of government in the policy. The policy does not seemto be specific on what the role of the municipality is in the provision of broadband. This finding indicates how the different spheres of government can interpret the details on the policy; if the policy is not clear this might delay the rollout of municipal broadband and it will be delayed. If one takes the broadband policy adopted in 2010 and reads the section *role clarification and implementation*, the role of the local government states that the policy acknowledges the different initiatives in local governments and the unique requirements of the municipalities and it further stipulates the need to connect the local government and its entities with broadband services and to drive the demand for broadband, promoting its uptake and usage.

The other concern that was raised is that the policy does not give guidelines as far as the market structure is concerned or the institutional arrangement yet one of the objectives aimed at is to facilitate sector growthat the municipal level. The respondents would like to see the market structure guidelines be incorporated in the policy so as to promote competition in the telecommunications industry and particularly in the municipal broadband arena; supporting this is the Strategic Initiative Project (SIP) 15 which is about rolling out of broadband. The challenging question here is 'how'? Currently there is one dominant player (Telkom) in the fixed broadband infrastructure and more on the mobile broadband infrastructure (Vodacom and MTN) which also has taken its own shape of two dominant operators becoming a duopoly market whereby the two easily

control the price. There should be clear guidelines on what market structure should look like in the policy and this could then be regulated for adherence or compliance.

This finding shows that the policy does not correlate with the Electronic Communications Act which states under Chapter 10 (Competition Matters) that the authority will set out competitive measures to impose remedies in the case of market failure in the market segments where competition is found to be inefficient. Therefore, this means that the policy requires modification to include competitive measures and the Department of Communications has embarked on that exercise and hopefully it will be implemented. DOC has been consulting with the various stakeholders mainly the network operators to improve the municipal broadband specification on the broadband policy. The market structure is alluded to in Chapter 1 of this document and the summary in Table 1 (Major fibre infrastructure investment) and Table 2 (Existing market structure: Dominant Network dynamics). The participants of this policy review as mentioned previously; are National Treasury , Science and Technology, Trade and Industry, Public Works, Cooperative Governance, Public Enterprise and both the private sector and public will be consulted to air their views on the policy that seeks to provide clarity on strategy and on the implementation plan.

According to the literature review above, the market failure is mentioned when debates are heated around municipal broadband deployment. Market failure can be due to monopolistic behaviour whereby consumers are charged a monopoly price and this could be excessive. This has a huge impact in delaying the process of broadband rollout as the consumers might not be able to adopt broadband. It is then prudent that policies are introduced to enhance competition. According toSantorelli (2007), the condition that need intervention is the high prices charged due to market power by the incumbent, in this case Telkom is.The views of the industry will then be taken into consideration.

Kelly & Rossotto (2012) state that policy makers and regulators consider the approaches which stimulate and promote broadband development. To assess which approach to take the challenges on both the supply of network infrastructure and demand of the applications and services should be addressed. On the supply side, just rolling out broadband is not that easy; the issues cost and data speed and technology selection arise. Building or deploying more infrastructure networks does not guarantee success. As more countries are seeking broadband development they are also moving into identifying broadband as an ecosystem whereby all components are intertwined to give more benefit and are less manageable. The City of Tshwane had a strategy to run pilots

to eliminate the infrastructure that will not be beneficial for the municipality; the costs that are involved, maintenance and sustainability that go with the implementation.

The approach that the global markets have adopted includes the ecosystem approach which is inclusive of networks, the services that the networks carry, the applications they deliver and users or consumers of those services from a demand side and also includes supply side, access of networks and services (Kelly & Rossotto, 2012). Municipalities therefore have a bigger role to play in that they should encourage demand where the private sector does not reach the citizens due to the limitations of applications and services. The areas where municipality can play a role are as follows; the focus should be on maximising competition, encouraging private investment and creating an environment where the barriers of entry are removed for SMME's. The City of Tshwane should intervene and engage with SMMEs and not rely only on the big service providers.

It should provide justifiable funding to role players starting up and venturing into new markets for competitiveness. This funding should not impede the fair competition between private role players. This will also guard against municipalities having favourite role players which will in turn erode the competiveness spirit. Subsidies as one of the funding methods can be opened to all role players. The municipality should regulate the sector to avoid concentration in one area of service provision. The regulation will eliminate the barriers to limit content creation or restricting local content for citizens and to encourage social sites for citizens' interactions (Kim et al., 2010). How does government develop policies for broadband deployment? The following summarised policies can be developed to encourage the demand and supply side of municipal broadband networks. These are not limited to national level of government sphere but to provincial and local spheres (Kelly & Rossotto, 2012). South Africa is currently reviewing the policy and has called upon all the role players' mainly private service providers to give input to the policy and the intention is to review the approach in which South Africa Broadband industry should operate.

According to Balhoff& Rowe (2005) municipalities should develop frameworks for policies based on the principles for decision making in order to address challenges. This argument is not far from Kelly & Rossotto (2012) stating that governments should follow approaches that seek to address the challenges. The main principle is to support the private sector and not compete with it; the two role players must avoid duplicating services. Secondly, municipalities should foster improved competitive systems and behaviours; most government agencies have many systems that are underutilised.

Thirdly, minimising risk to public assets through strategies; identified risk for municipal public network is not committing to socio-economic development. It should be a goal of the municipality to rollout broadband with fewer risks. Fourthly, the municipalities should focus on public resources in areas that the private sector would not attend to such as rolling out broadband to close the 'digital divide' in the community whereas the private sector is about revenue generation.

5.2.1.1 Policies to promote the supply side [ecosystem]

The promotion of competition and investmentspolicies to encourage interplatform competition; promotion of effective competition for international gateways that will assist operators to operate on wholesale basis; implementation of technology neutral and service neutral policies to encourage growth or innovation on the sector due to flexibility. Encourage multiple providers to share physical networks mainly in the low density areas. The encouragement of government coordinationacross all spheres of government including municipalitiesto facilitate the adoption of common standards in ensuring that the networks are compatible to international, regional and national.The municipal city plans and land use policies should include municipal broadband services. The allocations of spectrum policies allow new and current companies to be able to provide high speed bandwidth for services and permit operators to participate in spectrum trading. The facilitation of rights of wayand the need for operators to rehabilitate municipal infrastructure that will require new by-laws. Municipalities' broadband policies should include the construction of both backbone (long distance networks) and local connections. The facilitation for open access to critical infrastructure to develop policies that provide government sponsored networks for greater competition and consideration should be given to the implementation of local loop unbundling (LLU) for a competitive outcome.

South Africa has Competition Commission that was constituted in terms of Competition Act of 1998. It is under the Department of Trade and Industry of South Africa. It is empowered to investigate, control and evaluate restrictive business practices, abuse of dominant positions and mergers in order to achieve equity and efficiency in the South African economy therefore if there is any bridge of the guidelines of the broadband policy; there are other government controls put in place to deal with these matters accordingly.

5.2.1.2 Policies to promote the demand side [ecosystem]

Provision of infrastructure to connect schools to broadband networks policy, government becoming an anchor tenant policy, expand access to underserved communities universal support fund policy, build community centres policy and consider including broadband in universal service policy. Provision of services, applications and contentpolicies such as provision of e-government applications, the promotion of digital content, implementing reasonable intellectual property protections, ensuring non-discriminatory access to the citizens. The users access to the above mentioned services and applications policies to cater for the provision of low-cost user devices, development of programs for literacy education, the monitoring of quality of service and supporting and training small and medium enterprises (Kelly & Rossotto, 2012).

South Africa has made decisions to formulate agencies such USAASA under the Department of Communications. This decision can impede or delay the rollout of broadband when the agencies do not carry out their duties. USAASA's role as mentioned previously is to encourage private sector to initiate programs that provide universal access and they are legislated as well. The other important element of USAASA is the encouragement that it provides for government to fund SMME. Another government entity for IT, SITA, has already developed an e-government portal at a national level and this can be cascaded to the local level. SITA is Department of Public Service and Administration of South Africa. The City of Tshwane municipality has a call centre mostly providing the municipal services such as requesting water and electricity bills which are not smart to connect to the national e-government portal to access information or application for home affairs certificates. Municipalities should give attention to building their e-services capabilities such as mobile, Internet, social media as a means of getting demand and attracting role players to utilise broadband services for greater convenience. There has to be a coordinated effort of what content should be shared amongst government entities whilst ensuring security of information.

It is clear from this analysis that South Africa is not far off from having the broadband policy that is inclusive of the broadband ecosystem as explained by Kim et al., (2010). The policies that Kelly & Rossotto (2012) alluded to are also in the broadband policy but seem to be unclear to the role players both public and private. Government still lacks coordination on all the broadband programs that are implemented across the country. It will be of interest to find out whether the revision of the policy will include guideline from the literature review.

5.2.2 Broadband regulation effect for municipalities

The industry is criticising ICASA to be moving very slowly to put in place regulatory interventions. This finding shows that the regulator is not resourced and institutionalised correctly. The decision to have the regulator under the Department of Communications as another agency has delayed the rollout of broadband in certain aspects. The regulator is under the Department of Communications and has to go through all the processes of government which sometimes are inefficient. As indicated on the introduction section, the broadband development is governed by the Electronic Communications Act (ECA) which provides the legal framework for the communications technologies in South Africa, the Independent Communications Authority of South Africa (ICASA) which enables the effective and independent regulation of the ICT sector.

The regulation for spectrum allocation and price is moving at a slow pace. These findings show that lack of resources is impacting the efficiencies of the operations of the regulator yet the allocation of spectrum will increase the capacity and the competition will be conducive as there will be more players. According to Lehr (2006), the regulatory framework has an impact on municipal broadband when it is encouraging the private-sector deployments.

The respondents also alluded to the fact that ICASA seem not to be encouraging the local loop unbundling, Telkomstill continues with the monopoly behaviour. This could be the result of limited ICASA resources to monitor the behaviour or control the anti-competitive behaviour. The regulations that give the municipality authority to decide are more likely to increased economic growth (Lehr, 2006). This lack of control and monitoring of competitive environment has an impact on broadband rollout, it delays the process. There has been an improvement in the area of broadband infrastructure which is demonstrated by the commitment of ICASA in drafting the Rapid Deployment Guidelines that will be a booklet to advise on the do's and the don'ts of the broadband market. This will not be law. The document is still being circulated and discussed for input before handing it to the Minister of Communications.

The Local Loop Unbundling is also still top of the agenda as it will encourage infrastructure sharing and competition. The respondents are pleased that Voice over Internet Protocol (VoIP) is utilised through private telecommunication and expanding the

scope of VANS. This does not mean that the last mile infrastructure is addressed. This finding indicates that ICASA has to be resourced on the capacity side and perhaps more expertise on telecommunications matters will be advantageous and the regulatory landscape has to improve in a sense that the regulator becomes self-sufficient, independent and segregation of duties between the Department of Communications as a policy maker and ICASA as a regulator is clear and understood.

According to Kelly & Rossotto (2012) the world is moving swiftly into a converged ICT environment so therefore this means that the legislation framework and institutional composition need to be changed to adapt to the changes that are not only national but are internationally. Referring to the ecosystem, the supply side there are challenges in determining how regulatory frameworks should facilitate video, voice and data offerings of the service providers. Other issues are related to spectrum allocation, internet interconnection and the infrastructure access. On the demand side there are regulatory issues pertaining to the social, political and economic affairs are also on the rise to create a more challenging environment.

Given that the municipalities are acknowledged in policy as players in the broadband market, the regulation of items such as LLU and spectrum should give due consideration to the relevance of these regulations to municipalities. Regulatory laws must take municipalities into account.

5.2.2.1 Licensing Frameworks

The convergence in the technological space has accelerated the need to rollout broadband. Kelly &Rossotto (2012), state that the convergence of technology has brought about the force that demands new and flexible responses in the ICT sector. The policy makers and regulators in developing countries they are initiating reforms to transform the regulatory frameworks to effectively address converged networks and services. There are two elements that would govern this development a) the introduction of principles of technology and service neutrality b) the establishment of greater flexibility licensing frameworks especially broader networks and services in one single license. This could potentially impede on the competition law as the previous restrictions will be relaxed (Kelly & Rossotto, 2012). In South Africa, the introduction of the Electronic Communications Act, 2005, was the foundation for a greater market, liberation and convergence in networks and services. ICASA licensed nearly 500 industries to provide electronic communications network service (ECNS) even though it

is important to note that ICASA had to be challenged by one of the service providers, Altech, in High Court that ruled that Value Added Network Service (VANS) operators could build their own networks (Abrahams, 2010). Spectrum on the other hand has been awarded to only the fixed and mobile operators not to Internet Service Providers (ISPs) even though the ISPs have been granted the ECNS licenses this was not sufficient for ISPs to build their own wireless networks to service areas that are bandwidth intensive. (Abrahams &Akinsanmi& Zimri, 2012). The municipalities have not been granted any licensing and if this were the case they will be able to offer converged services and this will in turn stimulate demand and there will be more uptake on broadband.

5.2.2.2 Spectrum Management

The process for licensing spectrum is dependent on the countries general licensing framework. The normal approach will be to allocate the electronic communications service (ECS) license to cover both networks and services. With the converged licensing framework this has changed whereby there is one license for networks and services and one license for spectrum (Kelly & Rossotto, 2012). Issuing spectrum licenses in commercial services should be flexible so that it does not reduce the value of the broadband service and subsequently undermining the service provider's investment incentives. It is important to have a spectrum policy that stipulates which frequencies are to be allocated for broadband services and how should that be done. This will be a decision that a country has to make whether they maximise the upfront earnings through spectrum sales but reduce the potential investment. It could be that the service providers do not pay for spectrum for wireless services and therefore maximise the infrastructure investments (Kim & Kelly & Raja, 2010).

Electronic Communications Act, 2005, section 5 (2) states that the ICASA may, upon application and due consideration in the prescribed manner, grant individual licences for electronic communications network services (ECNS) and electronic communications services (ECS). Furthermore, the Authority may provide ECN for provincial and national scope for commercial purposes and these services may be prescribed as and when ICASA establishes that they have a socio-economic development element. Currently ICASA provides spectrum allocations and frequency assignments to the market at large. The respondents have indicated that Department of Communications is looking at splitting the roles of ICASA whereby there is an agency that allocate spectrum to government (Spectrum Management Agency) and ICASA can allocate to non-government organisation. The DoChopes that this initiative will create a more sensible

framework for spectrum allocations and assignments and will make the distinction between policy making and policy implementation clearer.It will make sense that ICASA assigns the frequency assignments within the international standards of between 2.6GHz and 800MHz bands which are also known as the digital dividend. Sentech, the signal distributer for broadcasting sector in South Africa frequencies will be handled by ICASA as a single assigner. South Africa can release a significant amount of radio spectrum by switching from analogue to digital terrestrial TV that can be utilised for other usages.This will enable the faster downloads speeds and the greater services associated with that wireless broadband. This will further encourage commercial operators to provide services to government institutions. Municipalities will be allocated spectrum through the Spectrum Management Agency if this materialises, however the spectrum policy process has been delayed for over a year.

5.3 Municipal Factors that affect rollout of broadband

This section will indicate the municipal factors that affect the rollout of broadband in the City of Tshwane municipality. The following sub-headings will either analyse the factors and related issues or challenges.

5.3.1Business Model Selection for municipalities

The respondents indicated how there is no formal business model for the rollout of broadband in the country and that PPP model is adopted and the National Treasury gives funds based on that model or issues grants based on business models. The conceptual framework indicates that making a decision on the appropriate business models to utiliseand identify the need for funding are the first steps in managing the rollout of municipal broadband. The delay in deciding on appropriate business models will impede the rollout of broadband. Tapia et al., (2011), states that the private-public partnership presents an opportunity to build a competitiveenvironment which brings about the decrease in broadband costs for both consumers and operators. This further improves the funds allocation for economic development and technological innovations to close the digital divide (Tapia et al., 2011). In the City of Tshwane municipality; the rollout of broadband over powerline by Korea Telcom was done through a PPP model. This means that the foreign telecommunications company, Korea Telco as a private entity undertook the substantial financial, technical and operational risk in the design and building of a development.

Tapia et al, (2011) further gives more examples in the literature review of business models that could be adopted by countries or municipalities to address market failure. It is also important to note that the policy is the key driver to give guidelines on the suitable business models for different requirements;the retail service model - municipality owns and operates the infrastructure and offers customers services; franchise model – the municipality outsources to private entity to build and operate the facilities; real estate model – the municipality outsources to the partner end to end service to customers and lastly; coordination model - the municipality provides a hub for buyer groups and plays a coordination role amongst community networks such as Wi-Fi (Lehr et al., 2006).This finding demonstrates that there are business models that can be adopted in the telecoms environment to build the capacity and skills.

Furthermore the finding demonstrates that Department of Communications needs to give guidelines on the business models the industry should adopt. The other important department to intervene is the National Treasury as it allocates funds or grants when there are projects to embark on. National Treasury does not prescribe any business model to municipalities however from the analysis point of view; here is how the identified business models can benefit the city of Tshwane by improving the rollout of broadband.

(a) *Retail service model* – the municipality owns and operates the infrastructure and therefore offers retail services to consumer. Currently City of Tshwane has fibre infrastructure networks that can be utilised. There is WiFi connectivity in certain areas mainly in the urban areas. Entities in the community such as hospitals and fire departments participate in retail services. There is a Medical University of South Africa, Medunsa, inGarankua town which provides hospital services to the citizens. Medunsa can then be a retailer deploying municipal broadband.The City of Tshwane is well equipped to own and operate the locals access network or last mile access network. It is important to note that this model could work on dark fibre technologies mainly and might have limitations on issues of pricing to recover costs whilst enabling optimal competition.
(b) *Franchise model* – the City of Tshwane contracts with the private firm to build and operate the facilities. This is where the SMME's can operate. USAASA need to encourage the municipalities to review this model so as to create a competitive environment at appropriate levels. The private firms in most cases are new carriers that would have responded to the City of Tshwane requests for proposal. This model will work works because the municipality has the flexibility to change the range of players

that might be considered and services that they might offer depending on the dynamic technological environment.

(c) *Real estate model* – the City of Tshwane provides access to conduit or public rights-of-way. There has to be collaboration with the Department of Public Works (DPW) as it leads the infrastructure sector and Department of Transport for roads infrastructure works closely with DPW. This model includes access for stringing or burying cables by the municipality; whereas in the wireless world it includes locations for antenna sites. The City of Tshwane will have to partner with the private firm to deliver end to end services to consumers. This model creates an opportunity for the municipality to manage resources that are outside plant structures such as antenna sites or conduit. This however may require long-lived, sunk investments that might create bottlenecks if privately provided.

(d) *Coordination model* – the City of Tshwane provides a hub for demand aggregation mainly by buyer groups; in this case the municipality is able to exert power and also reduce risks and costs to private firms by demonstrating demand for broadband. In turn the municipality will co-ordinate community networks efforts (Wireless Fidelity, WiFi); help with the new technical options to deploy wireless hotspots through wireless technologies via mesh networking (Lehr et al., 2006).

As mentioned in the findings chapter above, National Treasury is continuously reviewing the guidelines of PPP's to suggest a simpler and efficient process for municipalities. The municipalities are at liberty to choose any of the business models as long as they abide by the governance frameworks of government and that competition is fair and controlled through the Department for Provincial and Local Government.

The City of Tshwane adopted the PPP model whereby private companies assume the financial, technical and operation risk and it was the case with rolling out of broadband over powerline, a partnership between City of Tshwane and the Korean company, Telco.

5.3.2 Funding levels in municipalities

Broadband services are still unaffordable for the majority of the country despite the on-going price decrease from 2010-2012. The market and the competitive environment are still underdeveloped and the dominant service providers are charging higher prices for the end user. The South African government has made decisions to fund municipalities to curb costs that will be incurred to rollout broadband. When the municipalities take long to make their internal decisions on priorities and which business models to

implement this may cause a delay. The respondents indicated that the funding for broadband is not specific on the municipal roll-out level. The funds are allocated to infrastructure and the municipalities then decide how to distribute it. As mentioned above, the National Treasury point of view is that there are no specific funds put aside for broadband initiatives. This funding demonstrates that there is lack of coordination from the national to the local government sphere.

The formation of Strategic Integrated Programmes will assist government to monitor the funds and implementation of services. The respondents also suggested a need to specify in the policy guidelines the funding levels that the municipalities should follow. The literature review showsthat there are several models that can ensure that there are limited financial constraints for both operator and government such as (a) introducing competitive subsidies, government intervening by creating funds for small operators, National Treasury is a funding entity (Gillwald, 2005). The City of Tshwane drafts the Integrated Development Plan that indicates the funds required for ICT initiatives and broadband is mentioned on this plan showing the drive. This finding indicates that there is a need to move fast on the Strategic Integrated Programme because this will be coordinated with clear deliverables.

Organisation such as The World Bank Group (WBG) in conjunction with regional organisations such as NEPAD; continuously contribute towards the investment in national broadband initiatives to ensure ICT for development mostly in developing countries where South Africa is a beneficiary of such grants. This has encouraged open competition between cross-border countries, international gateways, regional licenses (Guislain et al., 2005). These projects are typically long term and the operators including mobile operators benefit due to cost effective interconnection, present an opportunity for value added services such as e-commerce or e-government, improve the internet speed, improve economic development initiatives and alleviate poverty (Guislain et al., 2005).

Gillwald (2005) states that there are several models that can ensure that the financial constraints or burden that operators experience is lessened such as (a) introducing competitive subsidies, government intervening by creating funds for small operators e.g. USAASA with the SMMEs initiatives (b) telecommunications Cooperatives; this is not utilised by the city of Tshwane but this is an interesting concept which is more for the private operators like Vodacom and MTN where the subscribers could buy shares in a form of equity whether this has improved teledensity is yet to be confirmed; (c) Build-

Operate-Transfer model has proved to be working for smaller role players such as Link Africa, they own and operateFibre Optic Networks in South Africa's major cities. These networks are comprised of metropolitan backbone networks, access networks as well as the last mile to the end customer, commonly referred to as Fibre-to-the-Premises (FTTP). They deploy fiberthrough methodologies and technologies that reduce the cost and increase the speed of deployment significantly.(Gillwald, 2005).

Justification for funding as mentioned previously iskey to decision making. The case should be able to support the broadband development and the benefits should likely outweigh the costs incurred. The desirable outcome should be economically prudent. Governments challenge is to put policies and regulatory measures to promote the rollout of broadband networks. The OECD identified few policies that should be able to provide the support for funding; improvement of access to passive infrastructure (conduit, poles and ducts), ensuring the access to rights of way in fair manner, promotion of open access, municipalities should be encouraged to enter the telecommunications market to provide dark fibre networks where feasible, government can provide greater access to spectrum which is a barrier to wireless broadband provision (Kelly & Rossotto, 2012). In South Africa government has been granting wireless broadband licenses to mobile operators to support high speed data. This has in turn boosted the enhancement of 3G and 4G technologies and the sector is more competitive. The regulatory reform and private sector investment has played a role in broadband deployment. Funding can therefore be provided to a service provider in various forms such as cash subsidies, grants and tax incentives. Municipalities can choose to be the grantor or have the national government provide a grant to them. When government subsidises the service provider it will require cash upfront and this might not be recovered. The PPP involves the cash upfront from service providers but at least in this case the funds can be recovered as dividends. Government could gain profit from the sale of spectrum as revenue. The preferential taxation such as holiday tax, custom duty can bring revenue to government and this can be distributed to municipalities for broadband programs.

To be able to identify whether funding is required for certain broadband development, there are few principles that the municipalities should follow, the estimation of costs and benefits should be done. This will help in determining the scarcity of services and goods, comparing the economic costs and benefits without goods and services to reflect real costs (excluding sunk costs), the assumptions should be made in regards to technology and market development because prices can be distorted by market interventions and business loses resulting in digging up streets to lay the fibre. Benefits

are even harder to estimate as they are more after the effect. This depends purely on the customer satisfaction whereby if the clients receive excellent service they are willing to pay more. Secondly, the principle to compare costs and benefits can assist in determining the need for funding by looking at the net present value (NPV) of the expected monetary value minus the costs over time. If the result of NPV is greater than zero then it means that the project will have a positive effect on the country's welfare. Any project with negative economic NPV should not be funded. (Balhoff& Rowe, 2005) The City of Tshwane does not follow any of these principles at present. This will be valuable to do most especially since there are many programs that on paper can look viable till the post implementation evaluation shows a different picture.

According to Kelly & Rossotto (2012) there are more funding levels that can be explored by the City of Tshwane such as private investment whereby government insists on service providers to invest in the rural areas of the country and to provide subsidies to encourage the broader broadband rollout. The public, private partnership model promotes sharing of financial risk and government can also subsidies the expansion to remote areas (Universal Service Fund). The PPP is the most accepted model of funding and a business model for South Africa foreign investment and this happens in ICT programmes and these have been for submarine cables, fibre optic backbones and satellites. The local efforts, bottom up networks are mainly funded under the universal service and access whereby municipal broadband networks provide additional funding to include government programme such as e-government, public schools, libraries and multi-purpose centres to be connected. Private Service providers continue to work with municipalities as partners. The universal service fund for broadband gives priority to scope that provides wireless and telephony services to underserved regions.

5.3.3 Technology adaptation for municipalities

The City of Tshwane deployed two technologies, namely, Wi-Fi and broadband over Powerlines (BPL). The respondents think that there is no major challenge regarding the technologies to be deployed but it is the approach or the selection without doing feasibility studies on the environment. This should include the status of Telkom infrastructure as a backbone infrastructure that could require maintenance and also an upgrade to be compatible with the new generation technology to be deployed. When the Korea Telcom did the pilot with South African companies; the feasibility was done to assess the status of the infrastructure. There is a variety of technologies in the country and in most cases the service providers have an extensive knowledge and coverage on

the technology. The slow decision-making process to select technologies based on various terrainsin the municipalities, or compatibility of such technologies with current backbone network, might delay the rollout of broadband

In recent times the trend is that the devices are connecting to faster and popular video-friendly broadband networks. The speed of broadband has also doubled, the video compressing is reducing the bandwidth needed for video streaming; this offer the bit rates that are adaptive to reduce the load on the network. Fibre optic technology is being rolled more and more as it is delivers better quality videos and it improves the video-on-demand proposition and the congestion is minimised where buffering is not an issue anymore over wired networks This has also seen the increase in mobile subscriber base. Growth in the fixed network is also rising by over 30% a year; Telkom is in the process of migrating its customers to a capped service for band width control(Deloitte, 2012). The increase in demand and the improvement in supply certainly will double the volume of data sent via wireless networks. The mobile subscribers have already been on capped services hence the drive to use free WiFi. City of Tshwane has few hotspots in Hatfield and Rooiwal district. The issue here was that the citizens did not know how to connect to the Wi-Fi and also the awareness was not adequately done. At the end it was not utilised optimally. Demand for data connectivity is going at the pace of data-centric devices in the market. The number of connected tablets, smartphones, media devices, Internet TV, Wi-FI radios to millions strains the network by all these super powered devices that further add significant traffic on the network (Ovum, 2012). This traffic or the strain on the network could be avoided by using the short-range wireless connectivity to exchange data directly between the devices not the internet, the common things to be exchanged over the internet using any smart device are photos, files and media files containing wireless speakers and displays.

The municipality personnel need to be skilled so that when the technology is implemented on a PPP business model or any other model that requires their involvement; they should be knowledgeable about the technology to minimise the issues. This finding illustrates that the technology becomes a factor when the non-compatible technology is deployed on the existing infrastructure. Telkom has a challenge that some of the fibre does not get upgraded or maintained due to lack of human resources. It is also costly to maintain some dormant fibre. The analysis further confirms that cost implication of the technology can also inhibit the rollout. According to the conceptual framework described above; technology is one of the factor that

determines whether it is feasible to rollout broadband in a certain area and whether there are available e-skills to carry out the task.

Chapter 6: Conclusions and Recommendations

6.1 Introduction

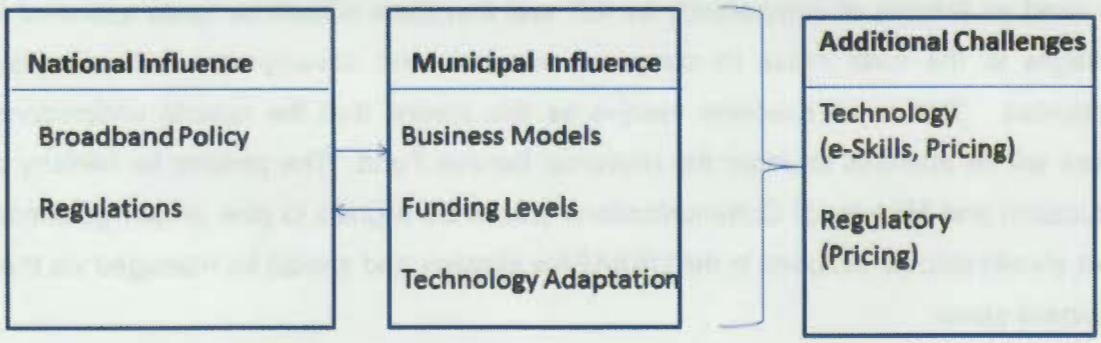
The research is the qualitative case study and the aim was to respond the main question which seeks to establish how the municipal broadband has taken effect in South Africa by which government through policy making, creating regulatory frameworks, determining policies regarding funding levels, giving guidelines in business models and establishing whether technology has any bearing in the rollout of municipal broadband. The findings showed that all the factors affect the rollout of municipal broadband however at a different levels at all spheres of government. The slow process of decision-making made at the national level regarding the two factors: policy interventions and the regulatory effects may impede the process of rolling out broadband and therefore create a delay. Similarly, the decisions made in regards to factors at the municipal level may hinder the rollout of broadband and this will result in a delay. The service delivery relies more on the municipal sphere of government and that is where there are more challenges. South Africa is advanced in policy formulation and has sound regulatory frameworks; the challenge is implementing and co-ordinating the efforts without duplicating efforts hence the Ministry has called upon the role players to participate in the review of broadband policy so as to ensure that the mandates are understood and that the citizens do not suffer non-delivery due to lack of co-ordination. Using the case study of City of Tshwane was based on the fact that they have roll out both fibre and wireless broadband and in both instances there have been challenges. The broadband policy clearly states the participation or role of municipalities yet the private and public sector claim that it is not clear enough on the roles. The other element of the broadband policy is that it has an out-dated broadband definition. The broadband is currently under review and the Ministry has urged all respondents to provide feedback before public viewing.

The pace of rolling out broadband is slow even though there has been movement on the roll out of broadband by municipalities whereby metropolitan municipalities are in the drive to be a "Smart City" however providing such services in more dense and affluent areas than their underserved areas which tend to be populated by lower income group therefore making such initiatives elitist and no different from the private sector initiatives. Municipalities'roll out of broadband was informed amongst others by the right to self-provide electronic communications network infrastructure which were issued by ICASA.

National Government has provided a broadband policy and thereby was supposed to share same with Provinces and Local Governments in so far as implementation was concerned. However given the many competing strategies and plans by all three spheres of governments and there being no clear provision of funds by Treasury the challenges still remain. There have been calls for an Integrated ICT policy to help resolve this challenge however to date it only remains that an ideal. The African National Congress (ANC), South African ruling party, had a 53rd Congress meeting in Mangaung in 2012 and realised that there is a gap in the broadband strategies across government spheres hence it has resolved to take action and correct this.

The various challenges that were raised by the respondents during data collection and thereafter analysed indicate that South Africa has to review the policy guidelines and update regulatory framework to be on par with other countries in regards to broadband rollout. This means that there are many plans and little action. One of the respondents also raised the issue of creating committees for simple tasks and then on the other hand there is also another view that the municipalities do not have capacity or right skills for the task at hand. There are few recommendations put forward after going through the literature review, broadband roll-out conceptual framework, getting the views of respondents during data collection phase and the analysis thereof. The following figure 8 shows the recommendationspertaining to the factors that affect municipal broadband and challenges thereof.

Figure 8: Factors that affect the Rollout of Municipal Broadband



Source: Research Recommendations, 2013

The figure above indicates that there are underlying factors that affect the municipal broadband and the following conclusions and recommendations should be taken into consideration by the Department of Communications and National Policy Review Panel.

6.2 Technology Adaptationas a Factor

Technology adaptation as indicated in the findings above is less of municipal broadband issues: the two major challenges that face municipalities are e-skills and broadbandpricing.

6.2.1 e-Skills challenge

The country's skills shortage around ICT technologies is still high compared to other countries of the same scale. Rapid technology adaptation requires highly skilled human resources. It is therefore important that South Africa realises this and rapidly embarks on educational programs that will enhance people's ICT skills from the primary to higher learning institutions. The private sector should also create a learning environment for their employees. The Ministry of Education and the Ministry of Communications have started on the e-skill program by introducing the e-Skill Institute to address these gaps through research and development projects, policy making; proof of concept, delivery and evaluation of impact. The resources will be sourced from various institutions as mentioned previously. There is a need to equip the local leadership with leadership skills that may not necessarily be e-skills but will be able to assist when they make decisions and provide core people, those who do the real ground work with long term technical skills. These people will have a potential to become leaders of tomorrow with the technical know-how. The ICT private companies should be encouraged to run exchange programs whereby their employees are seconded to foreign ICT companies so as to learn on the job. The ANC has resolved that the some of the colleges should be used as schools of competency for ICT and that there should be funds allocated to colleges in the rural areas to carry out research and development with adequate resources. This is an excellent resolve as this means that the remote underserved areas will be attended to under the Universal Service Fund. The policies for Ministry of Education and Ministry of Communications should be aligned to give proper guidance. This should also be included in the USAASA's strategy and should be managed via their business plans.

The e-Skill Institute should adhere to the timelines proposed to accelerate socio-economic factors and the job creation sustainability. The outcome of the e-Skils audit is crucial to the curriculum that colleges need to put in place for e-skills initiative. It will also be prudent that the e-skill audit is done across the ICT sector including private sector. There is no denying that in the private sector there could be foreign employee contracts that are entered into, meaning there could be few South African telecoms

engineers in the market. The action to develop Knowledge Society should not be taken lightly as it is the sustainability part of the ICT work force. This could be run by the departments as stated in the e-Skill Action Plan for 2012-2014; however the private sector holds the bulk of technical force hence intensifying the service providers to include youths in their skills development plans is crucial. There should be a balancing act.

6.2.2 Pricing challenge

Technologies for broadband ADSL is Telkom's broadband product and is the most available to the market. The rollout has been moving at a slower pace because of the price and bandwidth limitations. Telkom reduced the prices at some stage but that did change the fact that South African broadband prices are high. The emerging markets are not making this easier as the market grows and as the demand grows there are more technologies being introduced at a cost or lucrative prices that an ordinary South African might not afford. Currently, the broadband opportunity continues to serve an important role in the connectivity of communities. The broadband technologies that are in the market are HSPA, WiMAX and DSL with the introduction of LTE which Vodacom and MTN already are offering to their subscribers and these are at a different cost/price curve. The fixed line is not popular in the emerging markets and the investment in copper is not favourable either. The Telkom copper infrastructure in the urban areas has seen an increase in the DSL to serve the existing customers and gain a share in the growing broadband market. WiMAX is widely provided by Neotel as an uncapped service to compete against Telkom with its fixed line offering.

According to Ovum (2012), since 2010 broadband services in emerging markets have been more affordable with price cuts across markets. The increased adoption of services depends on the value and quality to the end user. Even though there have been price cuts the cost of broadband in emerging markets remains high. The services are still out of reach for majority of ordinary people. South Africa has the high GDP per capita yet the broadband affordability ranks low due to the broadband price that is very high for the operators. DSL and WiMAX services recorded average affordability; HSPA was the most affordable technology. The LTE is expected to bring about change in the broadband market. Other operators are keen to see the evolvement of LTE services that will not last long. 3G/HSPA model (usage and price) is used a benchmark for the uptake of LTE technology.

There is an expectation that the operators will focus on product and service design so as to ease the simplicity usage of the technologies and that there will be transparency so that the consumers have an idea of how much they are paying for broadband access. 8ta and CellC have rationalised their packages to include usage and costs and they are positioning their services at lower costs to attract subscribers. The municipalities will need to do a cost benefit analysis when choosing a technology to deploy as the cost may outweigh the benefits and that is not a working solution. The e-skills are now even more crucial because some of the decisions might depend purely on the viability of a certain technology as a new venture or to be integrated with the existing one.

6.3 Funding as a Factor

There are various outlets where municipalities can receive funding. The mandate of National Treasury is to manage the national government finances. Under the Municipal Finance Management Act No. 56 of 2003 (MFMA), National Treasury has the responsibility to develop implementation strategy of how to support the financial and technical needs of local government. This includes the conditional grants, subsidies, technical guidelines, policy advice and the placement of international advisors with various municipalities.

The MFMA aims to organise budget into the modern way of doing things, accounting and financial management practices by placing local government finances on a sustainable footing in order to maximise the capacity of municipalities to deliver services to communities which is critical. It also aims to put in place a sound financial governance framework by clarifying and separating the roles and responsibilities of the council, mayor and officials.

The municipalities should seek advice from National Treasury on how to put together a framework or guidelines on the funding they can source. Guidelines give flexibility but having no funding guideline is risky as it exposes the municipality to unscrupulous behaviour. There is neither national strategy nor requirements from the National Treasury on how funds will be allocated on broadband initiative this leaves the municipality with the flexibility to decide which funding model to use; referring to the mandate of the National Treasury above, the City of Tshwane can request from National Treasury subsidised broadband programs or can request Universal Service Funds (USF) from USAASA to rollout out broadband in the rural or remote areas. The Build-

Operate-Transfer model can be utilised by the municipality to transfer to small operators once the rollout is done so they can operate.

Government has formed a Presidential Infrastructure Co-coordinating Commission (PICC) as mentioned above. The rollout of broadband have prioritised under SIP 15 which is for the expansion of access to communication by the citizens. There is emphasis on the provision of broadband coverage and the municipalities will be integral to this process as they are first hand government service providers. The municipalities need to identify which areas should Broadband Infraco should as a partner be involved in to lay the fibre networks in deep rural areas. The municipalities should capitalise on the fact that other programmes rely on broadband technology to be successful therefore the funding of the telecoms SIPshould be given top priority. The municipality can then seek funding on the notion that broadband is the national priority and National Treasury will be core to this undertaking.

The DOC has initiated the Broadband Inter-Governmental Implementation Committee that will develop the Broadband Implementation Plan. This will need expertise in project management, finance and technical, therefore the e-Skills Institute plan to second resources might become useful in this project. The funding for the establishment of the Broadband Inter-Governmental Implementation Committee (BI-GIC) is provided for under DOC budget. Funding for the implementation of broadband initiatives will reside under the provincial and municipal budgets. The allocation of these funds will be in line with the BI-GIC programme. This budget will be available once the plan has been developed and associated costs implications determined. This will ensure that the broadband initiatives across all spheres of government are coordinated and that resources are allocated effectively.

6.4 Business Models as a Factor

The business model for rolling out municipal broadband can boost both demand for applications and services or supply of infrastructure. It is important to evaluate or do a feasibility study on the various business models in the market and thereafter select the one suitable. The adopted official business model in South Africa is Public Private Partnership (PPP). The main legislation governing PPPs at a national and provincial levels is the Public Finance Management Act (PFMA) (1999) and Treasury Regulation 16. The municipal PPPs are governed under the Municipal Finance Management Act (MFMA) (2003), Municipal PPP Regulation and Municipal Systems Act (MSA). All

thislegislation supports the government's objective to deliver infrastructure and public services. Treasury Regulations do not prescribe how the financing structure of PPP should look like however it allows the municipality to transfer the risks to the private partner for finance, designing and operating infrastructure. In a PPP approach, government may contribute capital to the initial costs of the project and this will not be debt as it is deemed as government fund and private equity arrangement. Municipalities should ensure that all elements of the contract are clear for the engagement. The main questions that the National Treasury may ask are; firstly, can government afford the fee? , secondly, is the solution bringing about value for money? and thirdly is substantial risk transferred to the private partner in regards to finance, technical and operational? Over and above this the municipality should be able to gauge whether it is viable to enter into an agreement with the private partner. The main question that the municipalities should ask is whether they have sufficient capacity and expertise to engage in the PPP venture therefore the municipality plays a critical role at the feasibility stage of the project.

Black economic empowerment (BEE) is the national policy objective and PPPs are good measure to promote and develop it. This policy guideline is regulated under the PFMA (1999). The National Treasury and Department of Trade and Industry monitor and facilitate the PPPs arrangements for governmental spheres. It is therefore imperative for municipalities to understand or improve the understanding of PPPs to be able to respond to the regulatory questions stated above. The challenge is that municipalities do not have sufficient capacity in rolling out broadband from a human resource point of view hence the development of e-skill competency has a key role. The e-Skills Institute has an opportunity to contribute to developing the municipal PPP that is sustainable. According to the finding the PPP model works for municipalities however there is room for improvement as far as capacity building and improving the quality of service rendered by the private partners.

6.5 Regulation as a Factor

Technologies for broadband ADSL is Telkom's broadband product and is the most available to the market. The rollout has been moving at a slower pace because of the price and bandwidth limitations. Telkom reduced the prices at some stage but that did change the fact that South African broadband prices are high. The emerging markets are not making this easier as market grows and demand grows there are more technologies being introduced. The effect of legislation and regulation of broadband rollout needs to be reviewed as there seems to be loop holes in the current state. There

is a notion that the Act is protecting Telkom monopoly then but there has since been a second network operator, Neotel. With the mobile broadband technologies flourishing there is little activity on the fixed line front. There should be more licenses issued for the fixed line or converged services in the country. There is a need to regulate the pricing structure for ADSL market. Currently there is one licensed player, Telkom.

Licensing municipalities to provide services to communities and provision of spectrum at the municipal level should be integral to ICT4D. The regulation of spectrum as a scarce public resource should be governed by the following principles, alignment of spectrum allocation and licensing framework for socio-economic development. SMME receive equitable allocation of spectrum, the need to comply with the universal service obligation, to promote broad-based black economic empowerment. These currently are guidelines but they should become the law.

6.5.1 Local Loop Unbundling and Infrastructure Sharing challenge

One of the policy recommendations will be to facilitate open access which is made possible by unbundling the local loop for competition on the supply side of the ecosystem mentioned above. The intervention of the regulatory in many of the countries and South Africa is not immune. The local loop is unbundled so as to have more players in the market other than Telkom. This will enable other service provider the direct interaction with the customers whereby they improve on their services. Currently this does not work efficiently as Telkom network infrastructure is reproduced and this is resource intensive. The incumbent can use this as a means to balloon costs between competitors, the facilities operator and service operator. It is important to note it can be advantageous to have the local loop in effect; the ability to allow faster market entry whereby the entrants are forced to build their own network and the disadvantage is that the incumbent operator, Telkom, will not have any drive to lay more fibre optic networks. The concern regarding LLU is the connection relative to retail price for broadband as the determinant for whether they will be profits for new entrants.

In the discussion paper that ICASA published for public scrutiny in 2011; questions are raised such as "what form of local loop unbundling do stakeholders realistically favour in South Africa"? The committee had to report back with at least three models. The allocation of facilities for LLU purposes must be allowed. Any operator appropriately licensed by ICASA should have access to the local loop to deliver voice or data.

6.6 Policy Making as a Factor

The broadband policy (2010) is currently under review to modify the broadband definition amongst others. It is still going around the industry for comments before tabling it at parliament. The broadband policy defines broadband as "available, multimedia capable connections with a download speed of at least 256kbps". This is way below what is currently in the market due to the development and improvements of technologies. Government should follow certain principles in setting up the guidelines of the revised broadband policy as identified during the analysis of this study, government should set guidelines that are clearly defining the roles of private entities and that of government; there should not be perceived duplication or competition on services. Municipalities should take an active role to foster competitive systems and behavior that can be outsourced to private entities through Municipal Public Private Partnership (PPPs) business models. The municipalities should minimize the risk by entering into contracts with the private entities that are clear and 'ring fencing' the separate requirements of scope of work. The issue of risk is mainly around the technologies that constantly change, product offering changes and business operating models fail.

It should therefore be a goal of the municipality to rollout broadband with fewer risks, the right questions asked (as stipulated under the PPP recommendation), before embarking on projects. Municipalities should focus public resources on areas that the private sector would not attend to such as building competitive networks in communities that already have them might not be prudent and it will be wasteful effort that might create more issues than what was the original challenge.

The role of the municipality in broadband policy (2010, pg. 17) is stated as;

- to implement and align existing policies with the national Broadband Policy;
- defining the requirement for Broadband services in the municipalities to enable the provisioning of infrastructure;
- to develop and align existing broadband strategies in line with the national and provincial Broadband Policies;
- ensuring the provision of electronic communication network services in cooperation with the provincial and national government
- connecting the local government and its entities with Broadband services and enabling the distribution of e-government services to drive the demand for Broadband and promote uptake and usage
- investing in the development of local content support uptake and usage of broadband services

The roles of three spheres of government should be clear and concise; there should not be duplications or doubts of what each level must do. The national level or Department of Communications should be able to define the requirements for broadband services as these will be co-ordinated under the Broadband Inter-Governmental Implementation Committee which will provide the implementation plan for development and deployment of broadband.

The one element that needs to be included in the broadband policy is the adoption of a broadband ecosystem that is in the literature review / conceptual broadband rollout, and analysis of this study. The ecosystem seeks to highlight the necessity of providing policies that are demand and supply driven policies. The government is perceived as a broadband user on the demand side and therefore is will be in the driver's seat to direct investment where necessary because it will be able to measure the demand, stimulate demand by developing centers of excellence and rollout e-government programs. On the supply side, broadband rollout is more challenging in that the issues cost and data speed and technology selection arise. If the risks are not identified and mitigated upon this could cause a business closure and the citizens will be impacted by non-delivery of services. The ecosystem is inclusive of the networks, the services that the networks carry, the applications they deliver and users or consumers of those services from a demand side and also includes supply side, access of networks and services. This failure then will impact the whole ecosystem.

6.7 Conclusion

The study brought insights of the challenges and factors that affect the rollout of municipal broadband in South Africa. The decision making process on factors that affect the rollout of broadband may cause a delay if not addressed appropriately and on time. It is clear that there is a dependency on the broadband infrastructure for growth and development. The main driver of the rollout of broadband is the Ministry of Communications and has shown commitment in putting in place intervention regarding the Broadband Policy.

This study was a qualitative case study that seeks to examine the factors that affect the municipal broadband in Tshwane. What has been interesting to note is that factors that affect the City of Tshwane are the same as other main metropolitan municipalities such as City of Johannesburg, City of Cape Town and e-Thekweni. This demonstrates that

this is a national challenge. The lack of coordination became apparent as one of those reasons why the broadband initiatives are not successful or if they are there is minimal impact on the socio-economic growth and service delivery. The 5 factors that have been identified and examined as posing a challenge for broadband rollout arguably do not stand alone. It further emphasises the co-ordination of efforts since all ministries depend on the success of the technology. The policy and regulation seem to be integral to all other 3 factors as for each factor there has to be governance that manages the process and outcome of the project. The funding levels such as grant or subsidies are regulated by National Treasury under the Department of Finance, the business models are regulated by National Treasury under the Department of Trade and Industry and technology adaptation is regulated by ICASA under the Department of Communications. In conclusion, it is then clear that the municipal broadband has to undergo reform and the factors that have been identified and reviewed for the rollout of municipality broadband can be addressed and the revised Broadband Policy will include some of the recommendations. .

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APPENDIX A: RESEARCH INTERVIEW GUIDE

Dear Sir/Madam

I am Lebogang Jiya, currently working towards completion of the degree, Master in Management ICT Policy and Regulation (MM ICT PR), at the University of Witwatersrand (WITS). The curriculum consists of coursework and research, which involves compilation of a Research Report. My research focuses on the factors that affect the rollout of broadband in Tshwane. The study identified several sources of data, and one is to obtain information from Tshwane Municipal personnel, Department of Communication personnel, ICASA personnel and Service Providers personnel on observed issues. Your contribution is going to help me complete the work. The questions are presented in an open ended format:

Open ended questions:

Requires an elaborative response on the views you have in relation to the questions

You are therefore kindly requested to assist by answering the questions that follow, to the best of your ability and understanding.

This study attempts to establish means on how Tshwane Municipality experienced the rollout of broadband through the pilot projects that took place in the past and further get the insight on what factors affected this roll out. The reason to study the factors that affect the rollout of municipal broadband in Tshwane Municipality is the intention to establish a Smart City. There is also an intention to rollout free connectivity and the integration of the Smart strategy and programs for various government services that include emergency services, safety and security structures.

All your responses will be held in strict confidence; findings will be summarised and no statements used in the report will be attributed directly to you. The interview will take approximately 30-45 minutes and with your permission the proceedings will be recorded.

Thanking you

L. Jiya

Topic: Examining factors that affect the rollout of municipal broadband in Tshwane

INTERVIEW SCHEDULE
There are **9 sections** in this Interview guide
Section A is for the Demographic details of the respondents
Section B is for the overview on municipal broadband or broadband understanding in general
Section C is for Department of Communication Personnel
Section D is for the ICASA Personnel
Section E is for Municipality Personnel/Councilors
Section F is for Service Providers mainly implementers
Section G is for National Treasury
Section H is for Broadband Infraco
Section I is for ICT Broadband Subject Matter Experts

SECTION A

1. **Demographic Details of the Respondents**

1.2. Province----------

1.3. Occupation: _____

1.5. Institution/organization: _____

1.6. Length of time at Institution/organization: _____

1.9. Email and contact numbers:
_____

1.10. Date(s) of interview:
_____

Broadband: As defined in the *Broadband Policy (2010);* available, multimedia capable connections with a download speed of at least 256kbps.
Broadband Services: Content, Multimedia, Broadcasting
Broadband Infrastructure: Terrestrial (Wimax etc), Satellite, Fiber Optic

SECTION B*:* Overview

1. **To what extent do you think South African municipalities have adopted the rollout of broadband?**

2. **Please state the challenges faced by municipalities in rolling out broadband?**

3. **How is the government active in this broadband rollout process? i.e. at a national, provincial and local level?**

4. **What in your view constitutes a Smart Province/Municipality?**

5. **Do you think that Gauteng as a province is a Smart Province? and why?**

6. **Are you aware of what the City of Tshwane has initiated in regards to broadband rollout?**

SECTION C: Department of Communication

What has been the approach to develop the Broadband policy, how was it developed, what are the challenges, what are success factors, who has participated in this process, how this policy fits with Infraco Act?

1. **Explain the process that was followed to establish broadband policy for the country in terms of available legislation relating to ICT? e.g. ECA Act**

2. **What are the achievements of Municipal Broadband (MBB) thus far?**

3. **What are the driving factors for MBB and how does the policy support these?**

4. **Was the department involved with the pilot to rollout broadband in Tshwane? And what was the government's role?**

5. **What are the challenges of the department in endorsing a broadband policy?**

6. **Has the department done some research on municipal broadband? Are there any case studies the department can share?**

7. **Is there anything else you would like to add on this subject?**

8. **Would you be willing to respond to a short email follow up, if required?**

SECTION D: Independent Communications Authority of South Africa (ICASA)
What has been the approach to the development of regulations that support the broadband rollout e.g. spectrum and rights of way etc, how are they developed, what are the challenges, who has participated in this process, how the regulations fits with the broadband policy guidelines?

1. What are the key regulatory issues that constrain the development of municipal broadband access, availability and affordability in South Africa?

2. Is there any conflict in the establishment of Broadband Infraco as opposed to similar initiatives being implemented by the private sector? What are the key issues regarding this conflict, if any?

3. How effective is the broadband infrastructure regulation in far as regulating price of deployment? How can the municipality influence this?

4. Are there any future plans to include municipal broadband in the regulation and what will be the driving factors?

5. Was ICASA involved with the pilot to rollout broadband in Tshwane? And what was their role?

6. What are the challenges of the authority in supporting broadband rollout?

7. One of the regulatory drivers is to promote competition and infrastructure sharing; are there any mechanisms in place and how are they implemented? Elaborate.

8. Is there anything else you'd like to add on this subject?

9. Would you be willing to respond to a short email follow up, if required?

SECTION E: Municipal Personnel/Councilors

Identifying the involvement of the stakeholder in the broadband rollout pilot in Tshwane? The lessons learned during the pilot phase, the understanding of the intended outcome. What have been the approach to development of broadband in the city and what the challenges are?

1. **What business model did the municipality adopt? How did that decision come about?**
2. **Did the municipality receive any funding from public or private sectors? What were the terms and conditions?**
3. **What technologies did the city deploy? What were the key drivers to choose those particular technologies? What were the changes over time?**
4. **What was the process that the city followed to rollout broadband at the municipal level? Where there any guidelines from National Government i.e. DOC? Please elaborate.**
5. **What were the challenges of the broadband infrastructure and services rollout?**
6. **What were the lessons learned from the project?**
7. **Do you think that ICASA, Department of Communications (DOC) are necessary entities in the deployment of broadband? And why?**
8. **One of the regulatory drivers is to promote competition and infrastructure sharing; do you think that the involvement of ICASA and the DOC in these matters is effective?**
9. **What are the changes that the government policy should do to promote the municipal broadband in regards to funding or business models choices?**
10. **What are the changes that the ICASA should do to promote the municipal broadband in regards to technology selection or business models choices?**
11. **Is there anything else you would like to add on this subject?**
12. **Would you be willing to respond to a short email follow up, if required?**

SECTION F: Service Provider/Implementer

Identifying the involvement of the service provider in the broadband rollout pilot in Tshwane? The lessons learned during the pilot phase, the understanding of the intended outcome. What has been the approach to deploy broadband in the city and what the challenges are?

1. **What bid process did you follow prior to your appointment as a service provider?**
2. **Was the process clear and the requirements clear? Elaborate?**
3. **What business model did the municipality adopt? How did that decision come about?**
4. **What technologies did the city deploy? What were the key drivers to choose those particular technologies? What were the changes over time?**
5. **What were the challenges of the broadband rollout?**
6. **What were the lessons learned from the project?**
7. **Do you think that ICASA, Department of Communications (DOC) are necessary entities in the deployment of broadband? And why?**
8. **One of the regulatory drivers is to promote competition and infrastructure sharing; do you think that the involvement of ICASA and the DOC in these matters is effective?**
9. **What are the changes that the government policy should do to promote the municipal broadband in regards to technology selection or business models choices?**
10. **What are the changes that the ICASA should do to promote the municipal broadband in regards to technology selection or business models choices?**
11. **Is there anything else you would like to add on this subject?**
12. **Would you be willing to respond to a short email follow up, if required?**

SECTION G: National Treasury

Identifying the involvement of the National Treasury in the broadband rollout pilot in Tshwane? Understanding the business models, funding strategy and support of broadband policy guidelines?

1. **What are the requirements for funding municipalities in regards to ICT development such as broadband infrastructure?**
2. **To what extend does the department fund the municipalities, percentage wise?**
3. **Is there a National Treasury strategy to support the broadband policy?**
4. **Which business models does the National Treasury promote or support?**
5. **Do you think that ICASA, Department of Communications (DOC) are necessary entities in the deployment of broadband? And why?**
6. **One of the regulatory drivers is to promote competition and infrastructure sharing; do you think that the involvement of ICASA and the DOC in these matters is effective?**
7. **What are the changes that the government policy should do to promote the municipal broadband in regards to technology selection or business models choices?**
8. **What are the changes that the ICASA should do to promote the municipal broadband in regards to technology selection or business models choices?**
9. **Is there anything else you would like to add on this subject?**
10. **Would you be willing to respond to a short email follow up, if required?**

SECTION H: Broadband Infraco

What has been the approach of the agency to support the broadband rollout e.g. spectrum and rights of way etc, how are they developed, what are the challenges, who has participated in this process, how the agency aligned to broadband policy guidelines? How does the regulation affect the agency operations?

1. **What are the key regulatory issues that constrain the development of municipal broadband access, availability and affordability in South Africa?**

2. **Is there any conflict in the establishment of Broadband Infraco as opposed to similar initiatives being implemented by the private sector? What are the key issues regarding this conflict, if any?**

3. **How effective is the broadband infrastructure regulation in far as regulating price of deployment? How can the municipality influence this?**

4. **Are there any future plans to include municipal broadband in the regulation and what will be the driving factors?**

5. **What are the challenges of the agency in supporting broadband rollout?**

6. **One of the regulatory drivers is to promote competition and infrastructure sharing; are there any mechanisms in place and how are they implemented? Elaborate.**

7. **Is there anything else you'd like to add on this subject?**

8. **Would you be willing to respond to a short email follow up, if required?**

SECTION I: Broadband Subject Matter Experts

How policy guidelines and regulation have promoted or inhibited broadband rollout? What are the challenges or factors that affect the rollout of municipal broadband?

1. **Is there any conflict in the establishment of Broadband Infraco as opposed to similar initiatives being implemented by the private sector? What are the key issues regarding this conflict, if any?**
2. **What are the challenges of the broadband rollout?**
3. **One of the regulatory drivers is to promote competition and infrastructure sharing; do you think that the involvement of ICASA and the DOC in these matters is effective?**
4. **What are the changes that the government policy should do to promote the municipal broadband in regards to technology selection or business models choices?**
5. **What are the key regulatory issues that constrain the development of municipal broadband access, availability and affordability in South Africa?**
6. **If ICASA were to include municipal broadband in the regulation what will be the driving factors?**
7. **What are the challenges in supporting broadband rollout, mainly for participative institutions?**
8. **What are the key drivers to choose certain technologies in broadband deployment? What are the changes over time?**
9. **Is there anything else you'd like to add on this subject?**
10. **Would you be willing to respond to a short email follow up, if required?**