Cape Peninsula
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SUSTAINABILITY OF BROADBAND WI-FI INTERNET ACCESS PROJECT IN RATLOU LOCAL MUNICIPALITY IN THE NORTHWEST PROVINCE

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DECLARATION

I, Thelela Mvambo, declare that the contents of this dissertation represent my own unaided work, and that the dissertation has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

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I wish to thank:

ABSTRACT

To connect and integrate people, government, and business in the interest of economic growth and social cohesion, the Government of South Africa has decided on a programme to connect rural areas through free broadband internet access projects. But provision of free broadband internet access through the support from government is not continuous. Thus, the purpose of this research was to assess the possibility to sustain free Broadband Wi-Fi Internet Access project upon expiry of government subsidy. The literature showed that there were good interventions in which other countries embarked on to try and sustain deployed free broadband internet services in rural areas. Field work was thereafter conducted to test the correctness or incorrectness of the gathered literature. The research followed a Qualitative method and applied Constructivism Paradigm approach. The research discovered that it is not possible for deployed free broadband Wi-Fi internet access project to be sustainable after the expiry of government subsidy period. Some recommendations for possible areas of improvement were made, but these suggestions are not solutions rather they are platforms to assist for better implementation and possible solution to sustainability of similar projects in future. Suggestions were made to conduct further study to discover possible intervention

ABBREVIATIONS

BBI – Broadband Infraco

GDP – Growth Domestic Product

DoC – Department of Communications

DTPS – Department of Telecommunications & Postal Services

ICASA – Independent Communications Authority of South Africa

ICT – Information and Communication Technology

ID – Identity Document

ITU – International Telecommunications Union

TVWS – Television White Space

SARS – South African Revenue Services

SIP – Strategic Integrated Project

SITA – State Information Technology Agency

SMME – Small Medium and Micro Enterprises

USAASA – Universal Access and Access Agency of South Africa

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CHAPTER ONE

INTRODUCTION AND CONCEPTUALIZATION OF FREE BROADBAND INTERNET SUSTAINABILITY

1.1 RESEARCH BACKGROUND AND INTRODUCTION

1.1.1 Broadband Internet Access for Rural Communities

The availability of free broadband internet to rural communities in most parts of South Africa is directly linked to their socio-economic advancement especially through knowledge transfer (Herselman, 2003). This further transfers into rural industrialisation, employment generation, improved education and limited rural-urban migration while also resolving the rural-urban digital gap (Hoffman and De Wet, 2011). With nearly half (slightly over 25 million) of South African population living in rural areas, the potential for business is expected to be high. Despite the political will to harness these benefits as part of the 2030 Agenda for Sustainable Development (Government of South Africa, 2016), sustainability remains such a key hindrance in the provision of broadband to rural communities. Only the government and the not-for-profit organisations (NPO) have been clandestinely driving this initiative since the late 1990s. This paper seeks to investigate the issues surrounding viability challenges of this initiative.

Despite the above, most remote areas of South Africa remain sporadically connected to broadband internet access (Herselman, 2003; Manda & Backhouse, 2017:6). They further elaborate that only about 11 % of the rural population has access to internet services at home. To connect and integrate people, government, and business in the interest of economic growth and social cohesion, the Government of South Africa have decided on a programme to connect rural areas through free broadband internet access projects (Manda & Backhouse, 2017:6). To achieve the above, the government through the Department of Communication (DoC), established the National Information and Communication Technology (ICT) Policy White Paper with the aim of ensuring affordable broadband internet access for all (Government of South Africa, 2016; Manda & Backhouse, 2017:7).

The other goal of the policy, according to Manda and Backhouse (2017:7), is to deal with the issues associated with expanding the economy and affordability such as infrastructure, regulation, and competition as well as supply side issues such as e-readiness and e-skills availability. The South African Government also establishes a policy that will specifically address broadband penetration in the country. The policy to enable this goal was then identified as the National Broadband Policy (NBP) called the South Africa Connect (SA Connect) Policy. Hence the government through its agency ASA, has embarked on a process

of deploying free broadband Wi-Fi internet access to needy municipalities, and Ratlou Local Municipality in the Northwest Province, became one of the first municipalities to receive these services.

The policy thus enables for a programme called Rural ICT Access to be implemented in underserviced municipalities for the purpose of achieving the goal of access for all to ICT services. To see this programme achieved, reasonable broadband projects in needy municipalities of South Africa are implemented. The final purpose is to eventually alleviate poverty, close the digital divide gap and enable an information society. Thus, the aim of this research is to assess the sustainability of the free Broadband Wi-Fi Internet Access project as implemented in Ratlou Local Municipality in the Northwest Province of South African. As mentioned above, this project is based on the National Broadband Policy (NBP) also called 'South Africa Connect (SA Connect)', which was approved by cabinet of South Africa in 2013. SA Connect then establishes a programme with projects, wherein the South African Government has embarked upon, to ensure universal service and access for all.

Most rural communities of South Africa remain less serviced with ICT facilities and are not viewed as a practical business opportunity by some mobile telecommunication operators (ITU, 2012:33). The advancement in the utilisation of smart phones and tablets in urban areas, which has been propelled by recent mobile technology improvements, as noted in ITU (2012:35), shows that it has increased the digital divide between the have and the have-not, instead of narrowing the gap between the two. To mitigate the effects above, the rural population needs to be connected and have access to broadband internet access through deployment of wired (optic fibre lines) or radio based (terrestrial microwave links) broadband services; the latter being the preferred network architecture for deploying broadband internet services to these communities, as it is the most economical technique (ITU, 2012:35).

The study done by World Bank (2013:10) mentions that there are estimated over 6 billion mobile phone subscriptions, but two-thirds of the global inhabitants remain not connected to internet services. Accordingly, people connected to the internet accounted for about 2.4 billon, but still broadband mobile penetration is limited to rural communities, and as such, they remain underserviced when it comes to broadband internet (World Bank, 2013:13). On the other hand, smartphone users are growing rapidly in urban areas of the developing countries, but still there are difficulties associated with broadband infrastructure development and deployment in under-serviced areas (mostly rural communities), and accordingly these areas are mostly situated in the sub-Saharan Africa and South Africa is part of these countries (World Bank, 2013:14).

The World Telecommunication Development Conference of 2014 hosted by the (ITU, 2014:23) suggests that the advanced technological and discounted techniques for deployment of broadband infrastructure should be the viable solution for services in these

areas due geographical and economic conditions. This is quite important because these communities need services that will enable them to integrate into publicly available services such as online government, health, education, and agriculture services, to mention but a few (ITU, 2014: 26). To effectively see the above aspects achieved, emphasises ITU (2014: 27), there should be a robust and directed national policy and regulatory initiatives with partnership with these rural communities as the starting point.

Hence, broadband internet access is viewed to be the catalyst that can be used in vast applications for the benefit of the community within which these services are deployed. Thus, assessing sustainability of the deployed Free Broadband Wi-Fi Internet Access project in Ratlou Local Municipality is of importance in ensuring that digital divide gap remains low, and that communities benefit effectively from such services.

1.2 DEFINING SUSTAINABILITY IN RELATION TO BROADBAND

Pade, Mallinson and Sewry (2009:338) state that sustainability refers to improvement that satisfies the necessities of the current society without conceding the capability of the upcoming society to achieve their own desires. Sierra, Pellicer, and Yepes, (2017) remark that each deployed infrastructure has to be sustainable in order to provide a contribution to the society in which it is deployed. Social facets are more influenced by context than environmental or economic ones. These social facets need to be considered in the short and long term and must be properly defined for each project investment, thus ensuring that the deployed Infrastructure projects promote economic well-being. This means that the infrastructure should complement established social interventions and facilitate participation in socio-economical processes (Sierra et al., 2017:3).

In agreement with Sierra et al. (2017:3), Shen, Wu and Zhang (2011:5) mention that a government infrastructural service project is a type of civic society service in which public program has a crucial responsibility to impact the project on socio-economic development demands. Shen et al. (2011:5) further argue that deployed infrastructure services should cover a range of provisions such as the public power supply, telecommunications, water and sanitation, waste collection and disposal, as well as public works road infrastructure and including railway services. Arguably, Shen et al. (2011:6) mention that the deployed infrastructure should be viewed as a means for social and economic development of the community in which the services are intended and, as such good, sustainable investments in infrastructure should play a centre stage, particularly in ensuring community development and uplifting.

Pade et al. (2009:339) argue that there are significant challenges that seem to threaten sustainability of Information Communication Technology (ICT). Often, there is a thin line that associates the theory of sustainability to the financial sustainability or cost recovery of the project. Nevertheless, sustainability considers other aspects such as rootedness in local communities, cultural and political acceptance, and value to rural individuals (Pade et al., 2009: 340).

In the arguments tabled by Pade et al. (2009: 340), they allude to the concern that it is important that the needs, demands and driving forces of social, cultural and economic/financial as well as the technological sustainability should be coordinated and assimilated to accomplish the overall sustainability of the project. Further, the implication of enhancement of ICT projects sustainability infers that execution thereof needs to be sympathetic to serious aspects that promote the sustainability of the ICT project in rural areas (Pade et al, 2009:341).

Arguably, Pade et al. (2009:342) mention that the key to sustaining any deployed infrastructure and services is to establish clear and easy project objectives that seamlessly integrate delicate societal requirements and limitations at specific segments of project implementation. Thus, establishing a concrete strategy of modest achievable chunks phases and project deliverables will permit an easy and clear communication plan to stakeholders, consequently enabling delivery of project that results in sustainable ICT services (Pade et al., 2009:342).

In full accord with Pade et al. (2009), Ochara and Mawela (2015:1) mention that sustainability as it relates to information and communications technology requires community participation during implementation and post implementation of the project. This will take into consideration local customs, differences within communities in terms of culture and economic background, enabling access to services for overlooked groups as well as adapting to evolving community needs. One aspect that comes to mind is the idea of e-Agriculture, wherein rural farmers are enabled to sell their produce online through the deployed services. Another aspect is that of e-Learning. As we know, most advanced teaching skills in mathematics, science and accounting are mostly concentrated in urban areas. So, in order to tap from these skills and benefit the rural people we need to enable e-Leaning capabilities.

One of the disquieting issues for South Africa is whether the free broadband internet services are sustainable on the current dominant internet infrastructure which relies on wireless microwave communication links as the means to bring these services to rural communities, or whether the mobile technology infrastructure, given the high adoption rates in the continent and specifically South Africa, provides a better alternative as a vehicle for ICT sustainability (Ochara & Mawela, 2015:1). It cannot be denied that some of the rural areas of South Africa have a form of internet access through mobile access network, and as such, Ochara and

Mawela (2015: 2) argue that sustainability of the ICT services requires that an assessment of alternatives that can help compensate the involuntary consequences of digital divide that are related to broadband and its durability going forward be considered.

1.3 FBROADBAND INTERNET ACCESS IN SOUTH AFRICA

1.3.1 Broadband Penetration

There has been a big difference in the livelihood, in terms of ICT access, between those staying in the city zones as compared to those living in countryside areas, and this causes unbalanced access to internet services between urban and rural communities. In order to close this digital divide gap, the South African Government has established the means, in a form of projects through its policy, to reduce this predicament experienced by rural areas. The Government has embarked in rolling-out free Broadband Wi-Fi Internet access projects in some rural areas of South Africa since the promulgation of the SA Connect Policy in 2013.

Accessing internet facilities and services in rural areas is one of the fundamental requirements that could make it easier for rural communities to gain access to essential information and the online services offered by Public Sector/Government as well as by the Private Sector, thus enabling a knowledge-based society and possibly boosting economy. According to Esselaar, Gillwald, Moyo and Naidoo (2010: 18), about 16% of rural people are able to browse the internet using cell phones whilst 10% of the rural community is able to send and receive emails using their gadgets. This means that there has been extraordinarily little internet penetration and knowledge in rural areas of South Africa. This could be attributed to less or no infrastructure at all, high data prices as well no access to gadgets that enable internet connectivity. These effects can further be attributed to lack of employment in these areas.

The approach of the South African Government is to ensure that these previously disadvantaged communities gain access to internet services by deploying free Broadband Wi-Fi internet access that will provide many benefits. Enabling fully operational ICT Broadband services in the rural communities is thus opening opportunities for people to access online services such as the following by leveraging on the broadband access network: e-Government services, which could include online application in the form of SARS e-Filling and Online Home Affairs Services; e-Education (interactive blackboards, online application to higher learning institutions); e-Health (electronic internet diagnostic, online ordering of medication); e-Business (livestock sale over internet for rural people).

On the other hand, in the private sector, this could refer to access to services such as online jobs and applications, livestock selling and purchase by posting or downloading a picture of

cows or sheep depending on what one wants to buy or sell. More often than not, South Africa has experienced a rising number of international tourists who are interested in the rural areas of South Africa and, as such, when they visit these communities, they still need to remain connected to their loved ones back home. Access to all these can only be made possible by internet connectivity through broadband infrastructure connectivity access projects.

According to the SA Connect Policy (DoC, 2013: 230), the broadband internet access target is envisaged to reach 100% of South African population that should have access to an average download speed of 100 Mbps by 2030. This target will be reached on a gradual cumulative basis, wherein, starting in 2016 going to 2020, at least 50% of the population should have an average download speed of 5Mbps. In doing so, rural communities are to be included in the access of such internet speeds at an affordable wholesale price.

The table below summarises the National Broadband Policy Targets as follows:

Table 1. 1 – National Broadband Policy Targets

Target	Penetration measure	Baseline (2013)	By 2016	By 2020	By 2030
Broadband access in Mb/s user understanding	% of population	33.7% internet access	50% at 5Mbps	90% at 5Mbps, 50% at 100Mbps	100% at 10Mbps, 80Mbps at 100Mbps
schools	% of schools	25%	50% at 10MBps	100% at 10Mbps	100% at 100Mbps

Source: SA Connect Policy 2013, p 23

As mentioned in the SA Connect Policy, the challenge relating to the inclusion of rural community is the access to the infrastructure and services that enable such internet speeds, hence the rural broadband connectivity infrastructure deployment of ICT services.

1.3.2 Current status and envisaged developments
In evaluation of the sustainability of the broadband roll-out project, it is quite imperative to also look into the advantages of access to internet broadband services, as mentioned in the SA Connect Policy. The policy forecasts that, if the current targets are met, there will be a massive job creation over 10 years of deployment of services. To be quite exact, it estimates about 400 000 jobs will be created with more of these jobs being manifested in the rural areas of South Africa (DoC 2013:23).

According to Goldstuck (2012:72), there has been a high uptake usage of cell phones and smartphones in South Africa, in which, by end of 2011, there were about 6.8 million internet users which can be translated to about 17% of internet penetration. This has left South Africa

5th in terms of Internet users in Africa. Further, Goldstuck (2012:73) mentions that the reason for South Africa to fall behind some of its counterparts in this aspect is due to high retail price for internet access.

It therefore shows that internet access plays a pivotal role in enabling a better economy and ensuring the prosperity of SMMEs. The only problem is that rural areas have been provided with no total network coverage by the telecommunication service providers, thus leaving the burden to connect and provide access to broadband services to these poor communities at the hand of the national Government (Goldstuck, 2012:73. According to the study period report of the ITU (2017: 15), there are a number of dynamics that distress the deployment of broadband internet services in the rural communities, and, according to the report, some of these factors that highlight slow pace of broadband deployment in non-urban districts include the following:

a) **Mobile penetration**

Contrasting the urban with rural areas, ITU (2017:17) acknowledges that there is very low mobile penetration in rural areas as compared to the urban areas. Further, ITU-D notes that improved mobile penetration provides better means for broadband infrastructure deployment and further enables prolonged sustainability of services. With fewer devices that connect to the network, it makes it difficult for the service providers to keep maintaining and further developing the built network, thus resulting in poor sustainability of services in rural areas.

According to Qwerty (2017:19), South Africa has about 55,21 million people, with an Urbanisation rate of 66%. Within that, 28.6 million (52%) utilise the Internet one way or another. QWERTY (2017:19) further argues that out of the 28.6 million, about 15 million users make use of social media platforms which are based on broadband internet platforms, with 13 million users doing so entirely from mobile devices.

b) **Internet access capabilities using different means**

Handsets, that is, end user devices such as a cell phone or tablets that are used in a particular area are possible catalysts in the deployment of broadband services. This is enabled by the demand factor imposed by what these devices are capable of doing or accessing. So, the lack thereof makes service providers deploy essential broadband services at a snail's pace. This trend could be attributed to lack of formal employment in the area and poor or no proper telecommunication infrastructure. Further, the price paid by end-users for voice and data fees is one of the highest in Africa. ICASA, in its bi-annual report published in March 2018, painted a black picture for the poorer communities wherein internet usage at households remained very low, and this report further highlighted that data tariffs favour the rich over the poor (ICASA

2018:8). The table below depicts households' access to the Internet by place of access,

Table 1. 2 – Access to internet by place

Place Internets accessed	Geotype	Province (per cent)									
		WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
At home	Metro	27,3	6,8	NA	8,2	9,0	NA	14,9	NA	NA	15,2
	Urban	16,6	5,8	6,3	4,7	6,7	6,6	13,8	5,4	5,2	8,3
	Rural	16,6	0,7	3,5	2,4	0,8	0,6	17,3	6,3	0,5	2,0
	Total	23,6	3,9	5,5	5,4	5,2	3,5	14,7	5,9	1,6	9,5
At work	Metro	25,0	20,9	NA	12,2	21,4	NA	25,4	NA	NA	23,9
	Urban	14,0	12,8	14,8	10,4	20,5	12,0	22,5	12,6	15,4	15,3
	Rural	9,0	2,5	4,6	2,7	4,4	3,4	25,4	5,4	2,7	3,9
	Total	20,9	10,9	12,0	9,9	14,5	7,6	25,0	8,5	5,5	15,8
Using mobile devices	Metro	64,5	67,0	NA	62,6	52,8	NA	62,2	NA	NA	61,6
	Urban	45,1	55,4	57,2	50,0	57,6	59,9	73,1	63,3	55,7	58,0
	Rural	25,8	29,9	39,4	41,0	35,5	45,2	58,8	50,0	35,5	38,3
	Total	56,9	48,0	52,2	52,4	47,1	52,4	63,6	55,8	40,0	53,9
At Internet Cafes or educational facilities	Metro	12,6	10,8	NA	6,8	15,9	NA	16,8	NA	NA	15,1
	Urban	11,3	9,0	3,5	8,5	8,9	5,4	14,7	5,9	3,7	8,5
	Rural	1,1	1,3	4,3	6,0	4,8	3,0	9,3	4,2	1,9	3,2
	Total	11,6	6,2	3,7	7,7	9,9	4,2	16,4	4,9	2,3	9,8

Source: ICASA Bi-Annual report - State of ICT sector report (2018:8)

If we then focus on the Northwest (NW) Province, the province in which Ratlou Local Municipality is situated, we can see, as depicted by the table above, that there is very low internet usage per household in rural areas. For example, if we look at Table 1.2 above, we can see that the rural community of NW Province has 0.6% access of internet at home. Those who are able to access it at work constitute 4.4% of the rural community. If we further look at individual access using mobile phones, this is about 45% of the rural community, which is better than the preceding numbers mentioned. However, this percentage is not satisfactory because more than 50% of this community does not have access to internet services. A more dire situation could be noted in Table 1.2 that access to internet in rural areas of NW Province using internet cafes and educational facilities make up a mere combined percentage of 3%. This further illustrates and emphasise the importance of this research on sustainability of free broadband Wi-Fi internet access in rural communities, and such study is more important to enable future sustainability of the internet access to end-users in these areas.

c) Terrain

Deployment of a mobile base station can be a very expensive task to embark on as regards time and financial implications. Due to high hills and mountains within the most rural South African areas, more base stations with microwave links are required to cover a reasonable area within a particular municipal area.

However, deploying these terrestrial base stations is still a better solution than deploying fibre optic cables. As much as the fibre link is faster and can carry more information in its communication line, the challenge with deploying fibre optic cables is their requirements of digging long kilometres of trenches from cities to rural areas. This is time consuming and expensive to embark on. Further, there is much agreement that needs to be attained when it comes to municipal-by-laws and wayleaves, as these differ from one municipality to the other.

The figure below provides the example of signal transmission from a typical server to a user in the remote rural area. As can be seen, the terrain on the right-hand side of the figure below represents the rural terrain.
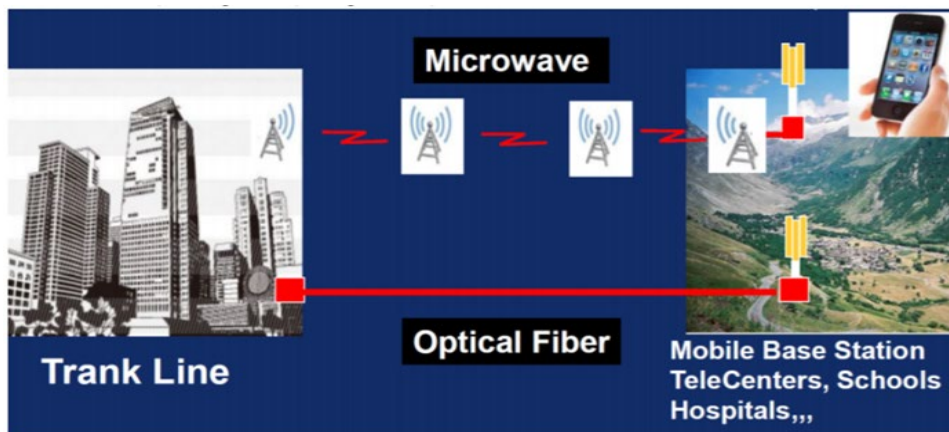
Source – ITU-D, 2017:16

Figure 1 - *broadband "backhaul" from urban to village areas.*

Below are pictures of sites taken by the researcher during one of the free broadband infrastructure rollout projects in a bad terrain at one of the municipal areas of South Africa.

Figure 2 – *Remote site pre-installation*

Source: Researcher

Figure 3 – *Remote site post- installation*

Source: Researcher

Figure 4 –Remote high site installation for broadband services

Source: Researcher

i)   Social and policy matters

a. Literacy

In terms of South African rural perspective, the content that is found on the internet is not based on South African context and is mostly not in the South African rural community context. There are two related issues involved - first, the accessibility of appropriate content, as well as the dissemination of that content (Qwerty 2017:11). Also, there is little local content available on the internet. Thus, lack of local content and language knowledge combined becomes a recipe for hindrance to deployment of internet broadband.

b. ICT literacy

The research by Qwerty (2017:7) states that ICT skills and knowledge contribute in one way or the other toward the positive penetration of broadband related services. Rural South Africa accordingly does not have sufficient access to ICT, thus creating challenges in ICT awareness. Alluding to the point above, Qwerty, (2017: 8) mentions that this gap creates restricted access in successful dissemination of internet infrastructure and services.

c. Policy initiatives

An all-encompassing broadband rollout plans that map policies which are related to the broadband can provide an optimistic agenda for effective infiltration of access

technologies and afford a concerted approach in employment of diverse technologies related to satellite, wired and wireless access mechanisms (Qwerty, 2017:10). It could be agreed then that, successful implementation of broadband technology policies should be carried out, bearing in mind the aspects listed over and by affording the needed incentives to lessen the blockages emanating from these (ITU, 2014: 50) and this could include, for example, less tax for the operators who offer services in underservices areas.

1.4 PROBLEM STATEMENT

To improve internet access in rural South Africa, the government, through its SA Connect policy, embarked on a national programme in which free broadband Wi-Fi internet access projects are executed in municipalities. Ratlou Local Municipality in the Northwest province of South Africa 2015 to 2018. Since the deployment and subsequent availability of free broadband Wi-Fi internet infrastructure as well as connectivity in rural South Africa (including Ratlou Local Municipality), there is lack of sustainability of these services beyond the lapsing of government subsidy period (Mekuria et al, 2021). Rural population incapacitation partly accounts for ICT underutilization, inefficiencies, operational and maintenance challenges (Gracia-Mora & Mora-Rivera, 2021). This is a digression from the primary and ideal objective that the deployed ICT infrastructure should be able to function sustainably as project recipients are expected to honour payment of services.

Besides the public, recipients include crucial rural social service institutions such as public schools, public health facilities, government facilities within the municipal precinct (magistrate courts, public libraries municipal offices, etc.). In some municipalities, contracted service providers have sold their network to third parties or stopped their contracts due to non-profitability of the network infrastructure beyond government subsidy. Thus, there is a need to evaluate the reason why the deployed broadband Wi-Fi internet access services are not sustainable upon expiry of state subsidy.

1.5 AIMS AND RESEARCH OBJECTIVES
This section will derive the goals and intentions of the research. This will enable the researcher to remain within the scope and direction of the research.

1.5.1 Aims
The main goal of this research is to evaluate the sustainability of free Broadband Wi-Fi internet connectivity project as deployed in Ratlou Local Municipality in the North West Province.

1.5.2. Objectives

The research has the following objectives:

1. To determine the benefits of the free broadband Wi-Fi internet access to rural communities.
2. To ascertain the capabilities of appointed service providers and beneficiaries to sustainably operate broadband Wi-Fi beyond the government funding.
3. To establish what interventions (if any) could enable sustainability of the deployed Wi-Fi broadband internet projects in rural South Africa.

1.6 RESEARCH QUESTION

The main research question for this dissertation is:

How sustainable is the project of rolling-out broadband Wi-Fi internet access in Ratlou Local municipality?

The following questions will act as yardsticks that will ensure that the researcher does not deviate from research topic:

- How effective and practical are the services provided by the project and what is the impact of these services to the beneficiaries?
- In what ways are appointed service provider able to continue providing services beyond the government subsidy?
- What and how do interventions ensure sustainability of broadband wi-fi internet projects in South African rural areas?

1.7. RESEARCH PROPOSITION

The proposition to this research is:

Broadband Wi-Fi internet is not sustainable after the expiry government subsidy period. An alternative proposition is broadband Wi-Fi internet is sustainable after the expiry of government subsidy.

1.8 RESEARCH DESIGN AND METHODOLOGY

1.8.1 Target Population and sample size

A population refers to the total number of phenomena under study. The population is constituted of 26 public institutions (schools, clinics and government facilities) within the Ratlou Local Municipality, (StasSA, 2017) Also, broadband internet service providers, ICT regulators and government implementing agency and regulators in the rural community of Ratlou Local Municipality.

1.8.2 Sample size and method of sample

A sample is a representative portion of the population that the researcher gathers data. In this research, the sample is equal to the population. Because the free broadband Wi-Fi internet project focuses on all public facilities -schools, clinics and government facilities- within the Ratlou Local Municipality. Within the municipality, there are 26 facilities which include the combination of schools, clinics and government/municipal offices connected with internet through the free broadband Wi-Fi internet connectivity project. Since the level of analysis of the research is pegged at institutional level, the research will engage key institutional representatives such as the principals or heads of departments and supervisors who have access to the free broadband Wi-Fi internet. Table 1 below shows the paticipants by institutions
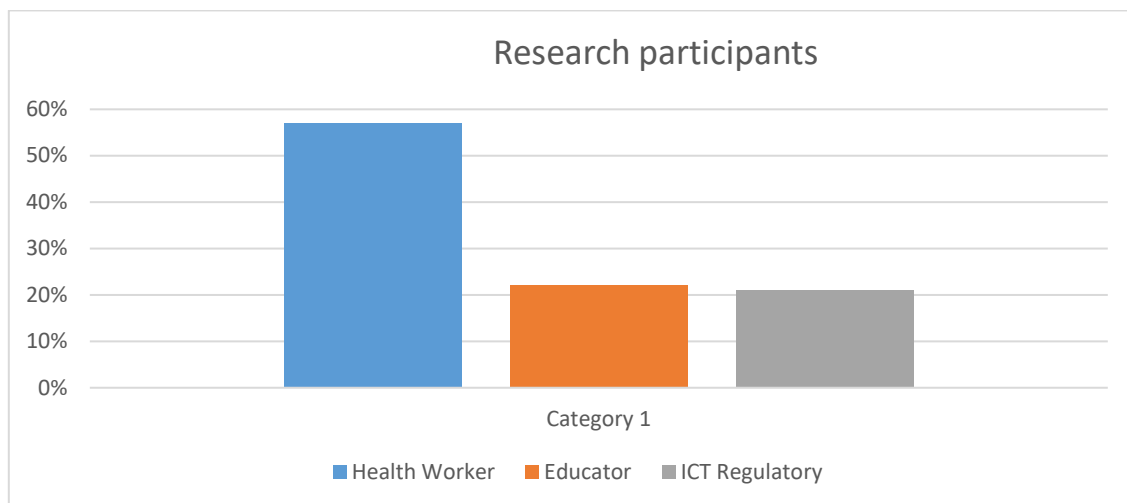
1.8.3 Data collection methods

A qualitative research method was used in this research because the research is primarily an exploratory one and also because the researcher needs to uncover trends in thought and opinions, and delve deeper into the problem (Blumberg, Cooper & Schindler, 2011:54). In this method, questionnaires with open-ended questions was used, whereby individual interviews are used with a list of prepared question being utilised and the data to be collected will be based on the individual sample number to be decided upon (Saunders, Lewis & Thornhill, 2008:36).

The sample size was based on the population in which the research needs to gather data from. The population in which the research is based on is the ICT sector, then the sampling

frame from the population will be rural municipality residents within the Ratlou Local Municipality, ICT policy/regulatory makers, and broadband internet access project governmental implementing agencies. From the sampling frame, an individual 7showing which relevant people or entities will be sampled (Walliman, 2011:10).

1.8.4 Data analysis

To draw good and convincing conclusions, the research should be creatively presented with high superiority evidence as well as comprehensive reasoning (Walliman, 2011:10). For this research, QDA Miner Lite was used, which is a free of charge and easy-to-use qualitative data analysis software package for coding, interpreting, recovering and studying small and large varieties of documents and pictures. It is a data analysis application that could be utilised to scrutinise consultation and conversations of records, speeches, open-ended responses, etc. It can also seamlessly integrate statistical (quantitative) data examination application with qualitative content breakdown means and the software provides amazing elasticity for examining text as well as connecting its content to a structured information application which includes mathematical and unqualified records.

How the research will go about analysing data will be in a three step-by-step process. The reduction process will be followed by arranging the compressed data into figures or drawings and tables which can display the data in a way that enables one to study connections and thus allow for the evaluating of relation meanings of dissimilar influences (Walliman, 2011:7).

1.9 LITERATURE REVIEW

Extensive literature assessment will be deduced from a number of different sources such as peer reviewed articles and journals, including published books based on this exploration which will add value to available literature. In current published studies, there has not been a deep exploration and the findings are slim as regards to the sustainability of free broadband internet access to rural communities of South Africa.

Further sources of information will be statutory documents, such national policies, regulatory documents in line with the ICT sector. The research will also consider online published documents from reliable sources, and such reliable sources can be found on Google Scholar.

1.10 ETHICAL CONSIDERATION

Firstly, ethical behaviour in this research will be underpinned by acknowledging research work that has been produced by other researchers in my field of work. In actual fact, quoting other peoples' work and acknowledging their contribution is considered an honour and their work must be respected because it shows that one is well read about views of other people and has a vast range of information (Saunders et al, 2008:18).

Secondly, when dealing with people of different backgrounds of religion, ethnic group, race as well as gender, the researcher ensured that he treats them with respect and dignity. A consent letter/form has been generated to inform participants that their participation in the research is voluntary and that they may withdraw from the research at any time and for any reasons that may concern them. In the interviews, they were informed that they do not have to answer all the questions raised, and that they may choose to omit questions that they feel are irrelevant or are difficult (uncomfortable) for them to answer. Participants were also advised that their identity and that of their organization will be treated as confidential.

It was further explained in the consent letter that their answers in the questionnaires will be used for the student's dissertation only and, if published, their responses will not be identifiable as theirs. At the beginning of their participation, the researcher has taken some time to briefly explain to them what the research is all about.

1.11 LIMITATIONS

The potential outcomes of the research maybe used to enable the review of the ICT policy in the country. The recommendations from the research outcomes may further influence the regulatory framework and also look into new (modern) models of financing rural ICT connectivity and infrastructure with a view to creating long lasting sustainability of these projects.

That being the case, the main limitations of this dissertation are based on the available time frame needed to complete the research, as well as the resources. The researcher will do all possible to ensure that all relevant and possible data is gathered within allocated time so that convincing conclusions and sound recommendations can be made.

Further limitations to the dissertation are available financial resources. To conduct a thorough research, one will need to have enough funds as a means of establishing a convincing case study. Also, due to the limited timeframe to complete the master's degree course, there is not enough time to consider all aspects affecting this research topic. The other limitations are the

fact that the research is based on a project implemented in a smaller area of the country (i.e., a local municipality) and with fewer people that are aware of such government initiatives.

Based on the above limitations, the research might not be able to unearth all underlying problems and provide possible recommendations for solving these difficulties.

1.12 CHAPTER SYNOPSIS

Chapter 1: Is an introductory part and contains a contextualisation of the study. The introductory part will thus summarise the proposal, and then the background will further provide explanation in general as to why the researcher wants to conduct this research. Limitations of the research work will also be mentioned in this chapter.

Chapter 2: Will present a literature assessment (review) of work already done in the subject area. This means that Chapter 2 will identify the exploration that has been done and/or concluded in the research area. Identified literature will be examined so that the information gathered is compared to help arrive at a particular conclusion.

Chapter 3: This chapter is the analysis of gathered literature as identified in Chapter One of this document. The literature discovered will form the basis of our field research and will test the findings of existing literature.

Chapter 4: This chapter will deliberate on research methodology of the study. The chapter focuses more on the resources used to gather the data and the relevant information. It will also explore a comprehensive portrayal of mechanisms of the methodology deployed. Moreover, these details clearly identify why the researcher chose this type of methodology to answer the research question over the other types.

Chapter 5: This chapter will outline the research results and discussion and forms the body of the dissertation. Collected data will be structured in an orderly manner, whilst ensuring that it is logical and cumulative. To accomplish the above, this chapter will be divided into sections and subsections.

Chapter 6: This chapter consists of conclusions wherein the data gathered from the field is interpreted to give meaningful results that outline clearly the findings and the way forward based on the researched information. Unanswered questions will be addressed and explained in the findings of the research regarding each phase of the research process. This chapter further provides an overview of the research process and clearly formulates the findings and conclusions regarding the research problem, the sub-problems and including the hypothesis.

1.13 CONCLUSION

The digital divide continues to separate urban and rural citizens of South Africa in one way or the other, thus leaving behind those who are less privileged and eventually pushing them into an undesirable state. As this chapter has shown, free broadband Wi-Fi internet access has been seen as the vehicle to close the digital gap between those who live within full ICT infrastructure covered areas and the ones living outside of these infrastructures (such as the rural municipalities or areas of South Africa).

For example, if we look at recent developments in South Africa, we can now notice that the government has started to offer online services such as booking online for ID-book applications or passport applications, paying e-payment municipal bills, doing SARS e-Filling, etc. The above-mentioned services are one of the few online services that the South African Government is offering.

Considering higher education and training, the requirements are that all prospective students should apply and register online for academic acceptance. By considering these few examples, we can understand the benefits of the free Broadband Wi-Fi internet services to underprivileged communities of South Africa. Thus, the ability of the deployed infrastructure to remain operational and sustainable for a prolonged period is a pivotal matter that really needs complete and thorough studying.

CHAPTER TWO: LITERATURE REVIEW

2.1.1 Introduction

Establishing their facts based on the rural broadband internet connectivity projects, Townsend, Sathiaseelan, Fairhurst, and Wallace (2013:2) highlight that rural areas, when compared to urban areas, possibly suffer financial and societal shortcomings because of predicaments that are associated with distance and remoteness of these zones. According to their discussion, Townsend et al., (2013:2) mention that ICTs, and more specifically, broadband connectivity and access should benefit the remote parts by linking its people and locations with industries and services that are possible to be transmitted through this infrastructure. Instead of increasing the deployment and uptake of ICT services, absurdly though, rural separation is intensified by the technological landscape (Townsend et al., 2013:3). This, according to Townsend *et al*. (2013:3) could be the result of rural areas confronting challenges both in terms of broadband access technology infrastructure deployment and eagerness and/or capacity of people to embrace these technologies.

As highlighted earlier, extensive literature reviews will be conducted from various sources such journals, peer reviewed articles and published books. Further sources of information will be statutory documents such national policies, regulatory documents in line with the ICT sector. The research will also consider online published documents from reliable sources, such as can be found on Google Scholar search engine.

In order to be able to gather relevant literature for this research, an important question needs to be answered. The main research question is: How sustainable is the project of rolling out free broadband Wi-Fi internet in Ratlou Local municipality in the Northwest Province?

Whilst the literature to be reviewed will be used as the guideline to address the problem relating to sustainability of broadband project in Ratlou Local Municipality, the research style to be undertaken will be to delve deeper into the factors that emanate from different areas of responsibility. The first one is the government's experienced challenges in sustaining the project for longer periods and secondly, the inability of the municipality (or recipients of services) to take over the payment of services to sustain the project beyond government's subsidy.

The first section of the literature review will look at the definition of broadband internet and further look at the intentions of deploying broadband internet in rural areas. Once this is established, the research will then study the trends and means used to sustain similar projects in different areas of South Africa if any, then in Africa and then worldwide.

2.2 BROADBAND WI-FI INTERNET EXPLAINED

2.2.1 Fundamental definition

For us to understand this concept of broadband Wi-Fi Internet, we first need to understand the components making up this concept. We first need to understand what Broadband Wi-Fi and Internet are. According to the ITU (2010:7), broadband is transmission capacity that is faster than primary rate Integrated Services Digital Network (ISDN) at 1.5 or 2.0 Megabits per second (Mbps). Simply put, broadband is a combination of capacity (bandwidth) and speed. Further, ITU (2014:4) explains that the word Wi-Fi usually refers to the collection of technical specifications that can be arranged to create "wireless local area networks", or WLANs. This means that Wi-Fi is a "wireless local area network" which enables communication devices to access internet connection. Internet on the other hand is the global system of interconnected computer networks that use the Internet protocol suite (TCP/IP) to link devices worldwide. So, based on the above definitions, Broadband Wi-Fi Internet can be defined as the high-speed wireless network used to access internet through handheld devices or desktop devices.

2.2.2 How Broadband Internet is deployed

In order to achieve deployment of broadband internet service in the previously underserviced areas, three main infrastructure parts are required to establish a reliable network. These parts include the following: Backbone Infrastructure, Backhaul Infrastructure as well as the customer premises access infrastructure.

i. *Backbone Infrastructure*

According to the ITU (2014:18), backbone infrastructure is the interconnection of dissimilar geographic points in a particular area. In South Africa, usually national backbone is utilised as the point wherein the broadband *backhaul* network connects to. For the backhaul network to connect to the backbone, a Point-of-Presence (PoP) needs to be established as part of backbone. A PoP is a termination point from long distance backbone carrier which provides connection for the backhaul network to enable internet access from the main server that is usually situated at a distant area. Below is the example of the National Backbone fibre network as provided for by the Broadband Infraco in its 2018/19 Annual Report (Broadband Infraco, 2019:3). Broadband Infraco (BBI) is a South African State-Owned Entity (SOE) which provide wholesale broadband internet services to the industry.
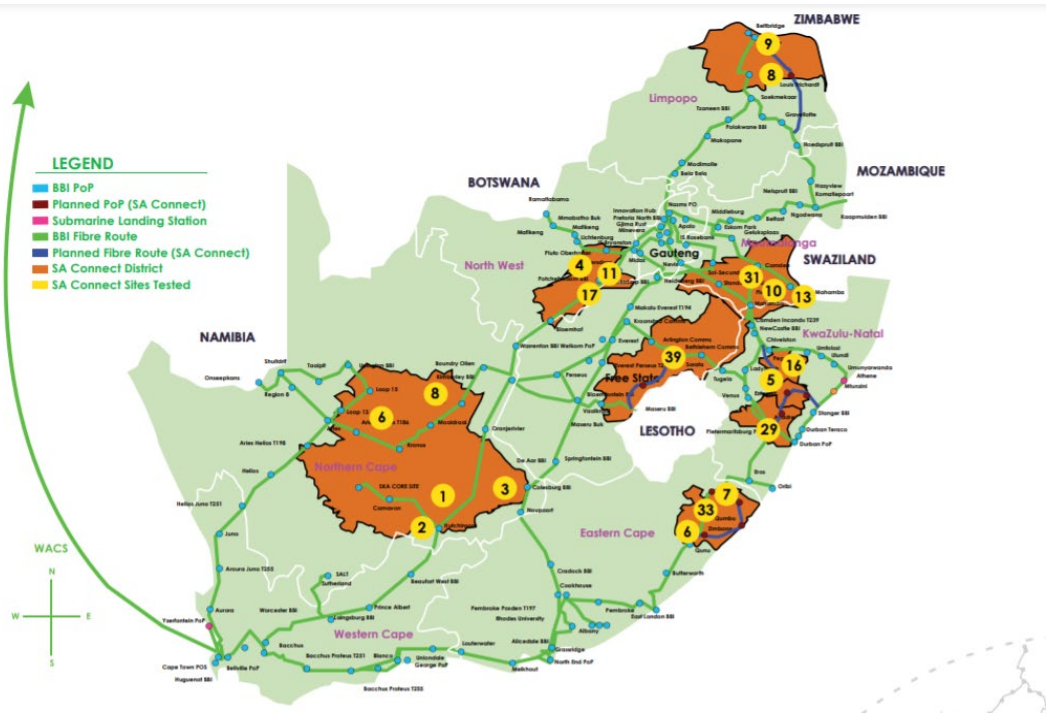
Source BBI annual report – 2019:3

Figure 5 – *BBI fibre cable backbone infrastructure*

ii) Backhaul Infrastructure

Backhaul infrastructure, on the other hand, is the built network from the PoP to the intended recipients in a particular area. In this case it would be Ratlou Local Municipality. Backhaul is made up of radio communication towers with point-to-point and point-to-multipoint microwave links. These microwave links are a solution to reaching and connecting to internet remote rural areas since they can link (communicate with) each other from distances that range between 24 Km to 28 Km (ITU, 2014:17). This makes them ideal for bringing broadband internet to the rural communities due to low costs and easy deployment, as opposed to the fibre optic cable that requires long kilometres of digging trenches as well as legal requirements from municipal bylaws as well as wayleaves (ITU, 2017:36).

iii) Access Infrastructure

Access infrastructure refers to the infrastructure equipment installed at the end-user premises to enable broadband internet access. Usually, this infrastructure is referred to as Customer Premises Equipment (CPE). The CPE includes the outdoor (antenna, cables, etc.) and indoor (router, access point, etc.) equipment that is installed at the end-user's premises. With the equipment mentioned above, the end user can now use his/her devices such as tablets, smart phones, laptops, etc. to connect to the internet.

2.3 ENABLERS OF SUSTAINABILITY OF BROADBAND CONNECTIVITY

2.3.1 Relevant policies to enable sustainability of deployed broadband services

In order to enable sustainability of the South African economy and to deploy ICT services, the South Africa Government established policies and strategies to assist it to execute and sustain deployed ICT projects (Manda & Backhouse, 2017:6). For the State to afford to deploy effective projects so that vision 2030 of the NDP is implemented, it developed a National Infrastructure Plan with 18 different Strategic Infrastructure Projects (SIPs) initiatives as part of the government strategies (Manda & Backhouse, 2017:7). According to the Department of Telecommunications and Postal Services - DTPS (2015:2), the SIPs are categorised into seven (7) segments as follows:

Five Geographically focused SIPs

Three Energy SIPs

Three Spatial SIPs

Three Infrastructure SIPS

Two Knowledge SIPs

One Regional Integration SIP

One Water and Sanitation SIP

For the purpose of this research, we will focus on the Two Knowledge SIPs whereby broadband infrastructure services reside. Broadband is categorised as SIP 15 under Knowledge SIP in which all government initiatives that relate to ICT infrastructure and services are directed (DTPS, 2015:3). Worth noting is the undertaking made by the DTPS (2015:3) that, under the SIP 15, the state will provide broadband coverage in deep rural areas on a private-public partnership so that it can make sure that the rural community, schools and health facilities gain access to broadband internet services.

To further enhance the implementation of the SIP 15, the government established the SA Connect Policy whereby targets were set as the drivers of the 2030 sustainable development goals as established by United Nations (UN) Member States (DoC, 2013:3). According to the policy, it is expected that by deploying broadband services, this will increase the nation's GDP, job creation, enhance the quality of education and health as well as rural development (DoC, 2013:4).

Now more than ever before, the SA Connect policy establishes a relationship between media, government services, online business trade, information technology services, telecommunication services, broadcast services and other technology services (DTPS,

2016:5). This convergence means that these technologies do not operate in isolation from each other, rather they act as a collective platform of services to enable access to applications and services such as the online government services, internet, emails, calls, listening to music and including the use of radio devices such a mobile phones, laptops, desktops and tablets (DTPS, 2016:5). For example, when the free broadband Wi-Fi project was implemented in Ratlou local municipality a limited number of connecting devices/gadgets such as tablets and smart phones were supplied for free at some schools and clinics which were also provided with free broadband access (USAASA, 2016: 15). According to USAASA (2016: 15), these gadgets were provided as means to ensure that people within these facilities can connect and access relevant and crucial information and to also ensure that these services are utilised to the fullest.

Thus, for the government to see achievement of its strategic objectives it required that it conceptualise the broadband infrastructure as part of the digital ecosystem. According to Katz and Callorda (2018:3), digital ecosystem is a set of interconnected mechanism structures which are integrated to function within a socio-economic framework. This ecosystem calls for the establishment of the infrastructure that is able to support digital-based services for individuals, businesses and public organizations for accessing and distributing digital content and services (Katz & Callorda, 2018:3). This infrastructure should also enable interconnectivity to relevant industry contributors in the digital ecosystem value chain so they can produce a value corresponding in size to available end-users (Katz & Callorda, 2018:4).

Indeed, the South Africa government has managed to deploy the free broadband Wi-Fi internet in Ratlou Local Municipality as part of seeing vision 2030 achieved, and as a means to enabling a digital eco-system in order to also close the digital divide. Below is a figure depicting a model for broadband digital transformation eco-system as deployed in South African rural communities.

Source: Manda & Backhouse, 2017:6

Figure 6 - Three pillars for digital transformation ecosystem

In accordance with Manda and Backhouse's (2018:6) three pillars for digital transformation eco-system, as a primary focus and to drive digital transformation, the government should be seen as the driving force in ensuring that the public sector is steered to a digital era, wherein government establishes or creates platforms for e-Government services. In this regard, the South African government is really trying its best to transform the public sector. For instance, the government has managed to transform the revenue collection services by establishing SARS e-Filling digital system, and through this system, individuals and companies that have access to broadband internet services are able submit their tax returns using this platform. On another front, the Home Affairs Department has also introduced a semi-digital online system whereby individuals wanting to apply for their identity documents (ID) as well as passports can do so online as a pre-application requirement. By so doing, the government is trying to reduce the bottlenecks, delays and long queues associated with ID and passport applications.

The last example in this aspect is the transformation of the public higher education from manual to digital services. In fact, even basic education in Gauteng Province has also initiated online applications for acceptance and enrolment of learners at high schools and primary schools.

However, most universities, if not all, have introduced an online academic application and registration system for academic enrolments. Research conducted by Agwa-Ejon and Pradhan (2017:3) suggests that the paper-based application would normally require a lot of work and time whereas the online process (i.e., paperless) enables enrolment and registration process to happen at a faster rate. The study further discovered that the current online process is satisfactory and that ease of use, reduction in time and cost, zero loss of documents, and accessibility of the process remotely and anytime from anywhere were reported to be the major benefits of the online process (Agwa-Ejon & Pradhan, 2017:3).

The second pillar of the digital transformation ecosystem is the ability to access and utilise these services by enabling digital literacy even to the most rural areas of South Africa (Manda & Backhouse, 2017:7). According to the discussions tabled by Manda and Backhouse (2017:8), in order to support and facilitate a digitally transformed and knowledgeable society, proper digital skills and literacy needs to be available to those accessing and utilising these services. In concurrence with Manda and Backhouse (2017:8), Oyedemi and Mogano (2018:3) allude to the point that digital technologies should be the resources that structure the lives of the rural community in terms of sociability, economic transactions and the way people learn.

However, argue Oyedemi and Mogano (2018:3), social disproportion remains to stimulate the form of access to digital technologies because those who are deprived access to these technologies discover a negligeable or forfeited sense of success in reaching the daily

activities of communication, business dealings and information acquisition necessary for socioeconomic human wellbeing (Oyedemi, 2012). The government has again tried to close this gap to a minimum achievement by means of the partnership between USAASA and NEMISA; hence the government has been training youth, women and people with disability in certain areas (USAASA, 2018:15).

Thirdly, according to the digital transformation ecosystem, the government should enable digital inclusion in the form of digital access, information as well as content (Manda & Backhouse, 2017:8). Agreeing to the preceding statement above, Alamelu (2013:2), defines digital Inclusion as a means of creating an informed society by including the digitally excluded as the technology advances and continues to empower citizens on the road of development. Alamelu (2013:2) mentions that accessing technology is a pivotal aspect to the complete process of bridging the digital divide and creating a digital cohesion that secures opportunity through internet, mobile services and computerization of processes, bringing in a new era of a connected nation and using technology better on behalf of citizens and communities.

Indeed, the benefits of accessing public and private online services using available broadband internet connectivity are overwhelming. The establishment of the SA Connect projects, like the one implemented at Ratlou Local Municipality seeks to enable this aforementioned digital transformation eco-system whereby the country becomes a digitally inclusive, innovative and knowledgeable society (Manda & Backhouse, 2017:7). The question that we should ask is 'did these policy and project interventions succeed in ensuring sustainability of broadband projects in South Africa?'

2.3.2 Broadband project success story

Katz and Callorda (2018:3) state that, in order to ensure broadband connectivity is sustainable, the government should ensure that it supports the adoption of terminals (computers, smartphones, tablets, etc.) and services (broadband, wireless telephony) in order to allow individuals and organizations to gain access to internet services. Network access enables the use of digital products and services, which is defined as digitization. According to the finding by Katz & Callorda, the demand of digital products and services by individual consumers, enterprises and governments should be used to form a basis to ensure sustainability of deployed services. Without the demand from these three spheres of society, it becomes difficult to enable sustainable connectivity, especially in the rural community (Katz & Callorda, 2018:3). To drive public interest and enable sustainability of broadband internet connectivity, the government should make it possible for convergence of digital ecosystem components, such as the Internet platforms, media companies, telecommunications operators and equipment manufacturers, among others (Katz & Callorda, 2018:4). Further, alluding to the need for a balanced and sustainable broadband internet ecosystem, Katz and

Callorda (2018:4) argue that digital industries (telecoms & internet service provider companies, including government) should facilitate and support conventional factors of production ranging from human to investment capital on their part. By doing that, there could be a noticeable price reduction that enhances financial capabilities with resources and active innovation creation for customer advantages wherein service providers are able to operate within a sustainable competitive environment, and receive the appropriate incentives and controls embodied in a regulatory framework and public policies (Katz & Callorda, 2028:4). Below is a diagram depicting the pillars to enable sustainable broadband internet connectivity:
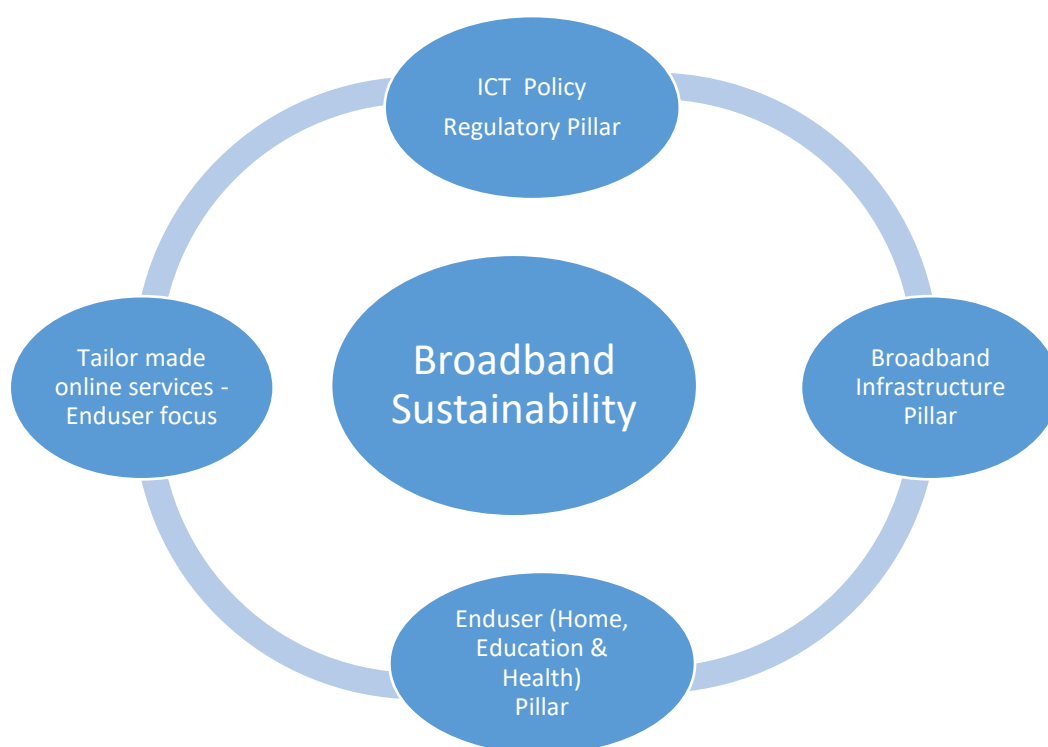
Source: Adopted from– Katz & Callorda, 2018:5

Figure 7 - Pillars for Broadband Sustainability

According to Mooketsi (2015:23), the deployment of broadband internet in rural communities is in accordance with the legislated and regulatory framework supported by Universal Service and Access fund (USAF) as mandated in the Electronic Communications Act (ECA) of 2005, Act no. 36 as amended in 2014. Emphasizing the point above, Mooketsi (2015:24) mentions that the interest of government to connect people in underserviced areas has enabled the expansion of ICT, specifically broadband infrastructure, to schools and other government facilities which are mainly in rural areas. Further, the Electronic Communications Act (ECA) makes provisions for projects and programs that are purposed to implement universal service and access goals to ICTs for all, hence the establishment of the SA Connect policy in 2013 (Mooketsi, 2015:25).

Thus, the government implementation framework and government strategies characterize a serious empowerment that bridges the development and sustainability of the broadband infrastructure and services (Katz & Callorda, 2018:5). On the other hand, Katz and Callorda (2018:5) argue that the reliable broadband infrastructure and services offered could accelerate the competitive environment amongst service providers; and they could enable more services and cheaper connectivity rates which could result in continuous use of broadband infrastructure services which eventually contributes to long term sustainability of services. Coupled with the above, in order for the deployed infrastructure to yield positive results, it is required that all end-users in rural areas (households or community and government facilities such as educational and health facilities) be digitized as well (Katz & Callorda, 2018:6). In line with Figure 7 and the arguments above, end-users are the pillars to sustainable broadband internet projects, because if the end-users who are stakeholders in the project do not have digital equipment and skills to access the deployed services, then the deployed free broadband Wi-Fi services will not be sustainable (Meyer & Gent, 2016:17). According to Meyer and Gent (2016:18), lack of adequate ICT skills and appropriate end-user devices in rural areas inhibits the deployment of reliable and sustainable broadband connectivity.

According to the ITU (2017:6), broadband has become the major role player in information communication, and ITU further states that as the advancements of mobile technologies get better, the operators are not willing to establish advanced network infrastructure in rural areas because of low economic activities in these areas. ITU (2017:34) further mentions that there are also other major challenges which contribute to the slow or no deployment of broadband services in rural areas, and, amongst others, is the unstable power supply from the power grid as well as the bad road infrastructure in these areas.

Accordingly, ITU (2017:35) alludes to the notion that lack of technological advancements hinder the deployment of serves because the mobile operators do not see the value of adding on or investing in infrastructure. The study by the ITU (2015:10) further states that. in its research done during the study period 2010 to 2014, that most of the broadband projects in rural ears are funded by the state. Further study realises that the advancement of broadband systems in rural areas is most related with the idea of universal service and universal access (2015:11).

Due to social, economic and geographical challenges in the rural areas, the ITU (2017:37) further suggests that there seems to be no 'one size fits all' approach in resolving the rollout of broadband infrastructure in rural communities. There needs to be integration of three pillars which underpin the deployment of broadband services; these involve technology, policy and economic coordination of these spheres (ITU, 2017:38). As earlier mentioned, the

government plays a pivotal role in ensuring that these areas are catered for in the deployment of broadband internet services.

According to Katz and Callorda (2018:8), sustainability of broadband infrastructure and services is also based on the uptake of services by the end-users and, as such, the revenue generated by these networks is linked to this uptake and use. For example, argues Katz and Callorda (2018:8), the reason why there has been more sustainability of deployed ICT infrastructure and subsequent broadband services in urban areas is because, in these areas, there is a massive uptake of services by end-users which translates to more revenue for service providers.

2.4 GOVERNMENT BASED SERVICES AS ENABLERS BROADBAND SUSTAINABILITY

Proenza (2010:6) states that sustainability of services is mostly made possible by social, health, education, and economic networks. This means that people mostly communicate with those who share the same lifestyle and background including those within their proximity as well as the close-by towns or villages, such that a relationship of this nature is perceived as means to strengthen existing relationships amongst community members (Proenza, 2010:6). This keeps social platforms and services viable and vibrant. According to the ITU (2015:13), in order for the deployed services to be sustainable and to assist the communities as mentioned earlier by Proenza (2010:8), there are four mainstreams that the deployment of broadband projects seeks to achieve for rural community's sustainable services. These are

e-Health

e-Education

e-Administration, and

ICT Training

2.4.1 e-Heath
According to Ouma & Herselman (2008:304), e-Health (electronic health) is defined as a type of electronic health information sharing or reporting by using an internet connection in order to better and effectively provide health care solutions. Based on this definition, it is thus clear that by deploying the broadband services in rural municipalities, one could achieve a lot as regards diagnosis of some ailments that affect the people living in these remote areas. Such a technology is able also to assist with patient information and records as people relocate from one place to the other, and by so applying this technology, the government is able to

save time and the costs of having to redo tests and diagnostics (Ouma & Herselman, 2008:304).

Ouma & Herselman (2008:305) further argue that the need for such technology in rural communities is further emphasized by the fact that, more often than not, the quality of health care in these areas is rather viewed to be of lesser quality that that of the urban areas. The contributing factor to the lesser quality of health care is due, to some extent, because of socio-economic reasons (Ouma & Herselman, 2008:304). Thus, continued availability of broadband internet services in rural community cannot be seen as luxury. Rather, it is a need and is a vehicle to address pressing medical issues in these areas.

In the South African context, e-Health is primarily used in rural areas through the National Health Insurance NHI initiative whereby decentralised health facilities are connected/linked under one sub-district and the sub-districts are connected within one district and eventually they are linked n to the national health network. So, the NHI initiative will play a pivotal role in ascertaining that broadband connectivity in rural areas is sustainable.

2.4.2 e-Education

In most cases the word e-Education (electronic education) is usually interchanged with the word e-Learning. According to Laschewski (2011:5), e-Education can be described as a learning platform which is identified by the deployment of latest available internet platforms wherein end-user equipment such as desktops, laptops, tablets, smartphones, etc. are used as tools to access remote learning information. In his study, Laschewski (2011:5) further discusses the advantages of e-education that are further reaching than just merely connecting educators and learners. Also, accessing learning information is made faster than it would have been without such technology. Additionally, Laschewski (2011:6) states that connecting e-education learning hubs with learning facilities in remote areas no longer becomes a problem as these are remotely connected by the internet. Hence, rural communities benefit a lot from these platforms and thus enables an improved quality of education. These techniques could enable sustainability of infrastructure and services for continuous delivery of broadband internet services to these underserviced communities of South Africa, especially by the Department of Basic Education (DBE).

Mooketsi (2015:23), argued that the DBE's e-Education White Paper of 2004 promotes the connection of schools via ICT platforms such as the broadband internet services. According to Mooketsi (2015: 23), to strengthen the achievement of government initiatives, the SA Connect Policy (or National Broadband Policy - NBP) advocates for universal service and access to ICT for all by setting connectivity targets that should be met at particular intervals until 2030 (Mooketsi, 2015:3)

Despite this tremendous progress in connecting schools in South Africa, still there are many challenges that are experienced when connecting rural communities. Even most developed countries experience similar problems to those that South Africa is experiencing. According to Bearden (2017:10), there are still schools with some districts in the rural areas of the United States of America (USA) that do not yet meet the government goals of universal access to broadband infrastructure services. According to the study, schools identify the price attached to connectivity bandwidth as the biggest barrier to sustainable connectivity, whereby a number of USA rural district schools highlighted that the terrain and geography of the area plays a major part in restricting sustainable broadband Wi-Fi internet connectivity (Bearden, 2017:13). Further to this, Bearden (2017:13) argues that most of these rural districts cited that, more often than not, there are one or two service providers available to offer these services.

2.4.3 e-Administration

The word e-Administration is abbreviated from electronic administration, and some simply refer to it as e-Admin. According to Pólkowski and Radu (2014:187), e-Admin are tools which transform conventional office tools, such as papers (where faxing and printing is required) and other mechanisms into an electronic process to enable a paperless office (or work environment) and remote working.

It is noticeable that the application of e-admin is also being used here in South Africa in recent years. It can be seen in private and public institutions, such as when one is needs to access information pertaining to local and national government services. In terms of the private sector, its application is noticeable wherein a remote located farmer sells or promotes his farm produce online.

e-Admin is used in business related purposes, and the users of this system can view and access information relating to government services and possible business opportunities (Pólkowski & Radu,2014:195-203). With the prevalence of the Cvid19 pandemic, e-Administration has seen a rise in the year 2020 which further illustrates the need and use for broadband services which could translate to its sustainability.

2.4.4 ICT Training

ICT, in its broadest sense, incorporates technologies that enable the transfer and exchange of information using computers, telephones, television, radio, etc. (Fengu & Krauss, 2013:1). Therefore, ICT is the enabler of e-Health, e-Education and e-Administration. It therefore requires that all those that will be using these platforms be adequately qualified and have the necessary skills to use them. According to Fengu and Krauss (2013:7), one of the deterrents to sustainable development, as regards the broadband internet services, is the issue of

empowerment and cohesion to enable transformation of the rural communities, which could be done through ICT education.

Fengu & Krauss (2013:8) further reason that, in most cases, ICT illiteracy is the major stumbling block that causes broadband internet services to fail. The reasoning further states that proper and efficient training leads to confident and all-encompassing effects of inspired motivated community members who continue to use these services to their fullest.

2.5 PROJECTS AND INTERVENTIONS IMPLEMENTED IN OTHER COUNTRIES

The research will consider literature as regards broadband implementation in other countries both in Africa and abroad. Universal coverage of broadband internet services and sustainability thereof is a common goal that almost any country aims to achieve. However, the ways to reach this goal vary among regions and among countries both with respect to policies applied and technologies to be implemented (Falch & Iaskio, 2018:2).

According to Falch and Iaskio (2018:2), broadband for all is a widely accepted policy objective in both developed and developing countries. However, the policy strategies for achieving this goal are quite different and sometimes similar in each country. These differences are originated in different levels of economic and technological development, as well as showing differences in institutional factors.

2.5.1 Sustaining broadband – A look in Africa

2.5.1.1 Kenya
In order to realize its National Economic Blueprint, Vision 2030, the government of Kenya established its National Broadband Strategy through the Ministry of Information, Communication and Technology (MoICT) in collaboration with its national regulator Communications Commission of Kenya (CCK) as the main commanders of the development of the strategy in terms of the Kenyan Government Strategy 2018 (Kenya, 2018:4-10-11).

According to Government Strategy 2013 (Kenya, 2018:6), the often un-coordinated and disparate infrastructure initiatives are key weaknesses that result in unwarranted duplication of resources that ultimately lead to higher cost of services and inhibits further roll-out of networks. To this end, the government has developed a policy to set clear guidelines for operators to share operator-specific infrastructure to avoid duplicating infrastructure in the same areas.

Further, Kenya (2018:11) states that harmonising related infrastructure development by relevant ministries such as roads and energy to ensure provision of cable ducts in the design of roads, pipelines, railways and power lines will go a long way in alleviating the cost burden

of deploying fibre networks. Considerations to provide incentives and rebates to operators extending roads and power may be necessary, argues Government Strategy 2018 (Kenya, 2018:21).

For continued support and full usage of deployed infrastructure project by the local community, Kenya Strategy 2018 (Kenya 2018: 22) argues that there are challenges related to accessibility and affordability of broadband services especially with respect to access devices such as computers, smart phones, amongst others. In mitigating this, the strategy proposed that government subsidises and/or zero-rates the services. Kenya Strategy suggested that strategies to promote online local content will spur demand and eventually reduce the cost of access as a critical mass of users is realised (Kenya, 2018:23).

It is quite interesting to also note that the Kenyan government realises that in order to be an industrialised economy, a global player and to achieve improved lifestyle for its citizens; the driving force will be to rely on the advancements of the broadband project initiatives (Kenya, 2018:23).

In order to achieve the above, the Kenyan Government has actually recognized five main issues:

a) Infrastructure and Connectivity

b) Content, Applications and Innovation

c) Policy, Legal and Regulatory Environment

For the purpose of this research, focus will only be made on part (a) Infrastructure, Connectivity and the devices aspect, as well as (c) Financing and Investment.

a) Infrastructure, Connectivity and Devices

Malungu (2015: 10) discusses the fact that there are serious obstacles that comes with ICT infrastructure deployment, and such difficulties include high operational and investment costs as well as the dynamic change in ICT services' infrastructure needs. Coupled with this, is the fast-moving pace in the regulatory front because of rapid change in technology advancements (Malungu, 2015:10).

According to Kenyan Government Strategy 2013 (Kenya, 2018:16), in order to achieve the goals of universal access to ICT broadband service for all, it embarked on a project journey of deploying fibre backbone network, which by the time of implementation, was intended to connect 80% of urban and rural towns of the country.

In its national strategy the Government of Kenya (Kenya, 2018:17), argues that the rural areas are not identical, have a sparse population, lack capacity to pay for services, and

have poor ICT literacy. These, among other factors, make it difficult to sustain broadband and ICT services infrastructure. Other issues the Strategy mentions include poorly maintained roads or an outright lack of access roads, commercial power availability, and security for the installations. These eventually pose a threat of making it difficult to sustain broadband connectivity for all and, in order to solve some of these issues, the Kenyan government entered into partnership with private sector in what is called Public-Private Partnership.

According to the Government Strategy 2013 (Kenya, 2018:19), subsequently, the telecommunications sector has had little choice but to fund non-telecommunications infrastructures – roads, diesel power generation, or pay to expand the electrical grid across long distances, and wayleaves for public access, among others. But still, these factors did not have a significant positive impact on the costs of broadband access in rural areas.

Further impacting on the cost of services, as mentioned above, are the issues associated with network duplications as well as underutilization of ICT resources which prevent access to broadband internet services (Malungu, 2015:11). In his argument, Malungu (2015:11) alludes to the issue that most ICT Operators prefer to rollout and own their infrastructure instead of sharing available resources from other operators.

Key to solving the issues of sustainability is infrastructure sharing, whereby two or more service providers share certain parts of the broadband network for a common goal of rendering services to the communities (Malungu, 2015: 12). But the main challenge in this suggested solution is that, in most rural communities of South Africa, there is limited availability of ICT or Broadband infrastructure (ICASA, 2018:38).

The lack adequate broadband infrastructure in rural areas of South Africa is usually identified as one of the country's biggest barriers to sustainable ICT services, such that most operators focused their investments in urban areas (Malungu, 2015: 13). Alluding to this, Malungu (2015:13) further mentions that the reason for the lack of deployment of infrastructure services in rural areas is because of lack of other services such as reliable electricity, better road infrastructure.

2.5.2 Sustaining Broadband – A look outside the African continent

2.5.2.1 The United States of America

According to Meyn (2020:99), rural communities find it difficult to continually provide social related services, easy access to education, as well as finding job opportunities. This at times are the factors of dynamic demographic changes such as aging as well as movement of young professionals to cities. Consequently, it is of utmost importance to further scrutinise

the possible resolutions, wherein digitalization can be deployed as a tool to empower people in rural areas (Meyn, 2020:99). Meyn (2020:99) describes digitalization as "more than technology—it also includes the skillset and the mind-set involved in using digital technologies". Therefore, according to this explanation, digitalization requires the key objective pillar to enable it to be effective, and this is referred to as a strategy – which when applied in a rounded fashion, could enable digitalization to create change and be employed as a promoter for community empowerment (Meyn, 2020:99).

In trying to unpack the digital landscape of the USA, Meyn (2020:103) mentions that the "digital divide" which are the variations between those who have access versus those who do have no access to information and communication technologies (ICTs), plus the disparities in terms of knowledge and skills needed to access ICTs, is prevalent in the USA.

Alluding to some programs which promote rural broadband deployment and the usage thereof in USA, Meyn (2020:104) highlighted that the National Telecommunications Cooperative Association (NTCA) has established a driver, named "smart rural community program". Another driving platform mentioned by Meyn (2020:104) is the "Tech Hire 2015" ingenuity which was started by the White House, with the purpose of connecting unemployed U.S. citizens focused on rural tech services. The funding core strategy was the public and the private partnerships used to aid coach citizens in digital skills for tomorrow's job market.

In developed states, like the United States of America (USA), efforts for continuous improvement of the broadband infrastructure were made possible by the government subsidy in order to ensure that inequalities in the broadband internet access between the urban and the rural communities are reduced (LaRose, DeMaagd, Chew, Tsai & Steinfield, 2012:2). In order to ensure sustainability of broadband internet services for rural communities, LaRose et al., (2012:3) suggest that a new paradigm is needed to be developed. This new paradigm, according to their argument, is that of a socio-cognitive model of broadband adoption.

According to LaRose, et al. (2012:3), in order to close the digital divide or the digital gap, the USA government guided its legislation, directed its national telecommunications regulator, the Federal Communications Commission (FCC) in 2010 to enable a national broadband plan in order to reinforce its intention of universal access to broadband services for rural communities. In this plan, four out of many desired outcomes stand out as the most significant ones and, in fact, they are also the main concerns for the South African rural arrears. These include healthcare delivery, education, community development and economic growth which is linked with job creation (LaRose, et al., 2012:4).

Based on the published USA National Broadband Plan, there were public-private partnerships which were realised, and one of the national ICT services providers agreed to subsidise less privilege household to pay an insignificant amount of money to access

broadband services for a three-year term (LaRose, et al. (2012:4). According to their arguments, there is no concrete evidence to the notion that lower income earners, non-educated people, as well as senior citizens are unable to utilise or adopt free broadband internet services (LaRose et al. (2012:4).

The study uses different types of theoretical models of technology adoption and utilization methods in trying to get to the issues affecting non-sustainability of broadband internet services in rural communities (LaRose et al., 2012:5). According to the study by LaRose et al. (2012:6), the most significant theoretical models include: -

b) *The unified theory of the adoption and utilization of technology* – This is an adaptation of theory of reasoned action which deals with performance expectancy, social influence and facilitating conditions which determines peoples' behavioural intentions to use technology, and

c) *Diffusion of Innovations (DoI) – is a widely used approach to understanding technology adoption and it has some characteristics that are viewed to affect innovation of technology rate of adoption*, and these include (1) Relative advantage — the degree at which a technology innovation is perceived as better than the existing alternatives. (2) Compatibility — the degree to which an innovation is consistent with one's values, beliefs, and needs, and with previously adopted innovations.

The results emanating from this research paints a very bleak picture as concerns continued sustainability of broadband services. For example, LaRose, et al (2012:9) state that technology adoption models have largely ignored the issue of cost of service as a factor in technology adoption, thus cost of broadband internet is one component of relative advantage.

LaRose, et al (2012:9) maintains that a consumer survey was conducted to explore current and prospective broadband users' willingness to pay for an increase in the speed of a broadband service and found that consumers without access to broadband valued an increase in bandwidth at less than one third the amount consumers with broadband access were willing to pay. This suggests that the expected outcomes of broadband technology gained through prior experience, alongside with the ability to observe the experiences of others as market penetration increases, attenuates the impact of cost (LaRose et al., 2012:9). Therefore, the price sensitivity may not be a significant factor in broadband adoption once observational and end-user active learning are considered (LaRose et al., 2012:9). Furthermore, these results suggest that demographic variables such as age, income, and race play a relatively smaller role in sustaining broadband, whereas self-efficacy and habit

strength play a relatively larger role. The sustainability of broadband can be enhanced by increasing the self-efficacy through ICT skills learning and habit strength of Internet users. (LaRose, at al. 2012:10-14).

2.5.2.2 Brazil

Brazil has chosen their own strategy for broadband development. This strategy is defined within a specific national context taking international experiences into account. The Brazilian government sees Broadband as a crucial instrument for the country's economic and social advance (Falch & Iaskio, 2018:8). There has been a debate as to what strategy should be implemented to ensure properly entrenched broadband sustainability policy directives, and they included two options, that of using government subsidy as the vehicle or that of enabling private competitive market through regulation as a solution, and the latter being the more preferred solution (Falch & Iaskio, 2018:3). As agreed in the Geneva Declaration of Principles, signed in 2003, Falch and Iaskio (2018:9) agree that digital inclusion (deploying ICT services in rural areas) is seen as a facilitator to guarantee other fundamental rights (i.e., rights to information and communication technology) that can be distributed over the internet. Thus, the need to ensure that deployed broadband internet is sustained beyond the provided subsidy for many years.

Since the adoption of its National Broadband Plan (NPBL – abbreviated in Portuguese), Brazil started to implement the roll-out of broadband in 2010, and it had three main pillars. They are reduction of connectivity price (price of data), network coverage in underserviced areas as well improved broadband speeds (Falch & Iaskio, 2018:9). According to their study, there are four sets of attention which include regulation, financial and tax relief, technological and productive policy as well as the building of national network.

For a sustained broadband future, Falch & Iaskio (2018:9-10) argue that the Brazilian government provided guidelines on how to achieve each of the four sets of action. According to Falch & Iaskio (2018:10-11), the following are the main guidelines for each set of action:

> *a)   Regulation –*
> To establish mandatory sharing of infrastructure and to manage public infrastructure and public assets, including radiofrequency, to reduce the costs of broadband internet connection service

> *b)   Financial & Tax Incentives -*
> To increase the access to credit by small and micro-providers as well as reduction of the taxes for broadband services to end users and equipment of the end of the value chain.

c)   *Technological and productive policy*

To increase tax incentives for equipment produced in Brazil and special conditions loans, through the National Development Bank (BNDES), for the national telecommunications equipment producers.

d)   *Building National Broadband Network*

To broaden access to broadband Internet connection services; to promote digital inclusion; to expand e-Government services and to facilitate citizens' use of state services as well as to promote the training of the population for the use of information technologies.

Based on all the above initiatives, the Brazilian government did not see the overall fulfilment of its plans and strategies as regards sustainable broadband, but it did experience some improvements in different areas of focus based on its National Plan (Falch & Iaskio, 2018:11-12)

2.5.3 Broadband sustainability - the South African approach

According to the Department of Telecommunications and Postal Services (DTPS) ICT White Paper Policy, South Africa is still a highly unequal society when it comes to ICT access, and that broadband sustainability is of utmost importance if ICTs are to play a part to the objectives of the NDP of eradicating poverty and abating inequality (DTPS, 2014:19). The policy framework for the ICT segment authoritatively addresses universal access as well as service issues to ICT platforms, services, applications, and content. For society to advance to latest technological growth, universal access to telecommunications services is essential (DTPS, 2014:19).

2.5.3.1 Policy and Regulation

South Africa has established ICT policies to assist the government to implement its programs to bridge the digital divide and realise the achievement of Vision 2030 targets as per United Nations target. Some of latest policies are the Nation Broadband Policy (NBP), which is South Africa Connect (SA Connect) and the National Integrated ICT White Paper. These policies integrate in them National Development Policy (NDP) goals which seeks to ensure a lively and associated information community as well as a vivacious knowledge of economic world using seamless information communication technology (ICT) infrastructure.

To ensure that it achieves the objectives of universal service and access, the DTPS established the policy on Universal Service and Access (DTPS, 2016:28). It is thus imperative to first explain the variations between two phrases, "universal service and universal access".

"Universal Service is purposed for delivery of ICT services to persons or houses or establishments, whereas Universal Access, on the other side, is meant for increasing access to communication services on a shared basis, such as on a community or village-wide level" (DTPS, 2016:28). Although these models sound similar, different policy and strategy interventions might be required to achieve each.

In order to put some of the aspects of the National Development Plan in practice, supported by the SA Connect policy of the DoC (2013:18), the DTPS through its state-owned entities USAASA, SITA and BBI, embarked on projects for deploying broadband infrastructure in rural municipalities which are decentralised from their main District Municipal offices. Under USAASA, the Act (ECA Act No. 36 of 2005 as amended) established an entity to manage ICT development fund called the Universal Service and Access Fund (USAF) which has been founded to offer sustenance to universal service and access to ICTs (DTPS, 2016:29). The definitive intention of this is to ensure that the residents within the rural local municipalities gain access to telecommunication services. The question to ask therefore is, upon delivering these services, will they /have they remained or in place beyond the government subsidy period?

i)   Objectives

According to the DTPS (2016:19), the objective of the policy is to enable the following key pillars of the Republic: -

Equality: All citizens should have reasonably priced access to ICT infrastructure and its services.

Accessibility: ICT based equipment such as devices that enable content-based services should be made available to all parts of the population.

Social Development*:* All citizens of the Republic should be able to obtain positive advantages from provisions made possible by the ICT infrastructure and services.

Economic Growth*:* Policy should permit access by all citizens to better value of ICT infrastructure and services to allow economic development, labour and prosperity formation.

ii)   Current status

According to Statistics South Africa (2016:45), only 4% of households in South Africa did not have means to use either a landline phone or a cell phone by 2014. In 2018, this number increased to only 10% of households in South Africa and were reported to having access to the internet at home, University of Cape Town – UCT (UCT, 2019:1). According to the UCT (2019:1), by comparison, this is almost fifty percent transversely

to developing countries. Still, the minimum average of broadband internet access in South Africa disguises the significant regional disparities in the country. Further information reveals that the Western Cape, for example, has about 26% of homes that have access to internet at their residences whereas Limpopo has only 2%, such that this implies that access to the internet in South Africa is incredibly low overall, and is considerable unbalanced when looking at level of access to internet, thus showing very high amount of inequality (UCT, 2019:1).

As can be seen from figure 8 below, there is high access to internet connecting devices such as mobile phones and tablets, but this high access to internet connecting devices does meant there is almost same level of internet access to these devices (Stats SA, 2016:45; UCT, 2019:1). The distinctions between provinces are minimal as regards access to mobile phones – with more significant differences seen in relation to access to a landline.
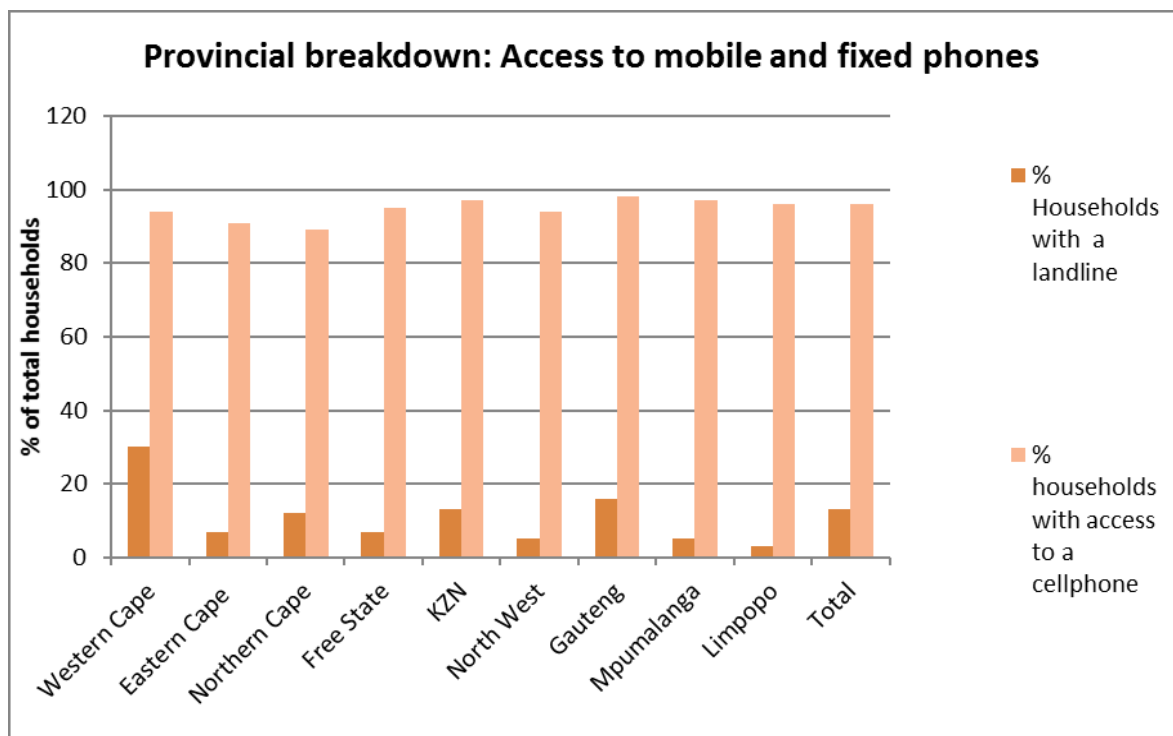
Figure 8 – Access to Mobile and Fixed Phone
Source, STATS SA 2016

Geerdts, Gillwald, Calandro, Chair, Moyo and Rademan (2016:2) argue that as much as there has been an upturn of internet network coverage together with the increased availability of smart communication gadgets (e.g., tablets, smartphones, etc.) Stats (2016:45), sufficient consumption of broadband internet services brought in by the internet

network is limited. For rural communities especially, the cause for the aforementioned finding could be attributed to inadequate network infrastructure coverage, slow network internet speeds in remote areas combined with the comparatively high cost of services with high cost of data packages (Geerdts et al., 2016:2). This further excludes the poor from the benefits of broadband internet connectivity and thus impedes optimum use by most possible subscribers.

In order to respond to the needs of its community based on the published National Broadband Policy (SA Connect), in 2013, the City of Tshwane Municipality embarked on rolling out free public Wi-Fi hotspots for its inhabitants. According to the research, Tshwane Free Wi-Fi is by far exceptional in terms of scale and impact (Geerdts et al, 2016:4). The strategy of deploying and subsequently providing services, is based on two main fundamental and important aspects. The primary aspect being that broadband as a basic necessity of each and every citizen, and it should be treated as such across the country entirely funded by national government. The subsequent reasoning then became the economic justification that enhanced broadband penetration that drives economic growth, increases commercial and financial activity that will expand the tax base and, which combined, will exceed the city's investment (Geerdts et al., 2016:5).

As predicted, the results, in terms of network deployment, have been impressive, and the content portal and programme to generate local video content has illustrated the potential for Wi-Fi and broadband to enhance employment opportunities, health and education and connect government to citizens (Geerdts et al., 2016:35). With these benefits included, it then means that most investments should therefore be carried by the government. This poses a serious threat in terms of sustainability, since the national government, governed by its national policies and national regulations cannot provide such services through contracts for an infinite period of time.

This dependency to government, according to Geerdts et al., (2016:37) poses a serious problem, wherein a similar project of public Wi-Fi deployed by a private entity in one of the Western Cape Town's left the project in the hands of the municipality to carry the costs and with no capacity in all aspects to do so.

a) City of Johannesburg

The City of Johannesburg has a long-standing broadband and smart city initiative wherein its major deliverable is fibre deployment in which there is free public Wi-Fi access to be deployed using the Smart Wi-Fi Project (Geerdts et al., 2016:40). This deployment of the Wi-Fi internet services would benefit cities unemployed youth. According to Geerdts et al.,

(2016:41), training skills for 1 000 students per year in ICT is one of the important aspects of the project. By providing such a training, these youths will gain experience to enable them to support the overall broadband project during deployment and post deployment phases. The programme included a number of ICT-promoting elements, including SMME incubation (in partnership with the University of Witwatersrand) and a "Joburg Hackathon", and by the year 2016, there were over 400 free Wi-Fi hotspots available in Johannesburg (Geerdts et al., 2016:41).
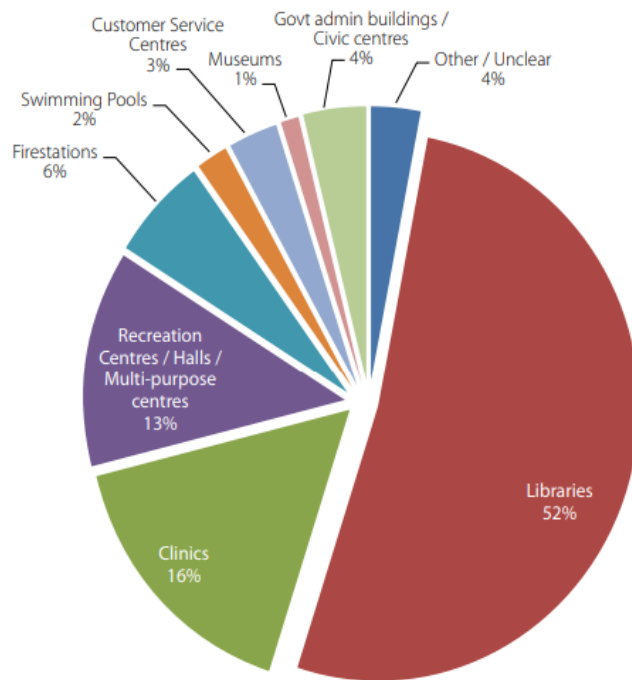
Figure 9 - Breakdown of venue types for JHB Wi-Fi

Source - Geerdts et al., 2016:41

b) Knysna local municipality

One of the earliest free public Wi-Fi broadband internet to be publicised was deployed by the Knysna local municipality in the year 2006 as Project "UniFi Knysna" (Geerdts et al, 2016:22). The success factors given by the deploying service provider for the project are plentiful, hence the service provider specifies that the essential driver of sustainability of free Wi-Fi Broadband internet is ongoing funding through the municipality's increased business activities by means of local rates and taxes (Geerdts et al., 2016:22).

Notwithstanding the planned activity of increasing the municipality business activities, Geerdts (2016:23) argues that the project could not progress to expected heights because, at the time of embarking on rolling out free public Wi-F hotspots, most gadgets were not enabled to access Wi-Fi technology, and as such, very few people could access internet

via their personal communication devices. Although the project did not produce the desired fruits, it did raise awareness to some extent amongst public officials, the media and the general public of South Africa as regards broadband Wi-Fi internet (Geerdts et al., 2016:24)

To sustain deployed broadband projects in rural areas is mostly affected by the behaviour of the network users. The survey conducted by Statistics South Africa (2014:46) reports that less than half of households (48,7 per cent) had access to the Internet in the period measured (DTPS, 2016:20). Access was highest in the Western Cape (62, 1 per cent), Gauteng (59, 9 per cent) and the Free State (48, 7 per cent). The general household survey reports that the primary reasons people given for not accessing the internet at home are a lack of knowledge/skills/confidence and expensive data prices (DTPS, 2016:20).

Another factor that is affecting the sustainability of broadband internet services is the cost of access to internet services, and DTPS (2016:18) further argues that, connecting over DSL, that is connection over a telephone line, costs around R12 per Giga byte (R12/Gb) and the "prevailing rate for mobile broadband services was R50/GB".

It doesn't matter whether the government or regulatory interventions have reduced the cost of mobile voice services in South Africa, what seems to be of concern is that data costs have largely persisted at high costs (DTPS, 2016:19). Could then the costs of internet broadband Wi-Fi connectivity be one of the reasons why the broadband Wi-Fi Internet is not sustainable beyond the Government subsidy? It appears as if policy initiatives did not holistically address the issue of continued sustainability of broadband Wi-Fi internet project initiatives, especially for the rural communities of South Africa.

i)   *Fibre optic cable broadband*

There has been a massive drive by the government to enable roll-out of fibre optic cables in the major cities and towns of South Africa in order to enable internet broadband connectivity (BusinessTech, 2016:1). According to BusinessTech (2016:1), the government is embarking on this journey to facilitate a faster Internet network, but the challenge is the manner in which the government has planned this, and the costs to the end-user (consumer) cannot be ignored, as this will affect their purse (BusinessTech, 2016). How will this be rolled-out, and how will it affect how much you pay for your Internet connection and your broadband speed?

Fibre optic cables are remarkably reliable; they are not affected by weather conditions such as rain or extremely high temperatures, and they can handle 1,000 times more information than other platforms of communication medium (BusinessTech, 2016:1). As these cables are not worth anything in illegal sales, the threat of theft and financial damage is also massively reduced.

The government's plans of rolling out fibre cables throughout South Africa by 2020 have been met with some challenges since the current state of internet accessibility is a concern for these future plans (BusinessTech, 2016:2). According to the report by BusinessTech (2016:3), only 10% of households have internet access at home, as based to the latest General Household Survey by Statistics South Africa in 2014, and this can largely be attributed to the costs involved.

For example, BusinessTech (2016:2) argues that a simple line with one of the major Telco's could amounts to R157 per month, without including once off charges for installation of the router and ADSL line which could cost around R600. Also, a once off charge of R1 200 – R1 500 is required to install a wireless access point so that all household members can use the connection on different devices. After installing crucial connections, a final cost of internet packages can range from between R340 and R3 000 per month, depending on what option one decides to take (BusinessTech, 2016:4). The above further impresses or underscores the fact that broadband internet services rendered through fibre optic cable are quite expensive. This estimate by BusinessTech does not include the costs of deploying fibre cables to distant rural communities, which is more expensive for the network service provider and this cost can such be transferred to the end-user (ITU, 2015:33).

ii)   Wireless Broadband (Wi-Fi and Mobile services)

Government has noticed that the task of rolling out fibre is an incredibly complex one, as it involves relaying all existing copper cables with the fibre alternatives, and that the delivery of broadband via the fibre cable connection has been slow and its costs are still quite high (ITWeb, 2020:3). This, according to ITWeb (2020:3), has made mobile broadband far more attractive to consumers than having a fixed line.

While government has good intentions, the roll-out of fibre will be an incredibly slow and expensive process, and according to BusinessTech (2016:4), if the country were to replace all of its 5 million copper cables with fibre optics, the cost is expected to come to roughly R60 billion. This cost will be passed on to consumers by broadband mobile operators. According to ITWeb (2020:3), for now, it appears to be that an insignificant section of South African population will have access to fibre as about 7% of regions will have enough money for good service delivery, while the 93% who are poorly served and do not have the correct infrastructure will be the last to receive a decent internet connection.

2.5.3.2 ICT literacy

Anyim (2018:9-10) states that another avenue to sustain deployed broadband services acquisition of ICT literacy skill is indisputably a step in the right direction towards an effective utilization of digital library resources and services. To thrive in an ICT library environment

without requisite skills on navigation of digital information platforms to access, evaluate and retrieve pertinent information is like driving a car without an engine. ICT literacy skill acquisition has been fraught with many challenges which hinder the patronage of digital libraries. Among the problems associated to acquisition of ICT literacy skill, according to Anyim (2018:10), is lack of integration of ICT in academic curriculum. It was believed that proper integration of ICT related courses in the academic curriculum would equip students beforehand with relevant ICT skill. Lwoga, Sife, Busagala, and Chilimo (2005:16) attribute challenges to the acquisition of ICT literacy skill to material and human factors. They assert that over-dependency on donor support, low bandwidth, inadequate ICT facilities, underutilization of the few available ICT facilities, inadequate ICT training and failure to retain ICT manpower proved to be a threat to acquisition of ICT literacy skill.

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The barriers mentioned above are little or no different from those identified by Chiware (2008:3) which include funding, human resources, training and retention of skills, internet connectivity, telecommunication infrastructure, and copyright issues. Chiware (2008:3) equally stated that the successful acquisition of ICT literacy skills depends on the commitment of management and availability of funds, trainers and the time needed for participants to leave their jobs and go for short courses at given intervals over a long period of time. Lack of fund has always been a problem whenever the issue of skill acquisition raises head.

The above could be caused by understanding that skill is an asset, and to acquire an asset, trained personnel and funds are required. Thus, Haneefa and Shukkoor (2010:5), in the same vein, states that lack of funds, infrastructure and skilled professionals to embark on automation of all library management activities and application of ICT is an issue of ICT literacy acquisition. Wallis and Adeyoyin (2005:10) pointed out poor infrastructural development, funding, ICT skills among staff are problems facing Nigerian university libraries along the road in the 21st century. Lack of enthusiasm to training in ICT has been discovered to be one of the causes of inadequate ICT literacy skill.

2.6 Conclusions

In this chapter, we have considered the free Wi-Fi Broadband Internet connectivity in its entirety. First, this chapter explained what is involved in the free Wi-Fi broadband and the explanation of what broadband internet is, using available published literature. The chapter then delved into different forms of interventions that have been embarked on by the South African Government and also other countries outside South Africa. It was realised, through available literature that the governments do try to close the broadband internet access gap in underserviced areas or rural areas. Through literature review, we discovered that South Africa, USA, Brazil and Kenya had developed programmes that would assist needy rural communities to be connected to the internet using different options and policies. Through the literature review, it was discovered that although the initiatives by these countries emanate from a noble idea, they lacked the ability to remain sustainable beyond the government subsidy or grant. The policies that these countries developed did not address matters relating to end-user equipment, internet pricing, robust infrastructure such as the roads, electricity and the ICT infrastructure itself. It was also discovered that the reasons for lack of free Wi-Fi Broadband Internet sustainability could also be due to lack of economic activities in the areas. This means that the service providers in these areas are unable to sell their services to these indigent communities because there is not enough employment. Therefore, there is a need for data collection to confirm these assertions as perceived from the literature used. Before the literature could be tested in the field, it is of great importance that the researcher outlines the research methodology to be used. By so doing, the researcher will be able to follow a structured systematic approach and will be able to gather required information for the type of research being adopted.

CHAPTER THREE: LITERATURE FINDINGS

3.1 Introduction

According to Mooketsi (2016:28), literature review forms a significant role in examining available literature on the topic or matter being researched. By so doing, one can understand important perceptions and ideologies on the subject matter being researched to develop a grounded framework for the research which will enable better field data gathering (Mooketsi, 2016:28). Thus, the discoveries that have been noted from the literature review will form the basis for field work. The literature can either confirm or not confirm the hypothesis of the research. For the researcher to be able to confirm what has been discovered from literature, it thus necessitates that the researcher goes to the field and test the theory. It is on this premise that this chapter will highlight briefly what has been discovered in the literature that was considered during the literature review process. In the following sub-sections, it will be shown that literature was gathered or evaluated from three main streams for sustainability of broadband Wi-Fi internet services for underserviced or rural areas. As such, literature findings are presented as follows:

3.2 Enablers of deployed Sustainability of Broadband Connectivity

In this section, a discussion pertaining to the policies that the government has established to enable sustainability of the economy and by extension, the sustainability of the deployed ICT infrastructure and services will be discussed. Literature reviewed showed that one of the major enablers was the establishment of the NDP which saw the development of the SIP policy under the National Infrastructure Plan as part of the government strategies and policies (Manda & Backhouse, 2017:7).

Further, the literature gathered on this matter enlightened the notion that the implementation of the SIP 15 made it possible for to establish the SA Connect Policy whereby targets were set as the drivers of the 2030 sustainable development goals as established by United Nations (UN) Member States (DoC, 2013:3). According to the SA Connect Policy, it is expected that by deploying broadband, there will also be sustainability of the economy (DoC, 2013:4).

Literature thus showed that more than ever before, the SA Connect policy establishes a relationship between media, government services, online business trade, information

technology services, telecommunication services, broadcast services and other technology services (DTPS, 2016:5). This convergence means that these technologies do not operate in isolation and from each other. Rather they act as a collective platform of services to enable access to application and services, such as the online government services, online internet business platforms, reading emails, making calls, listening to music and radio using devices such a mobile phone, tablets, laptops and desktops.

3.3 Government Based Services as Enablers of Broadband Sustainability

In this section, the approach was to gather data concerning government-based services which are envisaged to be better enablers of broadband Wi-Fi internet services. Literature thus presented that sustainability of services is mostly made possible by social, health, education, and economic networks (Proenza, 2007:26). According to literature gathered from the ITU (2016:13), it was argued that for the deployed services to be sustainable and to assist the communities as mentioned, there should be initiatives from the government that seek to assist with useful longevity of the deployed infrastructure. The following main application were identified: -

3.3.1 e-Education
When we considered literature that is based on e-Education as a catalyst to sustainable broadband services, it was discovered that the advantages of e-education are further reaching than just merely connecting educators and learners since accessing learning information is made much faster than it would have been without such technology (Laschewski (2011:6). It was also realised that, in line with the argument put forth by Laschewski (2011:6), that e-Education connects learning hubs with learning facilities at remote areas and this makes it easier for schools remotely connected by the internet to gather information. Hence, by establishing e-Education remote sites it could enable sustainability of infrastructure and services for continuous delivery of broadband internet services to these underserviced communities of South Africa, especially by the Department of Basic Education (DBE).

3.3.2 e-Health
Health is one of the basic human rights and thus, this basic human right been enshrined in the South African Constitution. Accordingly, literature was also reviewed to highlight e-Health as a pillar to sustainable deployment of broadband infrastructure. The literature reviewed proved that by deploying the broadband services in rural municipalities, one could achieve a lot as regards diagnosis of some ailments that affect the people living in these remote areas. In the South African situation, e-Health is primarily used in rural areas through the piloted

National Health Insurance (NHI) initiative established by the national government through Department of Health (DoH). It happens that decentralised health facilities are connected/linked under one sub-district and the sub-districts are connected within one district and eventually are linked into the national health network (Department of Health, 2019:20). So, NHI pilot stages initiative proves that e-Health plays a pivotal role in ascertaining that broadband connectivity in rural areas is sustainable.

3.3.3 e-Administration (e-Admin)

Remote access of vital information and services such as municipal accounts, SARS e-filling, job application, etc. and applying for such services has proven to be of essence in this new millennium. It also decided that literature reviews on this aspect, as the enabler of broadband sustainability, could be of vital importance.

The literature studied under this subsection further emphasised that on business related purposes, the user of the e-Admin system can view and access information regarding matters of interest in any remote location (Polkowski, 2014:195-203). With the prevalence of the Covid19 pandemic, e-Administration has seen a rise in the year 2020 which further illustrates the need and use for broadband services which could later enable sustainability of deployed broadband Wi-Fi internet services.

3.3.4 ICT Training

Lastly, training on the use of the ICT platforms is also viewed as being one of the cornerstones that can enable sustainability of deployed broadband services, especially in rural areas of South Africa. The literature revealed that ICT is the enabler of e-Health, e-Education, and e-Administration. It therefore requires that all those that will be using these platforms be adequately qualified and have the necessary skills to use them. Literature information derived from Fengu and Krauss (2013:7) highlighted that one of the deterrents to sustainable development, as regards the broadband internet services, is the issue of empowerment and cohesion to enable transformation of the rural communities, and this could be done through ICT education.

Further reasoning on this matter is that, in most cases, ICT illiteracy is the major stumbling block that causes broadband internet services to fail. Proper and efficient training leads to confident and all-encompassing effects of inspired motivated community members who continue to use these services to their fullest (Fengu & Krauss (2013:8). This further puts emphasis on the point that the deployed broadband infrastructure and services it carries can be sustainable trough ICT skills training.

3.4 Projects and Interventions undertaken in other Countries.

3.4.1 Kenya

It was decided that for the research to have a closer and a related view about broadband deployment, literature about one of the African countries needed to be visited. When literature about Kenya was considered, it was discovered that the country realised that un-coordinated and disparate infrastructure initiatives are key weaknesses that result in unwarranted duplication of resources that ultimately leads to higher cost of services and inhibits further roll-out of networks and sustainability thereof (Republic of Kenya, 2013:21).

It was also discovered by reviewing further relevant literature that harmonising related infrastructure deployed by relevant ministries such as roads and energy to ensure provision of cable ducts in the design of roads, pipelines, railways and power lines will go a long way in alleviating the cost burden of deploying fibre networks (Kenya, 2013:22). Thus, the government of Kenya has developed a policy to set clear guidelines for operators to share operator-specific infrastructure to avoid duplicating infrastructure in the same areas and considerations to provide incentives and rebates to operators extending roads and power may be necessary (Kenya, 2013:22).

Literature reviewed discussed a number of issues, such as the serious obstacle that comes with ICT infrastructure deployment, and such difficulties include high operational and investment costs as well as the need for dynamic change in ICT services infrastructure (Malungu, 2015:10).

The Kenyan government concedes that the rural areas are not identical, and has a sparse population, a lack capacity to pay for services, and has poor ICT literacy. These are among other factors that make it difficult to sustain broadband and ICT services infrastructure. Other aspects highlighted in the literature are that poorly maintained or outright lack of access roads, reliable power supply and availability, as well as the security for the installed infrastructure make it difficult to sustain the deployed services in the rural, communities of Kenya. These eventually pose a threat of making it difficult to sustain broadband connectivity for all, and to solve some of these issues, the Kenyan government entered partnership with private sector in what is called Public-Private Partnership (Kenya, 2013:22).

3.4.2 United States of America (USA)

For this research to have a broad scope and a view of matters pertaining to the broadband deployment and sustainability thereof, the literature review pertaining to sustainability of broadband services in rural areas for the developed countries was considered. Literature reviewed revealed that in developed countries, such as the United States of America (USA), similar efforts as those implemented in South Africa for continuous improvement of the

broadband infrastructure are made possible by the government subsidy to ensure that inequalities in broadband internet access between the urban and the rural communities are reduced (LaRose et al., 2012:2).

The study conducted in the USA pertaining to the costs, usability, and adaptation of broadband internet in the underserviced or rural poor areas revealed that current and prospective broadband consumers without access to broadband valued an increase in bandwidth less than one third the amount consumers with broadband access were willing to pay (LaRose et al (2012:9). This suggests that the expected outcomes of broadband technology gained through prior experience, alongside the ability to observe the experiences of others as market penetration increases, attenuates the impact of cost (LaRose et al., 2012:10).

Further, the data gathered through reviewed literature advocated the notion that there have been some funded programs established in the USA which were meant to promote rural broadband deployment and the usage thereof (Meyn, 2020:104.). The funding core strategy was the public-private partnerships used to help train citizens in valuable skills (digital skills) for tomorrow's job market.

Thus, the reviewed literature suggested that sustainability of broadband can be enhanced by increasing the broadband internet efficacy through ICT skills learning and consistent use of services by the Internet users.

3.4.3 Brazil

The final country that has been considered is Brazil. Brazil, being one of the developing countries, became the area of interest as regards the broadband deployment. The literature collected identified some few initiatives that have been considered by the Brazilian government to enable Wi-Fi Broadband internet connectivity. For example, data revealed that broadband strategies are based on two options; the first one being that of using government subsidy as the vehicle and the second one is that of enabling private competitive market through regulation as a solution, and the latter is the preferred solution (Falch & Iaskio, 2018:3).

According to this literature, Brazil decided to implement its strategy based on four sets of attention which include regulation, financial and tax relief, technological and productive policy as well as the building of a national network. Literature revealed that the Brazilian government did not realise the all-encompassing achievement of its strategies pertaining to sustainability of broadband, but there were some improvements in different areas of focus based on its National Plan (Falch & Iaskio, 2018:11-12).

3.4.4 South Africa

The literature also looked at the initiatives undertaken by the South African government. According to the gathered data pertaining to South Africa Broadband strategies, the Department of Telecommunications and Postal Services - DTPS (DTPS) ICT White Paper Policy mentioned that South Africa remains a deeply unequal society and it is crucial for ICT services to be deployed in order to respond and contribute to the goals of the NDP of eliminating poverty and reducing inequality (DTPS, 2016:19).

The literature further discovered that, Statistics South Africa (2016:45) stated that only 4% of households in South Africa did not have means to use either a landline phone or a cell phone by 2014. Also, in 2018, this number increased to only 10% of households in South Africa and were reported to having access to the internet at home, University of Cape Town – UCT (UCT, 2019:1). According to the UCT (2019:1), by comparison, this is almost fifty percent transversely to developing countries. Still, the minimum average of broadband internet access in South Africa disguises the significant regional disparities in the country. Further information revealed that the Western Cape, for example, has about 26% of homes that have access to internet at their residences whereas Limpopo has only 2%, such that this implies that access to the internet in South Africa is incredibly low overall, and is considerable unbalanced when looking at level of access to internet, thus showing very high amount of inequality (UCT, 2019:1).

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Throughout the years, the government has tried a number of initiatives partnering with the private sector and some NGOs, and the literature revealed that some of these initiatives improved to a certain degree of access to broadband services but lacked the capacity to sustained deployed broadband projects. The initiatives included the establishment of policies with the following main purposes:

> **Equality:** All citizens should have reasonably priced access to ICT infrastructure and its services.
> **Accessibility:** ICT based equipment such as devices that enable content-based services should be made available to all parts of the population.
> *Social Development*: All citizens of the Republic should be able to obtain positive advantages from provisions made possible by the ICT infrastructure and services.
> *Economic Growth*: Policy should permit access by all citizens to better value of ICT infrastructure and services to allow economic development, labour and prosperity formation.

3.5 Conclusions

This chapter has extensively tried to summarise finding from the literature that were reviewed in Chapter 2 of the research. This chapter compared the initiatives from different countries to discover how these have helped to sustain free broadband projects in rural communities or underserviced areas.

The literature discovered that, even though different countries deployed different strategies, in some instances, these countries deployed these services in similar ways. It was also discovered that there has not been an overall sustainability of broadband services even though there has been increase in excess of digital services by the citizens of these countries.

Therefore, these findings necessitate that the researcher goes into the field and tests the validity of gathered literature and the possibility of ensuring sustainability of free Wi-Fi Broadband Wi-Fi internet services.

CHAPTER FOUR: RESEARCH METHODOLOGY AND DESIGN

4.1 Introduction

The most important consideration of this research was to evaluate the factors affecting sustainability of the free broadband Wi-Fi internet access project as deployed in Ratlou local municipality in the North West Province. For this research to achieve this main objective, certain aspects need to be evaluated and they include, firstly, that the research be able to determine the practicality (usefulness) of the contract period for free broadband Wi-Fi internet access as provided for by the government. Secondly, the research should ascertain as to whether the appointed service provider was able to continue providing services beyond the government subsidy period. Also important was the ability of this dissertation to gauge the possibility of the end-user's ability to take up services for themselves upon expiry of the government subsidy. And lastly, the study will further try to establish or find other interventions that are possible to enable sustainable future for deployed free broadband internet services in rural areas.

Thus, for the study to be able to discover all the above aspects, a detailed research methodology including a research design needs to be outlined. As earlier mentioned in this document, the research used was a qualitative research methodology. According to Blumberg, Cooper and Schindler (2011:144), qualitative research refers to an analogy that characterises something. It deals with what causes a particular outcome. According to Blumberg et al. (2011:144), the aim of qualitative research is to understand and to explain 'what' makes this outcome or behaviour, and 'why' a particular phenomenon or behaviour, functions as it does in a particular setting. Qualitative research claims to describe the world as immediately or directly experienced in the more biased manner of everyday life, and, by so doing, qualitative research pursues the notion that contributes to a better understanding of social realities and to derive a consideration of processes, meaning patterns and structural features (Blumberg et al., 2011:145). Blumberg et al. (2011:145) mention that qualitative research makes use of the different and unpredicted as a source of awareness and is a mirror whose replication makes the unknown visible in the known, and the acknowledged noticeable in the unfamiliar, in such a way that it enables further prospects for self-acknowledgement.

According to Welfolo (2018:91), the Research Methodology and Research Design section should discuss the research methods implemented to get to the main objectives of the research. Accordingly, Welfolo (2018:91) argues that any good research undertaken was underpinned by its research design, data collection techniques as well as instruments used to interpret collected data from the field.

4.2. The research setting

Ratlou Local Municipality is one of the local municipalities situated within the control of Ngaka Modiri Molema District Municipality in the North West Province (Ratlou Municipality, 2017:10). According to the published report by Ratlou Municipality (2017:11), the municipality's boundary stretches out until it borders with the Republic of Botswana. The municipality is divided into 14 wards and based on its rural nature, Ratlou Municipality does not have large economic centres within its dominion, rather most of available business where applicable, and government services are conducted from different centres that are mainly located in Setlagole Town within the local municipality precinct.

4.3 Research Paradigm

A research design is a plan and structure of investigation that was outlined and detailed so that it can achieve answers to the research question; wherein the plan includes outlines of what the researcher will do from hypothesis right until the final data analysis (Blumberg et al., 2011). Research on sustainability of broadband internet services in rural municipalities is at nascent stage primarily due to lack of research interest. Moreover, sustainability in rural settings (as a research interest) has remained highly subjective and, thus, debatable due to its sociological nature that often overshadows economic discourse. As such, the phenomenon cannot be universalised as each setting has different experiences. To address the research question, the research seeks to investigate and explore this phenomenon with key reliance on the lived experiences of the internet users in the research setting.

4.4 The research design and methodology

Below is Figure 10 which depicts the research methodology which has been explained above and which has been followed for this paper as adopted from Provalis (2020:1).
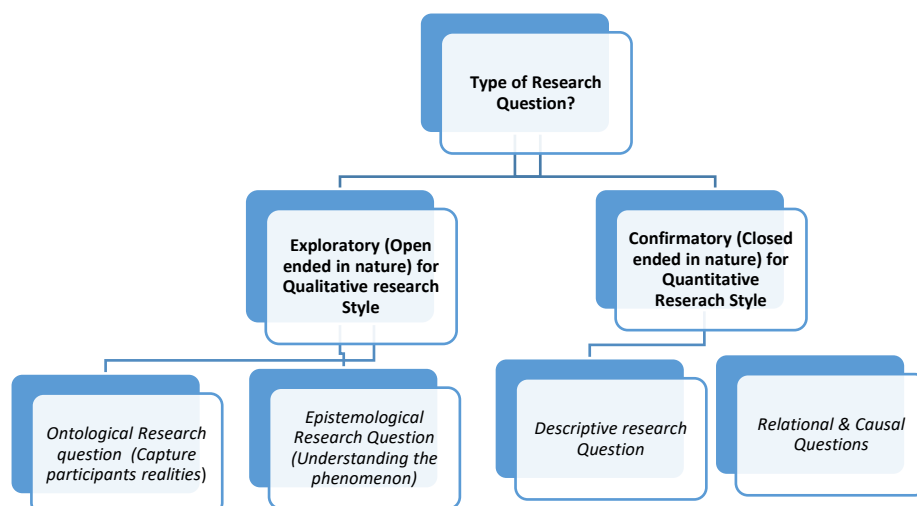
Figure 10 – Research Methodology

Derived from: Provalis (2020:1)

This research adopted a qualitative research design. Choy (2014) mentions that qualitative research emanates from the understanding that there is always a social-historical context that needs to be addressed through research, and to be able to conduct such research, it is imperative that one should be aware of social connotation of the researcher's environment. Further, qualitative methods typically refer to a range of data collection and analysis techniques that deploy a different technique for gathering data as compared to the quantitative method. The qualitative method uses goal-oriented sampling as well as semi-structured interviews with open-ended questions (Choy, 2014:99). The research seeks to provide a contextual interpretation of the research findings in which the views, opinions of the diverse interviewees are taken into account. Diverse groups of people help unpack these differing perspectives within a community. This might generate new and nuance findings on sustainability of broadband Wi-Fi internet services in rural areas.

Much research done to date has placed particular emphasis on statistically generated findings on broadband Wi-Fi sustainability in rural areas (International Telecommunications Union, 2018:21), However, little effort was directed at providing in-depth possible explanations as to why the findings point to such and what solutions can be envisaged. Besides, most existing literature on South Africa has been based on research findings dating as about 10 years ago. Considering material social-economic dynamics, internet technologies advancement, telecommunication transformation etc, there is chance that research may come up with new findings on the same subject. Hence, the need for an exploratory and investigative research approach. In addition, most researchers such as Helseman (2003) have maintained a macro- level of analysis (Africa and South Africa broadly). The meso level of analysis (a specific municipality) can assist in shedding more light on sustainability of broadband Wi-Fi. Residents of these areas must experience the effects, if any, of the deployed infrastructure.

According to Flick (2004:89), through experiencing things and reflecting on those experiences, people can develop new ideas and means of using the new information at their disposal. It was thus fitting for this research to be a proponent of the selected paradigm and design. The research itself was based on the issue that needs to be determined as to whether free broadband Wi-Fi internet access projects are sustainable beyond when the government subsidy period has ended and the research was based on how participants responded to the use thereof and to the amount of knowledge, they have developed based on use of the product of these projects.

4.5. Research Methods

According to Aspers and Corte (2019:146), qualitative research uses a variety of methods, such as intensive interviews or the in-depth analysis of historical materials, and it is concerned with a comprehensive account of some event or unit. Qualitative research is multimethod in focus, involving an interpretive, naturalistic approach to its subject matter (Aspers and Corte, 2019:146). Interviews with open ended questions were conducted. This allowed the interviewees to fully express themselves without limiting their views. Participants spoke in depth on a particular aspect using their own experiences and words. This helped the researcher to develop a real sense of a person's understanding of a situation. As Hancock et al., (2001:4) posit, interviews assist to broaden and/or deepen the researcher`s understanding of how things came to be the way they are in our social world

Based on Maxwell (2008:3), the selected research design will be able to address the five key strategic components to ensure that the research question is answered. These are discussed based on Figure 11 as follows:
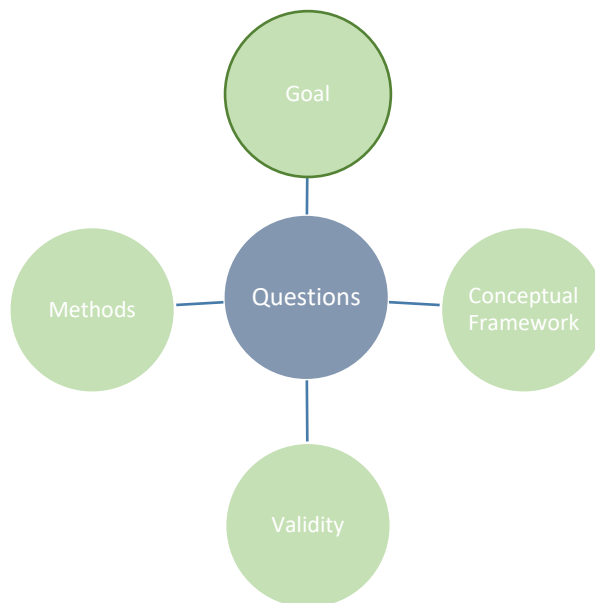
Adopted from Maxwell (2008:217)

Figure 11 – Interactive model of research design

a) **Goals/Objectives**– as highlighted in Chapter One of this research paper, it is essential that a convincing reason for doing the study be thoroughly communicated. To do this, the research document should highlight and clarify what methods and traditions one would like to see changed or improved (Maxwell, 2008:3). It should be noted, as in Figure 11 above that goals are closely linked with the research questions.

b) **Conceptual framework** – According to Maxwell (2008:3), when conducting a qualitative research, it is important for the researcher to be clear as to what type of qualitative design are to be employed. Agreeing with Maxwell (2008), Astalin (2013:119) mentions that there are four qualitative research designs one could explore, these are the phenomenology, ethnography, grounded theory as well as the case study. For this research, case study has been chosen as the type of design and the Exploratory Research type will be deployed for the case study. According to Harrison, Birks, Franklin and Mills (2017:8), they describe case study research as being the study that focuses on a specific object whereby research questions are used to guide and organise the study so that a systematic data gathering, and interpretation thereof can be evidenced. Further, to have a properly conceptualised framework study that is based on case study and exploratory research, a research proposition should be established as a starting point to enable debate and proper preliminary research in the form of literature review (Harrison et al., 2017:9). It is for this reason it is deemed appropriate that this research follows this pattern as mentioned above because, at the onset, a research proposition was established and also a preliminary research in a form of literature review has been conducted.

c) **Research questions** - The research questions are developed to assist with understanding specifically what could be learned by doing the study. They also help the researcher to know whether he/she is fully aware about the things being studied or things that affect the study (Maxwell, 2008:119). Further, these questions highlight aspects that the research will attempt to answer and the relationship of these questions to each other. Maxwell (2008:119), argues that research questions are a central part of the study because they help structure the research and he mentions four strategic components of research (i.e., goals, conceptual framework, methods and validity) that all link back to the research questions. As depicted in Figure 11, research questions play a central role for the research, and they are the engine, the driver of the research. As argued by Maxwell (2008:120), the research question should have a distinctive relationship with the goals or objectives of the research and be guided by what has been researched by other researchers.

d) **Methods** – at this point, it is imperative that the techniques that will be utilised in conducting the research be outlined and explained. This should include the approach that will be used in collecting, as well as analysing, field gathered data (Maxwell, 2008:120). Further, the methods used to collect and analyse data, as well as plausible validity of the data collected and processed, should also be closely linked to the

research questions and goals. So, there is an interrelationship between the five strategic components of the research design.

e) **Validity** – This is also an important aspect of the research because it identifies how comprehensive the research findings are. The validity of the finding should not be misleading to the public and the sector within which the research is being conducted. According to Maxwell (2008:120), the research design and methods utilised should be beyond reproach and plausible alternatives and validity threats should be clearly highlighted and a mitigation thereof must be outlined in the research. This research`s findings are restricted to the research setting but can be scantly applied (though not universally) to other rural settings in South Africa and Africa in general.

Thus, Figure 11 above can be summarised as follows: the top right triangle should be an approximately assimilated part, whereby both the goals and conceptual framework should have a distinct association with the research questions, and wherein the goals of the research are informed by what is already known about the marvel being researched (Maxwell, 2008:4). Correspondingly, argues Maxwell (2008:4), the bottom triangle of Figure 11 should also follow the same pattern, whereby the methods used were able to respond to the research questions as well as to deal with the plausible validity of the threats to the answers. This then calls for the questions to be tailored such that they consider the feasibility of the methods used as well as the significance of particular validity threats.   At the same time, the plausibility/credibility and relevance of a particular validity threat and the manner in which these are dealt with depend on the questions and methods chosen.

4.6 Research Plan

The research plan for this dissertation is primarily constituted of the research proposal with the following key outlines:

i)   Introduction

In this section of the document, the introduction and background to the research topic have been highlighted. A hypothesis was also derived as the yard stick for the research. The emphasis being highlighted is the need for sustainable deployed free broadband Wi-Fi internet for rural communities, specifically Ratlou Local municipality in the North West Province. The introduction further necessitated that a definition of sustainability in relation to the broadband be made.

ii)   Thorough look into broadband

The above led to a sub-clause which generally considered the broadband by contrasting its penetration in urban areas to that of rural communities. This section mainly looked at the

deterrents that either delay or block the deployment of fully fledged broadband infrastructures in rural areas. These included cell-phones, types and cost of services, terrain, reliable infrastructure (roads and stable power supply from the national grid).

iii)   Problem statement

In this subsection, the need for the research was identified, and as such, the significance of the study was outlined why such as research is important and beneficial was mentioned.

iv)   Research objectives

The main aim and goal of the project was identified. The chapter further identified the other four aims that will enable the researched information to answer the main objective of the research.

v)   Research Question

In this subsection, one main research question has been identified with four sub-questions to help answer the main objective as well as the four sub-objectives of the research.

vi)   Research Design and Methodology

Five building blocks of the research framework structure were identified, and they include the target population and where it will be located. It also included sample size and methods for sampling as a structural procedure. Included in this is the data collection methods together with data analysis techniques.

vii)   Literature Review

Different sources of literature were consulted based on the topic of sustainability of free broadband Wi-Fi internet projects. This included, but was not limited to, online journals, magazines, newspapers, books, etc.

viii)   Ethical considerations

It is important for any researcher to be found ethical when administering questionnaires to the participants. Therefore, ethical principles have been followed in line with the university guidelines.

ix)   Limitation

Because the time frame for the research is limited according to financial and specific timelines, not all aspects of the research will be possible to unearth.

x)   Chapter classification

In order to follow a systematic approach, the research document has identified a classification method in which the research is divided up into specific chapters by the researcher. This will ensure that the research is concluded as required by the university.

4.7. Research Structure

4.7.1 Target Population
According to Simply Psychology (2020:1; Draugalis and Plaza, 2009:3), a target population is a total group of individuals from which the sample might be drawn. For this research, the main targeted population was Ratlou Local Municipality, which also included the Municipality offices, schools, government offices, and clinics and those that are affected or involved in the ICT space. Thus, assimilating the desired data for the study from every member of a population. In the case of this research, it will be very difficult to get to each person connected to broadband internet services in the municipality.

4.7.2 Sampling methods and techniques
Agreeing with Draugalis and Plaza (2009:1), Taherdoost (2016:17) argues that to be able to respond properly to the research question, the researcher is expected to collect data from all cases, but this is impossible to do because there would be some constraint that could be experienced, such as time and resources. Hence the accepted technique to analyse the population is through applying a sampling method to reduce the number of cases (Taherdoost, 2016:18).

"Sampling frame is a list of the actual cases from which a sample will be drawn, and it should be representative of the population" (Taherdoost, 2016:20). Since the target population has been clearly defined in (i) above, it was difficult to cover everyone in the municipality considering the number of residents, and therefore, the following sample frame was identified:

- Educators- These are the employees in schools where Free Wi-Fi internet was installed for the school and for the public to access.
- Health workers - These are the health workers in clinics wherein Free Wi-Fi internet was installed for the clinic and for public access.
- Municipal Workers – These are the municipal employees in Ratlou Local Municipality offices who had access to the free Wi-Fi.
- Other Affected parties by the deployed broadband services – Includes service providers, policy and regulatory personnel.

For this research, a non-probability (non-random) sampling was chosen because it was best suited for case study research and qualitative research (Taherdoost, 2016:21). Because the research is a qualitative research, focus is on smaller samples and intended to examine real life phenomena. Statistical inferences to a broader population were not made, but rather to a sample of participants or cases. A clear rationale was needed to explain why these individuals

were chosen. As highlighted in (ii) above, these have been decided based on the proximity of access and knowledge of the free Wi-Fi Broadband internet and the built infrastructure.

As earlier mention in (i) above, there were 26 sites in which Free Wi-Fi Broadband internet infrastructure and connectivity was built into Ratlou Local Municipality, and therefore, in all the sites, questionnaires were administered to all those in charge of these facilities. Also, questionnaires were administered to the service provider that provided services in the area.

4.8 Data Analysis application software tool

For data analysis of the collected data from participants in the field, the researcher decided to use a freely available data analysis tool created by Provalis Research. The name of the tool is called Qualitative Data Analysis Miner Lite or simply (QDA Miner Lite) software, and as the name suggests, the tool is specifically designed to analyse qualitative data gathered from participants. This tool fits very well because the research style of the current research used is a qualitative research method.

According to Provalis Research (2020:1), the software was used for the analysis of textual data such as interviews, transcripts, open-ended responses, as well as for the analysis of still images, and many more. In order for the free software to be able to perform the above (Provalis Research, 2020:2), the application software has to be able to do the following important functions: -

i)   Import file – From a source (computer/cloud/mobile storage) to be able to load the files onto the QDA Miner Lite Project File.

ii)   Create Demographic Variables – Using information from participants.

iii)   Code Data – To enable data categorization.

iv)   Visualize findings – Using either bar-charts or pie-charts.

v)   Analyse Coded Data– using data evaluation and findings from data.

Below is a simple diagram depicting the QDA Miner Lite process. Further below is the brief discussion concerning each of the processes highlighted on the diagram.
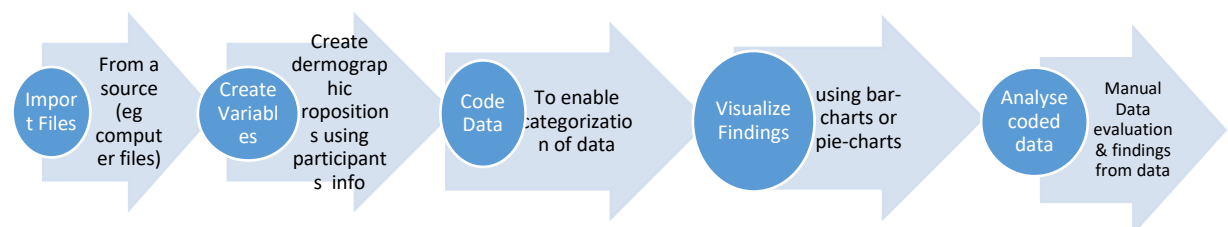
Figure 12 – QDA Miner Lite data process flow

4.8.1 Import Files

One of the important aspects of utilising QDA Miner is to first ensure that all collected data was saved as files either on the personal computer, external storage device and/or any other storage system that can be accessible by the QDA Miner (Provalis Research, 2020:2). Once that was done, we download the free QDA Miner Lite version from the internet. Before one can use this application, the user should first create a new project on the system (QDA Miner) then add all the documents to the project and give a name to the project. These documents are responses from the participants in the field. So, for the user to be able to analyse or group responses and to further add participants' demographics, each response needed to have a unique identifier from each of the responses.

4.8.2 Create propositions

In the previous section above, we have identified how to create a project from imported files. Further it was highlighted that these documents are responses received from the field, and on the QDA Miner, they are referred to as cases. Simply put, cases are files/documents created from transcripts from the participants (Provalis Research, 2020:4). So, if one has 10 cases on the QDA Miner, it then means that there are only 10 participants. Therefore, from all these cases, variables should be created for each. The variables should be according to what the questionnaire asked the participants to respond to as regards their demographics (e.g., age, employment status, experience, etc.).

4.8.3 Data Coding

Data coding is an essential part (the heart) of the data analysis tool that enables the researcher to be able to see the data and to later be able to manually analyse collected data. Coding is mostly about assigning labels to represent excerpts of data to help answer the research questions. The software does not analyse that data by itself, it thus requires the user to identify what kind of information should be entered into the software so that the information can be categorised and be interpreted easily.

So, for the software to be of value it was necessary for the research questions be assigned labels so that they could be linked with highlighted significant information on the software. This is done by clicking on the perceived significant information from cases received then adding this under codes with particular code names, then the code name is assigned to a particular category under which the research questions were assigned an identification label (Provalis Research, 2020:5).

4.8.4 Visualize Findings

Once the above has been concluded for all the cases, then the information was categorised under each research question. According to Provalis Research (2020:5), the information can therefore be exported onto an Excel spreadsheet, or a MS Word document for visualization and for the data categorization process. Once information is exported, then the information can be manually interpreted and analysed by the end-user or researcher (Provalis Research, 2020:5). The user can, if interested, take the information and visualise the findings under the Analyse tab in the software, and the information can be displayed either as a pie-chart or as a bar-chat/histogram, as depicted below.
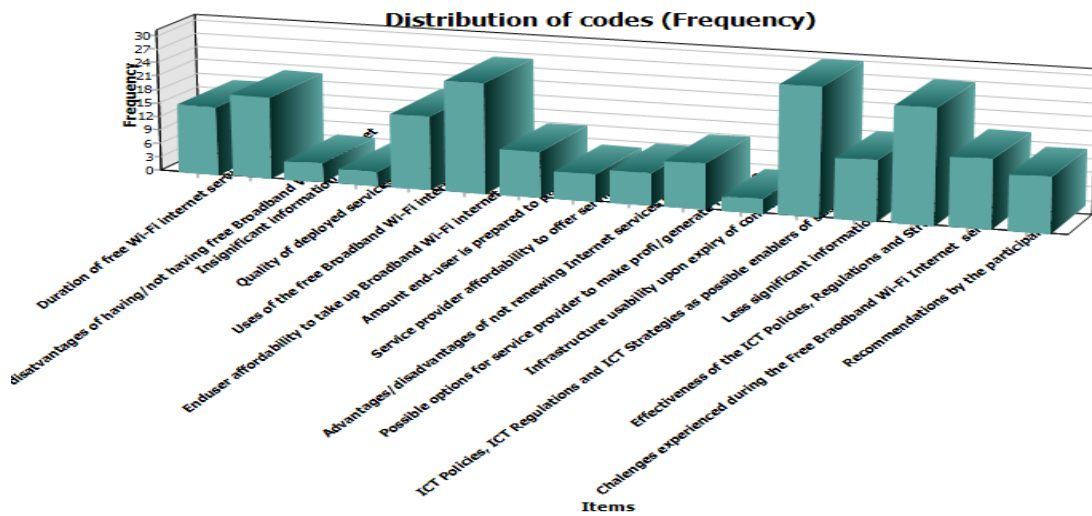
Source: Provalis Research

Figure 13 – *3D Bar-Chart Code Distribution (Frequency)*

Distribution of codes (No of Cases)
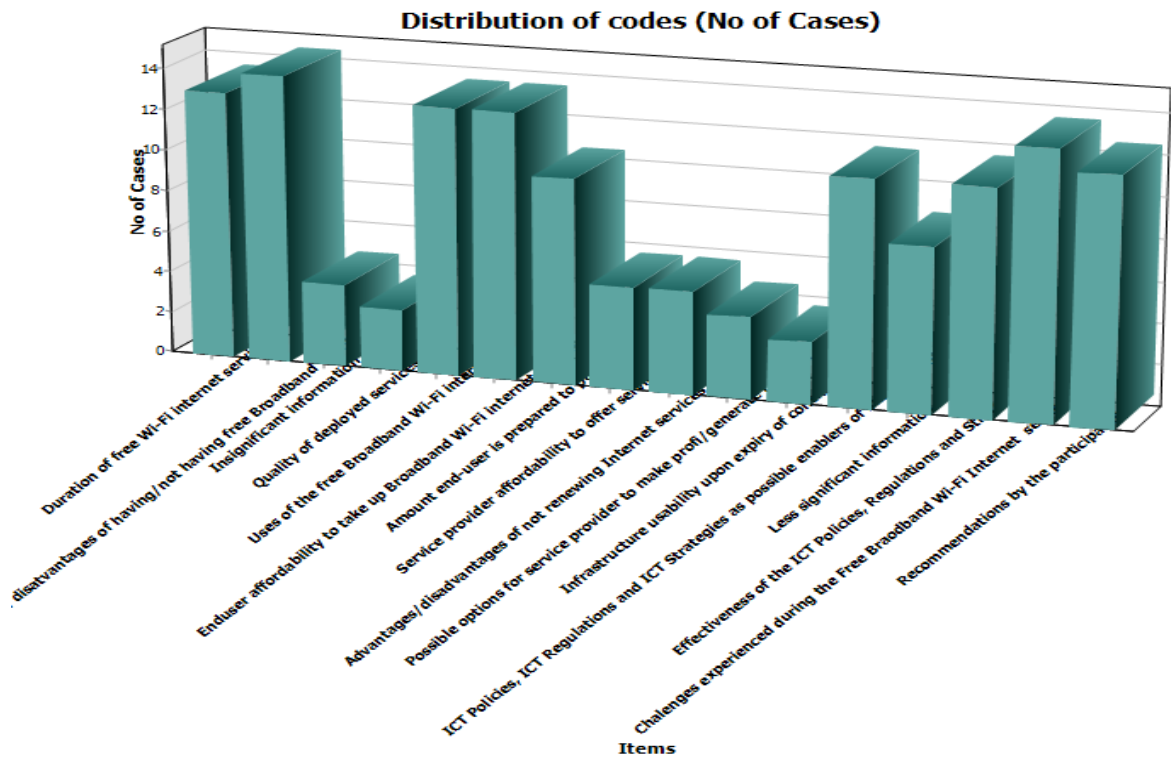
Source: Provalis Research

Figure 14 – 3D Sample Bar-Chart Code Distribution (Cases)

Distribution of codes (No of Cases)

Uses of the free Broadband Wi-Fi internet 9,2%

Insignificant information 2,8%

Enduser affordability to take up Broadband Wi-Fi internet services 9,2%

Advantages and disatvantages of having/not having free Broadband Wi-Fi Internet 9,9%

Amount end-user is prepared to pay 7,0%

Duration of free Wi-Fi internet services 9,2%

Service provider affordability to offer services 3,5%

Recommendations by the participants 8,5%

Advantages/disadvantages of not renewing Internet services contract 3,5%

Possible options for service provider to make profi/generate revenue 2,8%

Infrastructure usability upon expiry of contract 2,1%

ICT Policies, ICT Regulations and ICT Strategies as possible enablers of sustainability 7,7%

Challenges experienced during the Free Braodband Wi-Fi Internet service period 9,2%

Less significant information 5,6%

Effectiveness of the ICT Policies, Regulations and Strategies 7,7%

Source: Provalis Research system

Figure 15 – 3D View Pie Chart distribution of codes

The above pie-chart diagram is depicted so that it can be demonstrated that data from the field that has been entered onto the QDA Miner Lite can also be represented in this format. According to Provalis Research (2020:10), a pie chart enables data to be presented in a simple graphical format as opposed to a series of numbers.

4.9 Conclusions

This chapter discussed the most important aspect of conducting research that is a research methodology. Thus, in order for the research to be able to accomplish all that is expected, a detailed research methodology and a research design were outlined. This chapter outlined clearly what type of research would be followed, and it highlighted that the research is a qualitative research style. In this chapter, it was explained that the aim of qualitative research is to understand and to explain 'what' makes this outcome or behaviour, and 'why' a particular phenomenon or behaviour, functions as it does in a particular setting.

Qualitative Research claims to describe the world as immediately or directly experienced in the more biased manner of everyday life, and by so doing, Qualitative Research pursues the notion that contributes to a better understanding of social realities and derives consideration of the processes, meaning the patterns and structural features. This chapter further discussed the research design wherein the Interactive Model of Research Design was discussed as the pillar for a successful research.

The research plan further outlined how the document would be outlined from the beginning until the end. According to this chapter, it was discovered that the key to a successful research and to be able to produce conclusive data from the field, is to have a proper planned research structure wherein a target population, sampling frame, sampling size as well as the sampling. The chapter clearly outlined that a non-probability (non-random) sampling has been chosen because it is best suited for case study research and qualitative research.

The chapter further highlighted that the data will be collected from people at the sites that were connected to free Wi-Fi broadband internet in the Ratlou Local Municipality because the network did not cover the whole municipal geographical area. This chapter mentioned that QDA Miner Lite software, which is freely available, has been used as the data analysis tool to ensure that the data collected is relevant to the research questions and that data has been categorised and analysed accordingly. The tool is further able to assist in checking and tabling properly the research findings.

CHAPTER FIVE: RESEARCH DATA HANDLING, BREAKDOWN AND FINDINGS

5.1 Introduction

Within the local municipality, there are about 25 sites (facilities) in which free broadband Wi-Fi internet services were deployed. The sites include the following: health facilities, schools as well as the local municipality office. Out of the 25 sites, responses were received from eleven of these sites plus three responses from persons employed in the ICT regulatory field. The same questions were posed to all participants, and no different questions were asked.

Consequently, this chapter will assist in understanding the research finding that have been gathered from voluntary participants in the field. The research findings will help to get to conclusions about the main aims of the research. These aims were to evaluate the sustainability of free Broadband Wi-Fi internet connectivity projects as deployed in Ratlou Local Municipality in the North West Province. The main question for the research is – *How sustainable is the project of rolling-out free broadband Wi-Fi internet access in Ratlou Local Municipality?* The hypothesis of this research suggested that there is no sustainability of free broadband Wi-Fi internet access project upon expiry of government subsidy to connected facilities in Ratlou Local Municipality.

Thus, to answer the main question and to test validity of this hypothesis, four subordinate research questions were derived from the main research question as well as the hypothesis. The first question is to determine the advantages of free broadband Wi-Fi internet access as well as the feasibility of the contracting period agreed between the service provider and the government. The second question is about the possibility of the service provider continuing to offer services without government subsidy. The third question tried to ascertain whether the end-users can take up services from the service provider (i.e., sign broadband internet connectivity contracts) for themselves. The last question was to determine whether the government policies and strategies that are available respond and can ensure sustainability of deployed free broadband Wi-Fi internet services.

5.2 Demographic Information

Gathering demographic information using the research questionnaire is an important technique to utilise so that one can understand the participants. Such demographic information makes it easier to understand some of the background characteristics of the participants as regards age, race, ethnicity, income, work situation, marital status (SurveyMonkey, 2020:1). Therefore, the following demographics have been gathered:

5.2.1 Population group

This demographic information has been deemed necessary so that population background of the participants, in terms of race, could be identified and be recorded for statistical purposes at a later stage.

The majority of the participants were mostly from the black community and extraordinarily little from the Indian/Asian community. From the coloured and white community, there were no participants. To be exact, 93% of the participants were from the black community whereas 7% were from the Indian/Asian community. This is not a surprising considering that we are dealing with a rural municipality in South Africa which is predominantly a black community.
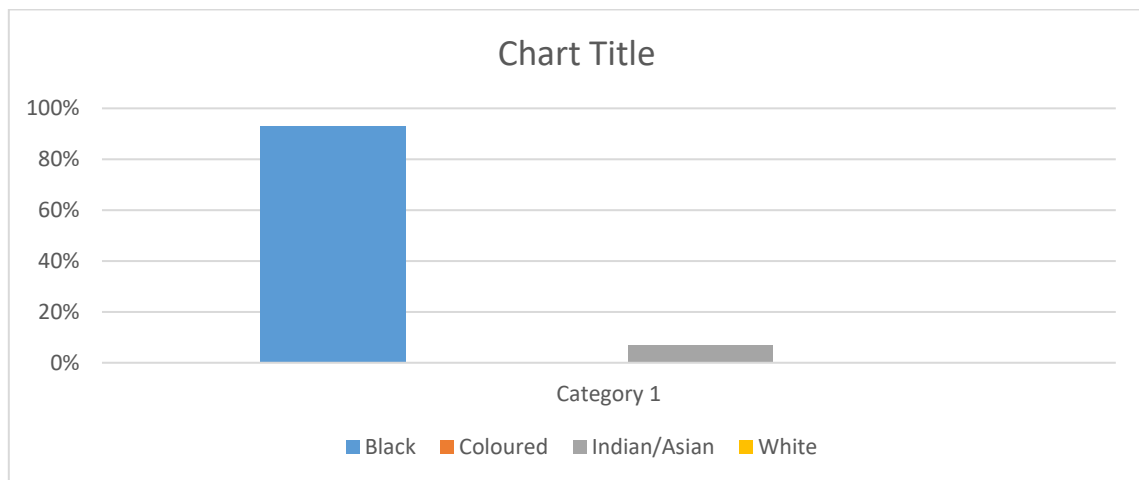
Figure 16 – Population information

5.2.2 Gender of the Participants

Equally important as highlighted in the figure above, demographic information such as age and gender, enable the researcher to better understand the participants. Therefore, the gender of the participants was also requested. The percentage of female participants and male participants is depicted by the graph below.
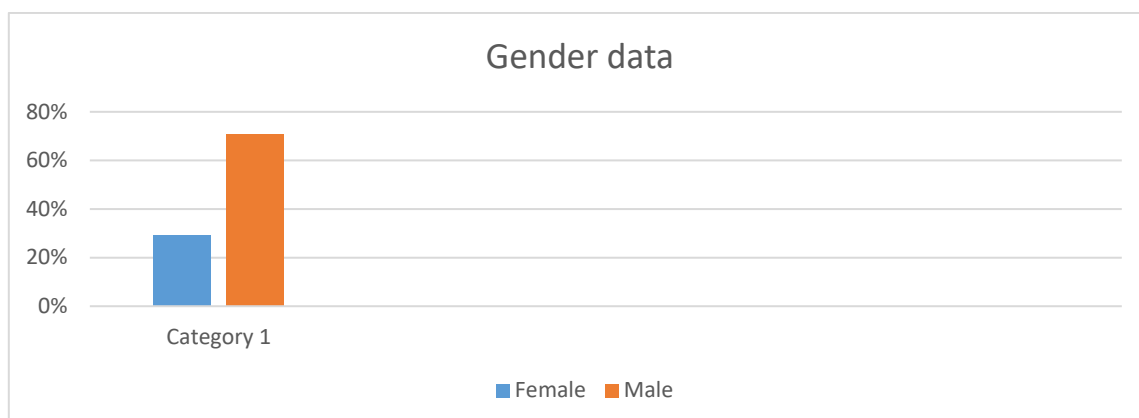
Figure 17 – Gender information

5.2.3 Age of the Participants

Another item gathered from the participants is their age. Considering that we are dealing with technology in the form of Wi-Fi internet access, it would also be of interest to see how different age groupings respond to the free broadband Wi-Fi internet access questionnaire. So, according to the responses received, there were 0% participants who were below the age of 30. Between the ages of 30 to 39, a reasonable percentage of 50% was received and between 40 to 49 years of age, a further 36% was received. Participants from 50 years of age and above constituted a measure of 14%, as highlighted in the following bar chart.
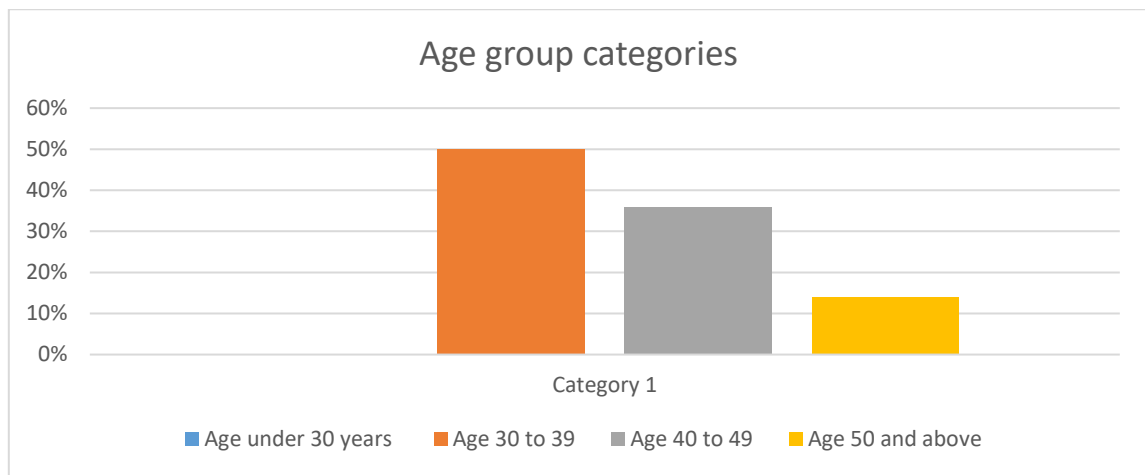
Figure 18 – Age group of Participants

5.2.4 Employment status

All participants were 100% employed either by the Department of Health, the Education Department of by the ICT Regulator. The category of the employment field is portrayed below.
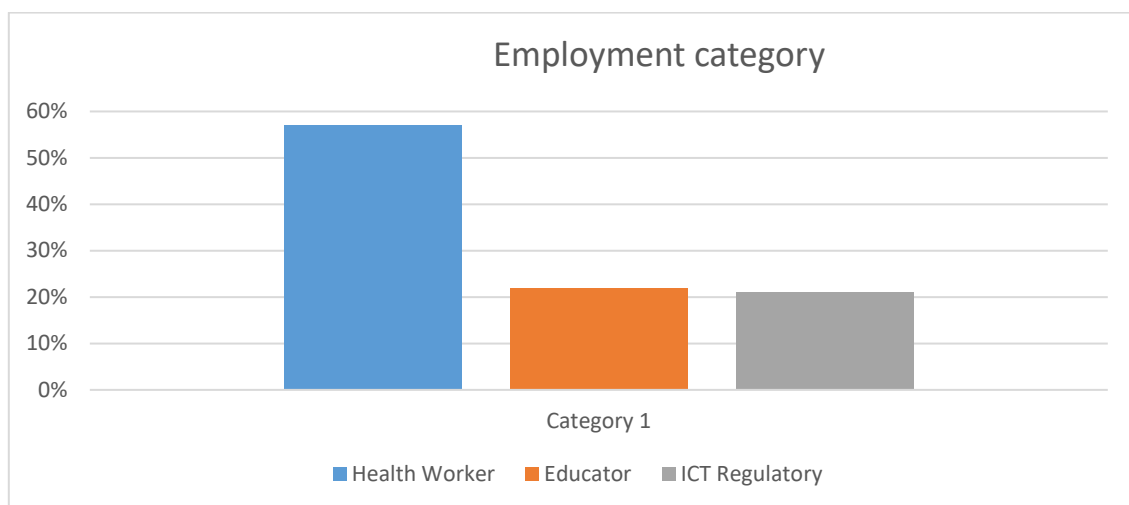
Figure 19 – Employment sector

5.3 Service Provider Broadband Contract and Duration Advantages

As earlier mentioned in this document, the main goal of this research is to evaluate the sustainability of free Broadband Wi-Fi internet connectivity projects as deployed in Ratlou Local Municipality in the North West Province. Thus, four subsets of questions were derived to get an answer to the four main aims associated with sustainability of broadband wi-fi project in Ratlou municipality.

Therefore, in this subsection, we will discuss research findings for the first research aim and the first research question. The first aim is to determine advantages and practicability (usefulness) of the free broadband Wi-Fi internet access contract signed between the service provider and the government. To answer this, it was also necessary to know what the deployed services are used for. It was also necessary to understand the advantages and disadvantages of having/not having these services as a driving force to the practicability of the contract and the duration thereof. The following is based on the information received from the participants.

5.3.1 Duration of the deployed services

When participants were asked a question pertaining to the duration of services, some of the participants said that the service infrastructure had been available for about three to four years and a few stated that it had been available for two years or less. The stats of this research can easily be seen in the figure and in its description below.

A reasonable number of Participants highlighted that these services have been available for about five years, but most of these participants mentioned that the internet services have not been provided for some time.

Almost all participants did not respond as to why the duration of service had been this short or long. Instead, the participants replied by stating the services are either off, on not permanently operational, or one responded by mentioning that the reasons for the duration is unknown.

Qestion 1 Responses

15%
5%
80%

■ Duration > 4 years ■ Duration = 2 to 4 years ■ Duration < 2 years ■
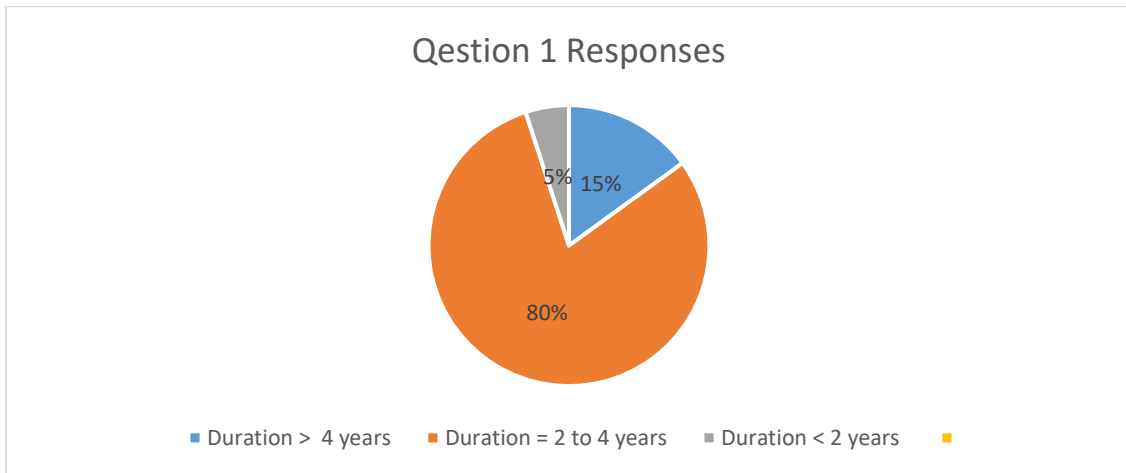
Figure 20 - Duration of deployed services and infrastructure

The pie chart depiction in Figure 21 shows that about 80% of the participants responded by stating that the deployed infrastructure and services had been available for about four years since deployment in year 2014, whereas the other 20% were distributed between those who stated that the services had been in place for either more than 4 years or for less than two years.

It could be noted in the figure that only 5% stated that the services were available for less than two years as opposed to those who responded by saying the services had lasted for more than 5 years.

It could also be noted that a significant number of participants mentioned that internet services are no longer available and that only the infrastructure is left. Some participants did not highlight whether the services were available or not. Only a single participant replied that the services were fully operational. Figure 22 below summarises this point.

SERVICE AVAILABILITY

■ Currently available ■ Not available ■ No responses

7%
21%
72%
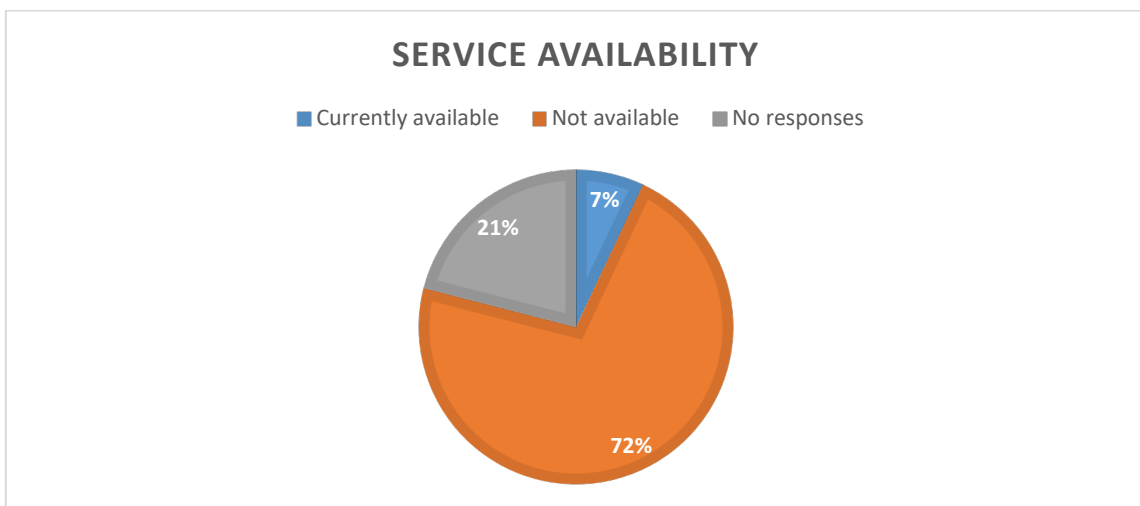
Figure 21 – Free broadband Wi-Fi internet service availability

5.3.2 Uses of the deployed ICT broadband services

Participant 1/Response1: Nursing In-charge
Nursing in-charge is a senior nurse in a particular health facility who overlooks the clinic as a whole and who makes sure that clinic administration is up to date. When asked what has the free Broadband Wi-Fi services were used for, the response was:

"For data capturing process, CCMD decanting, patients, or remote dispensing medication, for work communication through social work groups, for virtual training, etc.

❖ *Participant 2/Response 2 – Data Capturer: Health*

Data Capturers are admin personnel within the health facility (Clinic). These individuals capture detailed information about the patients who visit the clinic daily. According to the participant, the information captured assists the clinic to provide proper diagnosis as well as to administer appropriate medication to the patient. This information is then electronically sent to the district hospital for filing and for the distribution of relevant medication back to the clinic.

When asked the same questions as participant one, the reply from participant 2 confirmed the same sentiments as from participant 1, "I use it for Work related issues such as Health Patient Registration System (HPRS), Data Reporting, other work applications

The above two responses are some of the most common responses received from the end users in the health facilities. Also, the responses from education counterparts also provided similar sentiments about the project and the services. These can be seen in in the following two responses from the educators in some of the schools that had the privilege of being connected.

❖ *Participant 7/ Response 7 - Educator*

Educators could either be the teachers, deputy principals or principals. They are rightly placed to respond to these questions because they are the ones who mostly use these services to assist learners with their studies.

When the question was posed regarding what they mostly use free Wi-Fi broadband internet for, the respondent replied, "We use it for research purposes, downloading resources for specific subjects and topics". Further, the educator mentioned that these services are 'also used to show on the internet the learners how experiments are done because they do not have laboratories to conduct experiments.'

❖ *Participant 11/Response 11 - Educator*

This participant also highlighted that the advantage of having the free broadband wi-fi is that it helps them to report in time to the department of education sub district, and the lack of thereof makes it difficult for them to report required information about the school.

❖ Participant 12 -

Mentioning the advantages or benefits of having and using the free wi-fi internet, participant 12 indicated that internet makes life easier; the world is advocating for everything to be digitized. With the implementation of IOT (Internet of Things), we tend to easily connect the world and the growth of our economy more so now that we are moving to the 4th Industrial Revolution - 4IR.

As per the responses received from participants above, the following illustration (Figure 23) highlights the overall responses pertaining to the duration of the project, the uses of the deployed services as well as the advantages of the free broadband Wi-Fi internet services. It can be viewed from the illustration that 74% of participants highlighted that they use these services for work related activities such as the submission of work output reports, the arranging of work material as well as teaching. 18% said they use it for research and studying whereas the remaining 10% declared that they use these services for social media purposes.

Uses Free Wi-Fi internet

18%
10%
72%

■ Work related uses
■ Social media related uses
■ Educational related uses
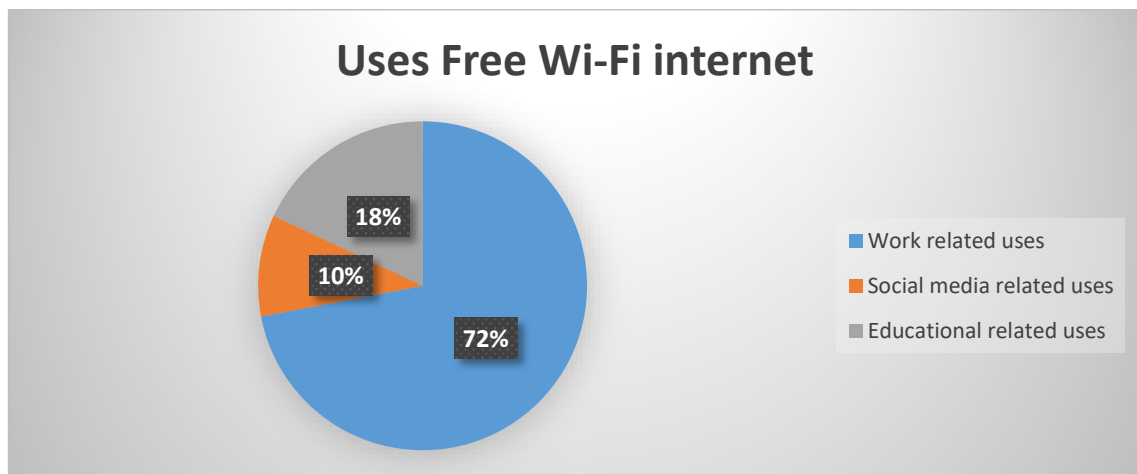
Figure 22 - Advantages of the free Wi-Fi broadband internet services

5.3.3 Disadvantages of not having the services

The following information is only some of the transcripts taken directly from the participants' responses. It should also be noted that not all responses have been captured in this section, but the illustrative figures provide representative responses from the participants.

❖ Participant 1

Concerning the disadvantages of not having these services, the nurse in charge responded 1:

"Unavailability hinders one from attending meetings virtually or training since there is COVID lately. Unable to respond on time to urgent social media work progress. We can't even submit daily stats especially for COVID."

❖ Participant 2 -

When asked about the advantages of having and disadvantages of not having free internet services, this participant mentioned that the effects of not having the free broadband internet services are the delays in productivity and sending work/data to senior management in the form of a report.

❖ Participant 7 - Educator

Regarding the disadvantage of not having such services, participant 7 responded as follows, "delay in productivity and sending work/data to senior management."

Participant 7 mentioned that lack of free broadband Wi-Fi services makes it difficult for the teachers to show learners the experiments.

❖ Participant 14 *an Executive Manager within the ICT regulatory space (Head of Engineering responsible for all ICT Radio Spectrum and Engineering activities.*

He emphasised that being always connected is essential to his job function and it has become increasingly necessary to have data always for connectivity in order to attend meetings online, especially due to the current Covid-19 pandemic and that services are mostly used for downloading documents/information pertaining to all aspects of researching, studying and others.

❖ Participant 5 – Data Capturer

This responded further painted a grim picture in that as the end users, since these services are no longer available, it has cost them financially. The participants stated that absence of free internet has affected their day-to-day work in such a way that they ended up in buying

themselves modems to keep their work up to date. It is important to note that the participants are not obliged to use their resources to conduct their work commitments.

Below is the graphical representation of the data collected as discussed in this subsection. It can be seen that more that 50% of participants have alluded to the challenges that it becomes difficult for them to submit their reports. Hence some have decided to buy their own internet connectivity equipment. On the other hand, for about 40% of participants have responded by stating that they either could not conduct their research/studies properly or they were not able to teach learners.

No Internet Availability

■ delay/no-submission of reports ■ Unbale to study/ Research/ ■ Not able to teach effectively

Figure 23 – Disadvantages of not having free internet

5.4 Service Provider to offer service without Government Subsidy

The purpose of this research question was to establish if there was the possibility for the service provider to continue to offer services to the facilities in Ratlou Local Municipality without government subsidy. In this part of questioning, there were four questions posed to the participants to help answer research question 2.

5.4.1 The effects of having the deployed infrastructure not used

When participants were asked what the effects were of having the deployed infrastructure not used for its purpose, the following responses were given which are all similar:

Participant 7, an Educator replied, "The unused infrastructure usually is left unused until a point they are damaged or sometimes will require extensive updates in terms of software or upgrades."

Participant 12, a specialist within the ICT regulatory space (Responsible for Radio Frequency Spectrum Allocation for broadband services) said, "If the infrastructure is not used or maintained, that really poses a serious challenge. The infrastructure will be redundant and ineffective".

Participant 13 a Specialist within the ICT regulatory space (Responsible for approval of ICT equipment to be used for broadband infrastructure) mentioned, "The deployed infrastructure will be vandalized by the community or mobile network operators can utilise the deployed broadband infrastructure".

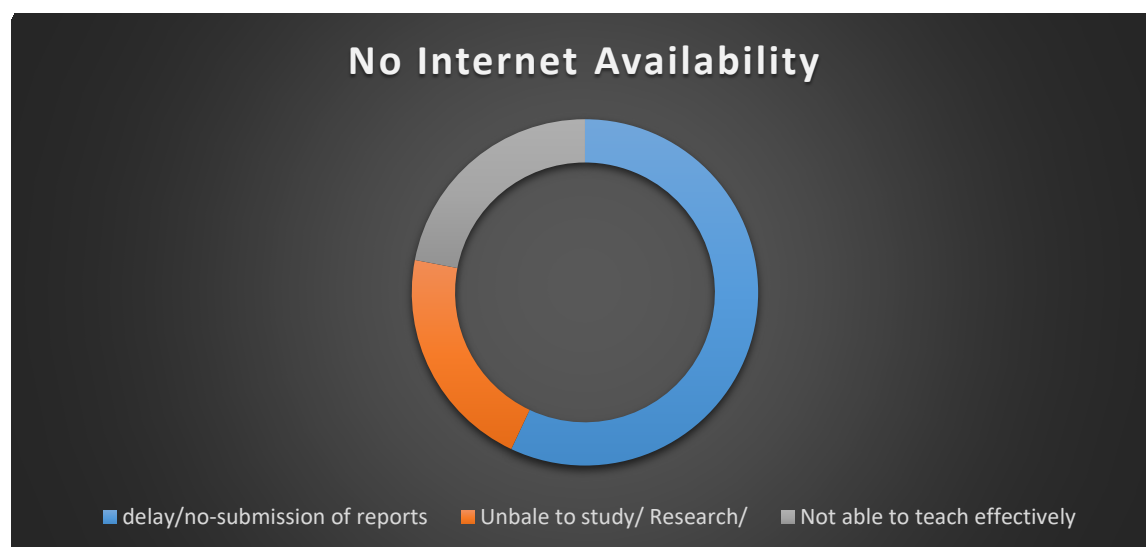*Participant 14 an Executive Manager within the ICT regulatory space (Head of Engineering responsible for all ICT Radio Spectrum and Engineering activities)* further alluded "We have noticed that the infrastructure falls into disrepair and is no longer utilised". This suggested that, when the ICT infrastructure is not utilised, it becomes degraded such that it becomes impossible to repair or recommission it for proper use at the later stage.

Chart Title

Category

■ Redundant Infrastrcture   ■ Expensive to mainatin/Recommission   ■ No response
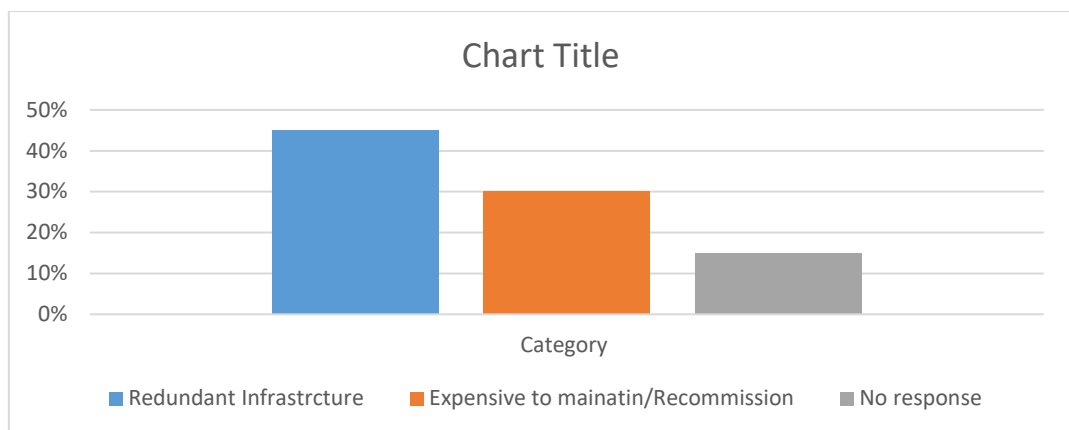
Figure 24 – Outcomes of unused Broadband Infrastructure

5.4.2 Possible options for the service provider to continue providing services

When the question about possible options for the service provider to continue providing services was raised, the following were the responses received:

Participant 14 stated: "Using off the shelf equipment would ensure that the infrastructure cost is kept as low as possible. Using alternative energy sources such

as solar in remote areas, could also make unconnected communities viable to SMMEs if infrastructure exists".

Another response from this participant 14 was: "SMMEs provide Wi-Fi hotspots wherever there is a backhaul solution available. Going forward, ICASA would allow access to TVWS within a prescribed regulatory process to encourage SMMEs to provide internet access. AS TVWS access would not attract a spectrum usage charge, SMMEs could make a revenue based on this cost saving available to them."

Participant 13 answered: "In my view, only private schools or clinics can take over the broadband internet service because they can recoup the bills from their clients. With government entities it's impossible in some areas."

Participant 12 replied with the following information "The option will be to lease them to other service providers."

Participant 1, 4 and 10 highlighted similar responses based on the poverty levels of the municipality. They highlighted that the possible option is for the government to continue providing free internet services for the community because of the remarkably high unemployment rate and poorer households. To further illustrate these responses, the figure below has been used.

5.4.3 ICT service providers making profit in rural areas without subsidy

Another question was asked pertaining plans that are used by the ICT service providers to make profit in the rural areas without government subsidy. Most of the participants did not respond to this question and only the following were the answers given:

Participant 10 (Data Capturer – captures patient information and submits reports to a central data base in the district) mentioned that residents or end-users may not be able to take up services because of the unavailability of services now, as this is perceived as poor service delivery.

Participant 4 (Educator responsible for teaching learners) also mentioned that users are suffering because the services have expired and that they will not have the means to pay for the ICT services because most heads of families in the area are not working.

Participant 13 highlighted that the service providers can propose to carry-out some of the obligations of Mobile Network Operators (MNOs), just as they currently do. They

should provide broadband connectivity services to schools then get their revenue from MNOs.

Participant 14, on the other hand, stated that SMME should come up with a strategy of gaining profit in rural communities while providing broadband services. They should not rely on government to pay for services. A strategy needs to be devised by the SMMEs in the operation in rural areas.

Figure 21 below shows that 50% of participants felt that there is no option for the service provider to make profit upon expiry of government, whereas 29% felt that there could be some avenues that could be used by the service provider to make profit in the rural areas and 21% did not respond.
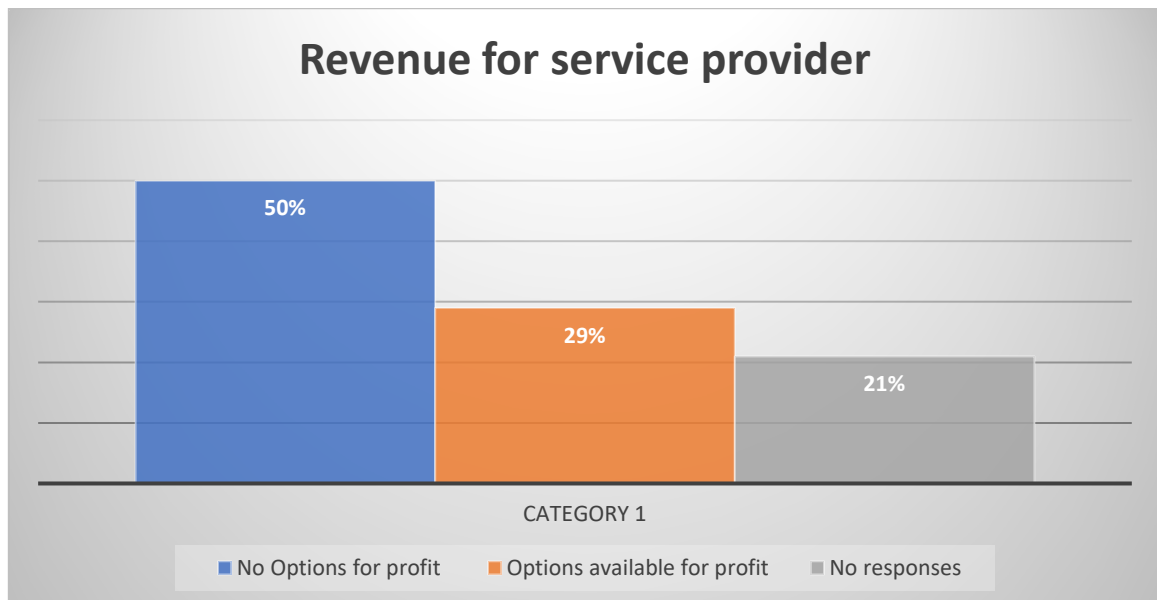
Figure 25 – Service provider makes revenue in in the municipality

5.5 End-user signing-up for services

The rationale behind this research question 3 is to determine the possibility of the end-users' (residents and connected facilities) ability to take up services for themselves upon expiry of the government subsidy.

5.5.1 Amount the end-user is prepared to pay for ICT services.

Participants were asked how much they are prepared to pay should they be requested to pay for the broadband internet services upon expiry of the contract, a variety of responses was received

Responded 1 highlighted the following "We cannot take over payment of broadband internet services because budget is managed by the Finance Department." But he further mentioned that, as an individual, it would be R150 a month.

Responded 2 replied "No. Clinic does not have budget for payments as it was not planned with them before."

Participant 4 provided the following feedback "My school depends on section 21 from the Department, we will not be able to pay for the internet service." This participant added that R300 a month would be an appropriate amount to pay so that the learners at school can have access to online education.

Participant 5 then highlighted that budgetary constraints are a possible challenge but that he would be willing to pay at least R100 a month for these services.

Participants 9, 10 and 11 similarly mentioned that they would not be able to pay for these services due to unemployment within the local municipality. Thus, it would not be possible for them to pay for broadband Wi-Fi internet services.

Participants 12 and 14 shared the same thoughts that, because of the background of rural communities, these services should be provided for free, especially for poorer individuals, public schools, and rural clinics.

It was further mentioned by participant 14 that the reason for these views is based upon the licence conditions of the major MNOs who are obliged to financially support initiatives of connecting rural or underservices areas of South Africa. Again, participant 14 did to not fully agree to the notion that other entities would not be able to afford to pay for internet access, except for perhaps the local municipality, schools and clinics in the rural areas. The participant concluded by stating municipalities can however negotiate with service providers to provide free broadband access in lieu of waived wayleave fees etc.

It should be noted that most participants (64%) were not willing to pay for services, but there were some who preferred to pay a certain amount of money so that they could be able to execute their responsibilities. The percentages translated to 29 % and 7% for those who are willing to pay between R100 to R200 and those willing to pay R250 to R350 each month, respectively. The illustration that follows shows the responses on this aspect.
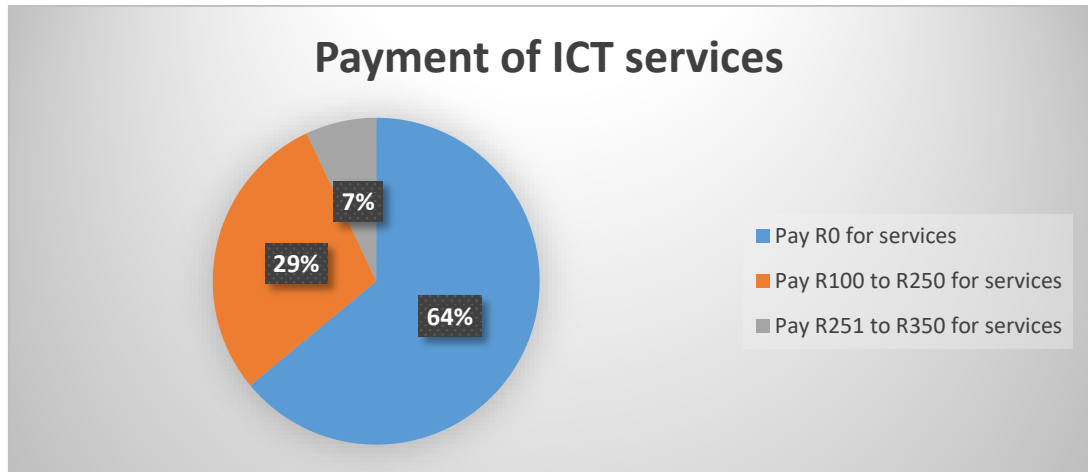
Figure 26 – Service fees participants willing to pay

5.6 Enablers of sustainability of broadband internet access projects

5.6.1 Interventions using ICT policies

The study went on to establish whether other interventions such as ICT Policy, regulation and strategy could enable sustainable future for deployed broadband internet services in rural areas. Thus, participants were questioned pertaining the effectiveness of the ICT policies for the rural areas. The following four tables were the participants' Reponses:

Table 5. 1 – ICT Policies are Unknown

Participants	Responses
Response 1	I don't know anything of ICT
Participant 1	I don't know any ICT coordination level at any government sphere. No communication was done with different stakeholders or members of the community

Participant 2	Do not know if there are any policies. But if there are any, they do not respond to the needs of the local communities
Participant 2	I don't know but if there is any strategy, I don't think its aligned with the policy.
Participant 2	I don't know of any ICT services regulations but in my view, it seems like there is sustainability plans when it comes to rural area.
Participant 11	It might be there but not fully implemented
Participant 11	It might be there but not fully implemented.

Gauging from the responses from the three participants in Table 5.1 above, it shows that some of the respondents are not aware of any ICT policies in place that are used by government that helps implement broadband services for prolonged period. But some participants felt that there are policies that are in place. They stated that the issues might be the implementation and the enforcement thereof, as shown in Table 5.2 below.

Table 5. 2 – Partial effective ICT policies

Participants	Responses
Participant 5	Yes.
Participant 7	Policies do respond to sustainability the difference is only in implementation of the policy on the ground such that our in our rural area the current infrastructure does not speak to what the policy outlines that is where the breach of the policy comes from and in that instance, there is no accountability.
Participant 7	It plays a big role in ensuring that there is/are services given to the community.
Participant 8	Yes,
Response 12	Yes
Participant 12	Yes, national Integrated ICT policy green paper and national Digital future skills strategy gazettes seek to address the alignment.

Participant 12	Yes, if they if they are well formulated and structured. They will better the living condition of rural areas.
Participant 13	Yes
Participant 13	Yes, they do, but enforcement on implementation of the services is ignored.
Participant 14	Not fully. Although government has prioritised access to broadband for rural communities, large parts of rural South Africa remain unconnected. The funding provided by USAASA is a good government initiative and I have personally witnessed rural areas receiving internet access that is provided by an MNO, via funding from USAASA. This process is however fraught with problems and maladministration, and funding should only be provided to a network operator with a sustainable track record and ability to complete these projects. I have also witnessed USAASA funded broadband projects that are all but abandoned by the community, due to poor workmanship, poor installation and equipment.

As it can be seen from the responses in Table 5.2 above, these participants felt that there are ICT policies that have been established by the government to respond to ICT related matters both in urban and rural areas of South Africa. The respondents shared the views that these policies fail at the implementation stages and that there is no oversight nor accountability for unaccomplished projects.

Other responses were those that were against the available policies of responding to sustainability of ICT services that have been deployed in the rural Ratlou Local Municipality. The following are the participants' views on the matter.

Table 5.3 - Policies not effective

Participants	Responses
Participant 13	In my view the government has the strategy, but it is legging out on the implementation process
Participant 13	Yes, they do, but enforcement on implementation of the services is ignored.

Participant 13	Yes, they do, but enforcement on implementation of the services is ignored.
Participant 13	Not enough capacity is provided mm
Participant 14	Generally at hotspots such as airports/conference venues etc. when using cellular data over a prolonged period of time would be prohibitive
Participant 14	Not fully. Although government has prioritised access to broadband for rural communities, large parts of rural South Africa remains unconnected. The funding provided by USAASA is a good government initiative and I have personally witnessed rural areas receiving internet access that is provided by an MNO, via funding from USAASA. This process is however fraught with problems and maladministration, and funding should only be provided to a network operator with a sustainable track record and ability to complete these projects. I have also witnessed USAASA funded broadband projects that are all but abandoned by the community, due to poor workmanship, poor installation and equipment
Participant 14	I do not think that the ICT strategy is the issue. The issue is the application of the said strategy, which is not well executed and is often beset by problems and delays
Participant 14	Yes, the proposed high demand spectrum auction will have several clauses that will stimulate infrastructure development in rural areas, before the spectrum can be deployed in urban areas. That is a good example of how ICT regulations can boost access in rural areas
Participant 14	I am not aware of this initiative, although in general, I would think that inter-governmental cooperation is essential. Economies of scale is just one example of how government can work together to procure broadband services for rural communities at the lowest cost
Participant 14	You can draw my recommendations based on my previous responses, but in a nutshell, a coordinated government approach that is well managed and provides incentives to bona fide networks operators, is the best way to promote access in rural areas. Alternatively, technologies like TVWS which do not attract spectrum fees, would make it economically feasible for private sector SMMEs to deploy networks in rural areas that could be profitable to them as well. It would be a win-win solution
Participant 2	I Do not know if there are any policies. But if there are any they do not respond to the needs of the local communities
Participant 2	I don't know but if there is any strategy, I don't think its aligned with the policy.
Participant 2	I don't know of any ICT services regulations but in my view it seems like there is sustainability plans when it comes to rural area.
Participant 2	Ratlou Health Department know nothing on broadband Wi-Fi internet service at facility level, we just see it implemented and when having problems we don't know where for quick service

Participant 2	Interruption of services. Wi-Fi has been off for months, internet problems not serviced as emergency. When it is reported, answer saying the municipality failed to pay account for services
Participant 2	There must be active intergovernmental coordination facility to be informed timeously when service become offline. Provide everyday number to report interruption of services. Installer or service provider to locate areas where there are problems and provide services as needed.
Participant 3	The department is the one that is responsible for the payment
Participant 3	No
Participant 3	Yes, The area is around/situated next to the Botswana Border so most of the time network is a problem and most of the time its roaming (Orange).
Participant 3	Ratlou is most rural area in Ngaka Modiri District and it is composed of villages that are scattered to town
Participant 3	It goes on and off.
Participant 3	To improve services
Participant 4	The government take us to the ICT workshops. But unfortunately, when we want to implement it becomes a problem because there is no internet connection
Participant 4	Yes, The area is around/situated next to the Botswana Border so most of the time network is a problem and most of the time its roaming (Orange
Participant 4	I do not think that they play a role, because in my area I do not Internet in my school. But there is one in the clinic if there was coordination all the schools and clinics in the same should have internet connections
Participant 4	As I have stated earlier, our internet was working for the past 3 years, since 2018 our signal was bad and this year 2020 the network is dead
Participant 4	The department of Education, Communications, and Cooperative Governance can work together, I think problems in the rural areas can be the thing of the past. Funds budgeted for a certain project must be meant for that project. There must not be any deviation
Participant 5	No
Participant 5	I do not think it does
Participant 5	I do not think it does

Participant 5	Yes. Especially for school regarding school researchers and other information gatherings…
Participant 5	To enable access to information and social connection
Participant 5	Low connection
Participant 5	Block download of multimedia Should have time for operation operate day to day
Participant 6	No.
Participant 6	No.
Participant 6	They are failing to ensure the sustainability because we always call and report internet Wi-Fi off.
Participant 6	They are failing to ensure the sustainability because we always call and report internet Wi-Fi off.
Participant 6	Our government must always make sure that they build a team to ensure the sustainability of the internet in the facilities every time.
Participant 7	Policies do respond to sustainability the difference is only in implementation of the policy on the ground such that our rural area the current infrastructure does not speak to what the policy outlines that is where the bridge of the policy comes from and in that instance there is no accountability
Participant 7	As long as the service providers or organizations appointed to see through the project I think that rural areas are a cash cow, there is always going to be a gap as if the policies are not working.
Participant 7	It plays a big role in ensuring that there is/are services given to the community.
Participant 7	Rights of the landowner's payment from the installation of such equipment. Source of power for the equipment, landowners usually switch it off as they are unclear who will pay. In the meantime, the service is off and not working.
Participant 7	advocacy of the importance of the internet. There must be regular monitoring of the programme by a relevant person.
Participant 8	Because the Wi-Fi is very important to me.
Participant 8	Yes, is very important as it can also help in many different aspects, e.g. students who enrolling can use it for assignments
Participant 8	The Wi-Fi is available only for few days and sometimes its available for few hours in a day. The Wi-Fi also does not open things like emails as it is very weak.

Participant 8	I recommend that the Wi-Fi be available everyday as that may improve our daily capturing and reporting.
Participant 9	No, the government does not respond to any of the queries with regards to sustainability of the rural communities.

It can be noted that in Table 5.3, participants consider ICT policies are not effective at all and some believe that they do not exist. The views of these participants could be understood from the perspective that the services are no longer available and, therefore, policies to help sustain these services seem not to be effective or are non-existent. The responses are further illustrated as per the Figure 28 below.

ICT POLICIES

■ Unknown ICT Policies ■ Partially effective ICT policies ■ Ineffective ICT Policies ■ No responses

9%
21%
28%
42%
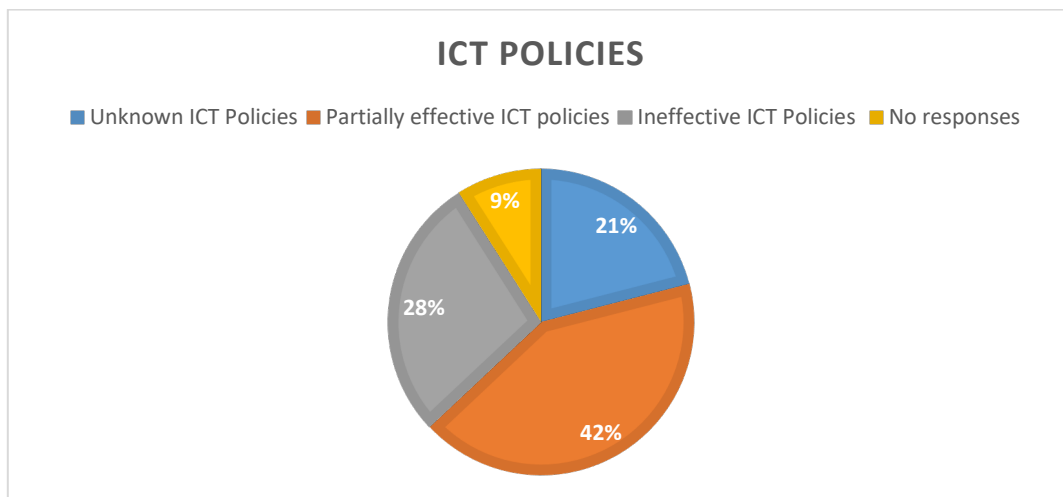
Figure 27 – Effectiveness of the ICT policies

Figure 28 shows that nearly 42% of the respondents felt that the policies are partially effective, whereas about 28% of participants felt that these policies are not effective. About 21% of the participants did not know any ICT policies in place, whereas 9% did not quite respond to the question.

5.6.2 Contribution of ICT strategies and regulations

The following question sought to ascertain whether the established policies tie-up with the ICT regulations and strategies and whether they are agents that enable effective deployment of ICT services and infrastructure in rural areas. In the main, the question seeks to answer the research question regarding the possibility that policies and strategies can be used as a catalyst for rural ICT sustainability. The participants submitted their responses as follows:

Table 5. 3 – ICT Strategy and regulation not effective

Participants	Responses
Participant 2	I don't know, but if there is any strategy, I don't think it's aligned with the policy.
Participant 2	I don't know of any ICT regulations but in my view, it seems like there is sustainability plans when it comes to rural area.
Participant 6	No.
Participant 6	No.
Participant 9	No, the government does not respond to any of the queries with regards to sustainability of the rural communities.
Participant 9	I would say yes but only in the high cities whereby everything is accessible and not for rural communities.
Participant 9	In my personal point of view, the government does not play an important role in the rural communities. Government is concentrating more on the big cities.
Participant 9	I would rather say the government does not take any responsibility for sustaining free broadband in Ratlou municipality because we experience problems for weeks or even months before we access internet.

Table 5.4 highlights the responses received from the participants in connection with their perceptions pertaining to the effectiveness of the ICT strategies and regulations. As can be seen, these participants believe that the established ICT regulations and strategy does not respond favourably to established policies and that they do not assist in sustaining the deployed services in Ratlou Local Municipality. Another participant mentioned that the strategies and policies are only effective in well-established cities as opposed to rural towns.

The following Table 5.5 lists the replies from partakers responding on effectiveness of ICT regulation and strategies. We can note, in the table below, that relatively fewer respondents replied to this question. We note with keen interest that those who have responded revealed that there is a role to be played by linking up the policies, strategies, and regulation but the issue is at implementation stage.

Table 5. 4 – Relatively Effective ICT regulation and strategy

Participant 7	It plays a big role in ensuring that there is/are services given to the community.
Participant 11	It might be there but not fully implemented
Participant 12	In spelling out the principle of inter-governmental mandate, is to establish and provide that every citizen has right to access of ICT services and promote the living conditions of south Africans through means of connectivity
Participant 13	In my view the government has the strategy, but it is legging out on the implementation process
Participant 14	…I do not think that the ICT strategy is the issue. The issue is the application of the said strategy, which is not well executed and is often beset by problems and delays

The following are the opinions of the respondents based on effective and ineffective of the policies, strategy, and regulations. It can be seen on the pie chart figure below that there is almost a close split between the selected categories. At this point, there is a higher percentage of nonresponsive participants than in all other questions replied to. It can be noted that 35 % of respondents felt that the ICT policies, regulations, and strategies respond partly to sustainability of ICT service and that they need to be implemented as a catalyst to enable sustainability of services in rural areas. Further, 28% felt that the policies, strategies and regulations do not respond at all to the needs of the rural communities when it comes to sustaining ICT projects. 37% did not respond to this question specifically, and a reason for receiving no responses could be that some of the respondent are not aware of any available ICT strategy and/or regulation.
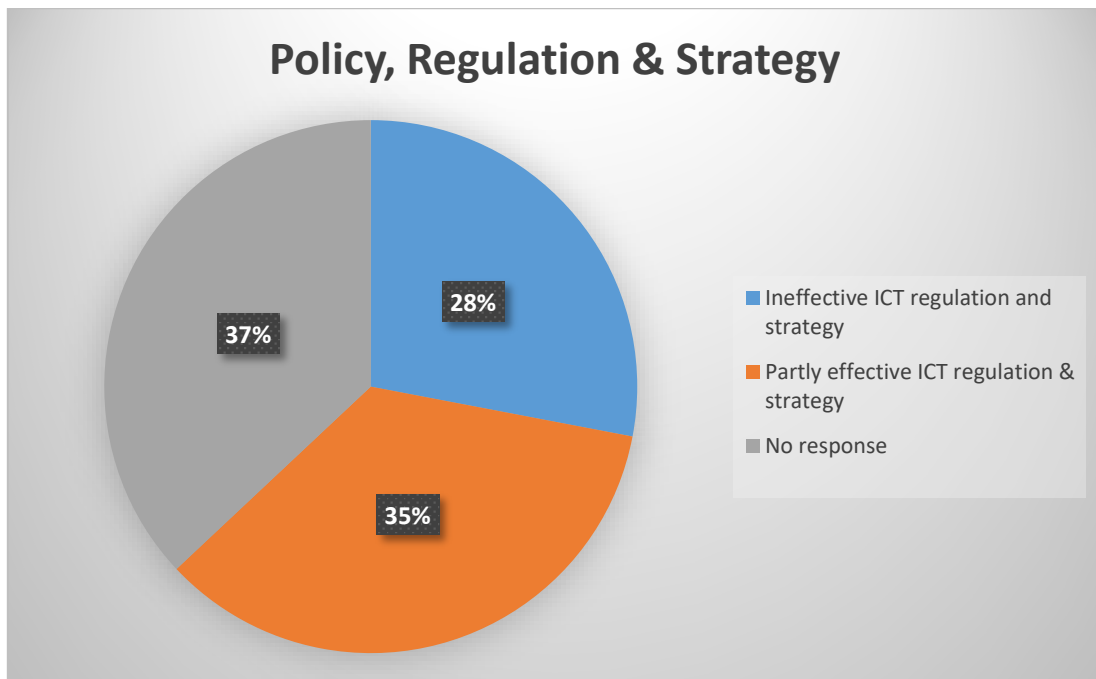
Figure 28 – Effectiveness of ICT policy, regulation, and Strategy

5.6.3 Recommendations from Participants

As the final part of the questionnaire, participants were also requested to provide their suggestions to enable sustainability of free broadband Wi-Fi internet access project in Ratlou Local Municipality. Table 5.6 below highlights some of the key recommendations provided by the participants.

Table 5. 5 - Recommendations

Participants	Responses
Response 1	Communication between affected stakeholders
Response 1	Involvement of the stakeholders to take part actively. Hold quarterly meetings to find a way forward
Response 2	There must be active intergovernmental coordination facility to be informed timeously when service become offline. Provide everyday number to report interruption of services. Installer or service provider to locate areas where there are problems and provide services as needed.

Response 4	The department of Education, Communications, and Cooperative Governance can work together, I think problems in the rural areas can be the thing of the past. Funds budgeted for a certain project must be meant for that project. There must not be any deviation
Response 5	Block download of multimedia Should have time for operation operate day to day
Response 7	As long as the service providers or organizations appointed to see through the project, I think that rural areas are a cash cow, there is always going to be a gap as if the policies are not working.
Response 7	advocacy of the importance of the internet. There must be regular monitoring of the programme by a relevant person.
Response 8	I recommend that the Wi-Fi be available everyday as that may improve our daily capturing and reporting.
Response 10	To make sure they fund free Wi-Fi internet and always maintain the signal to be strong
Response 11	To appoint local companies to manage our built network
Response 12	Education and training to our community members which should instil the necessity and the importance of having WIFI internet access
Response13	SMME must come with a strategy of gaining profit while providing broadband services, they should not depend on government.
Response 14	You can draw my recommendations based on my previous responses, but in a nutshell, a coordinated government approach that is well managed and provides incentives to bonafide networks operators, is the best way to promote access in rural areas. Alternatively, technologies like TVWS which do not attract spectrum fees, would make it economically feasible for private sector SMMEs to deploy networks in rural areas that could be profitable to them as well. It would be a win-win solution

The recommendations above can be categorised in the following aspects:

a) Recommendations based on the infrastructure and ICT service maintenance.

Sentiments shared by the views show that, for the services to be of value and be sustainable, the government should appoint local companies that have the knowhow of the municipality.

b) Stakeholder engagement and communication plan to be established.

A proper communication and stakeholder engagement plan should be in place when these projects are being executed. Stakeholders should include Cooperative Government, Department of Health, Department of Education as well as Department of Communications and Digital Technologies.

c) Service providers to leverage on available Policy, strategy, and regulation.

Regarding the ICT Policies, Strategy as well as the Regulation, the suggestion was that the SMEs should leverage on existing programs. These platforms encompass policies such as the Integrated ICT White Paper policy and the SA Connect policy as well as SMME development strategy. Further, the SMMEs should also establish their own strategies instead of relying solely on government for deployment of services in rural areas.

d) ICT skills training.

In terms of ICT skills training, a suggestion was given that there should be emphasis on the importance of utilising ICT services. The training should be to enable possible ICT literacy and the utilisation of ICT based applications or platforms.

5.7 Research Findings Interpretation

This chapter focused on the data that was gathered from voluntary participants in Ratlou who have been affected in a way by the deployment of free Wi-Fi internet services. Other participants who are also involved in the ICT space have also been asked to respond to the relevant question. Thus, this section of this chapter will focus on the finding derived from the responses of the participants.

The research had four aims that it wanted to achieve, which include:

1. To determine the advantages and practicability (usefulness) of the free broadband Wi-Fi internet access and service contract duration.
2. To ascertain whether the appointed service provider can continue providing services beyond the government subsidy.
3. To gauge the possibility of the end-user's ability to take up services for themselves upon expiry of government subsidy.
4. The study will further establish whether other interventions, such as ICT policies, regulation and strategies could enable sustainability of the deployed free Wi-Fi broadband internet projects.

5.7.1 Advantages of using free broadband Wi-Fi internet and duration of service

It was important to determine the effectiveness of the deployed free broadband wi-fi internet project because if the project did not add value to the end users, it would mean that it is impossible for it to be sustainable. Therefore, by measuring its success or advantages, we can be able to find means to ensure its sustainability.

Duration of services helps us to understand how long this project has been implemented and by knowing this information, it helps to understand how viable the project in the rural areas is.

When it comes to benefits or advantages of having these services, the respondents highlighted several important uses. For example, in the health facilities, most partakers replied that they use these services for submitting reports to district offices, online ordering of medication as well as distribution of medicines where relevant. For education purposes, some participants stated that because their schools do not have laboratories to conduct experiments, so when internet was available, they could connect to a particular website and download lessons that could assist learners to see how experiments are done in a laboratory.

74% of participants highlighted that they use these services for work related activities such as the submission of work outputs reports, the arranging of work material as well as for teaching. 18% said they use it for research and studying whereas the remaining 10% declared that they use these services for social media purposes.

It could be noted from these responses that these ICT services are of great value to the community within which the project was deployed. Sustainability thereof is of vital importance.

5.7.2 Service provider to offer services without government subsidy

The second aim of this research was to determine the possibility that the service provider could offer these services with the support (as a financial grant) from the government. This information is of vital importance because it is not possible for government to perpetually provide grants to service providers. There should be a plan in place that assists service providers to commercialise the deployed infrastructure so that it can become sustainable beyond government subsidies.

Data received from the respondents prove that it is quite a challenge for the service provider to continue providing services in Ratlou Local Municipality because of the high poverty level and unemployment in this area. Partakers in this research highlighted other key aspects that make it difficult for the end-users to pay for these services. One key aspect was that the facilities such as schools and health facilities (clinics), because of their financial status, receive grants from the national government for functioning. Thus, they have no budget available from that could be put in place for payment of broadband internet services.

This has been further confirmed by the United Nations Population Fund (UNFPA), when it published that Ratlou Local Municipality has a population of 107 339 people. Out of this population, a whopping total of about 43.9% is unemployed and the youth unemployment rate is at about 52.4% (UNFPA, 2016:1). Thus, because of high poverty levels, most residents in this area rely on casual jobs or social grants. It would thus be prudent, looking at the research findings to note that the service provider might not be able to continue to offer services if there is no grant provided to these areas.

5.7.3 End-users' ability to pay for broadband services

The third focus of the research is slinked to the previous aim in that it tries gauge the possibility that the end-users of these service could somehow pay for their usage of these services. It was deemed fundamental to establish each individual user's ability to pay for the broadband Wi-Fi internet services in Ratlou Local Municipality. Finding an answer to this question would assist in determining the possibility to maintain (sustain) the ICT services continuously within the municipal region for the benefit of residents.

The data revealed that 64% of participants were not willing and unable to pay for services themselves. That being said, 29 % and 7% of participants were willing to pay for their usage of these services, and these were willing to pay between R100.00 to R200.00 and R250.00 to R350.00 each month, respectively. Consequently, we can conclude by stating that most residents in the Ratlou Local Municipality are unable to pay for the services. This in turn poses a difficulty for the services to be continuously provided to the community.

The effect of the service not being provided after the expiry of the contracting period with the service provider poses a serious threat to the built infrastructure. stated by the participants, when the infrastructure is not used, it becomes redundant and eventually goes into a state of decay wherein, even if it were to be re-commissioned for use, it would be very costly.

5.7.4 ICT policies, regulations, and strategies as enablers of broadband sustainability

The study went on to establish whether other interventions such as ICT Policy, regulation and strategy could enable a sustainable future for deployed broadband internet services in rural areas. In the main, the question seeks to answer the research question regarding the possibility that policies and strategies can be used as a catalyst for rural ICT sustainability

Approximately 42% of the partakers felt that the policies are partially effective, whereas about 28% of participants felt that these policies are not effective at all to make it possible for deployed ICT infrastructure to be sustainable. 21% of the participant were not aware of any ICT policies.

35 % of respondents felt that the ICT policies, regulations, and strategies respond partly to sustainability of ICT service and that they need to be implemented as a catalyst for sustainability of these in rural areas. Further, 28% felt that the policies, strategies, and regulations do not respond at all to the needs of the rural communities when it comes to sustaining ICT projects. The remaining 37% did not specifically respond to this question.

A similar conclusion as made in previous subsections can be made, based on the responses from these participants. It could be said that the data received provided the understanding that the policy and regulation that are in place do not fully respond to the issues related to sustainability of broadband services in rural areas. Also, where there is a little progress in the deployment of these services, there is lack of proper strategy that could enable sustainability of deployed ICT services. It could also be noted that the service providers need to leverage on the available policies and regulations so that they can formulate a concrete strategy that will enable them to offer services at very low costs.

5.8 Conclusions

This chapter has assisted us to record, analyse and evaluate the data received from the field. Just as with the literature that was gathered, the data proved that deployed free broadband Wi-Fi services are not sustainable beyond the expiry of government subsidy. This outcome is the result of social-economic related issues such as ICT literacy, unemployment rate, poor

households as well as the state grants that residents receive in these areas. The data revealed that many people could not afford to pay for these services on their own.

Ratlou Local Municipality is a rural municipality, and there are extraordinarily little economic activities. As mentioned earlier, there is about 43% of unemployment with 50% youth unemployment. With the understanding that the youth are the drivers of ICT services' usage, and there is such a high youth unemployment, it would thus be difficult to sustain the broadband Wi-Fi internet projects.

The literature discovered that even though the benefits of free broadband Wi-Fi are many, there have been no proper strategies put in place to ensure that these services continue to be available even if the government is no longer providing financial grants. Further, the policies and regulatory framework proved to be of little effect in enabling sustainability of broadband services in rural areas of South Africa.

CHAPTER SIX: RESEARCH CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This research aimed to evaluate the sustainability of free Wi-Fi broadband internet access in Ratlou Local Municipality in North West province of South Africa. The hypothesis was that the deployed project and services are not sustainable once the government grant ceases to assist communities and appointed service providers.

To determine this, the research had four aims interlinked together and responding to the main research problem or question as outlined in Chapter 1 of this research. The aims were, first to determine the advantages and practicability (usefulness) of the free broadband Wi-Fi internet access and service contract duration. Secondly, to ascertain whether the appointed service provider could continue providing services upon expiry of the government subsidy. Further, the research aimed at measuring the possibility of the end-user's ability to take over payment of broadband internet services for themselves upon expiry of government subsidy. Lastly, the study was meant to establish whether other interventions such as ICT policies,

regulation and strategies could enable sustainability of the deployed free Wi-Fi broadband internet projects.

When these objectives have been established or discovered, the resulting effect would be to assist in laying\ a foundation for the sustaining of deployed free broadband Wi-Fi internet access projects. Thus, before gathering information from the field, literature relating to the subject matter was reviewed and findings thereof were reported in Chapter 2 and Chapter 3 of the paper respectively.

Another aspect required to be considered for this research was the research methodology and style. Chapter 4 of this paper delved into this matter and it was explained that the research is a qualitative research method using constructivism paradigm.

6.2 Main objective of the research achieved

Section 6.1 indicated that the main research objective was to evaluate the sustainability of free Wi-Fi broadband internet access in Ratlou Local Municipality in North West province of South Africa. To attain this objective, the main question was asked "*How sustainable is the project of rolling-out free broadband Wi-Fi internet access in Ratlou Local municipality?* The hypothesis to this question was "*Free Broadband Wi-Fi internet connectivity access project in Ratlou Local Municipality is not sustainable after the expiry government subsidy period.*"

To answer the question and to test the truthfulness of the hypothesis, four sub-questions to the main question were asked, as follows:

1) How effective and practical are the services provided by the project and what is the impression of the duration of these services?
2) Is the appointed service provider able to continue providing services beyond the government subsidy?
3) Can it be possible for the end-users to take up services for themselves upon expiry of government subsidy?
4) Could interventions such as ICT policies, regulations, and strategies support sustainability of free broadband wi-fi internet projects in South African rural areas?

These questions were used as guides to the researcher to help remain focussed on the main research objective. It is understood that to be able to resolve the main issue, other related influences on the matter need to be addressed and, by so doing, one can address the main problem. Therefore, these other four questions assisted in trying to get to the bottom of the issue.

Data gathered from available literature, as well as the data gathered from the field, proved the hypothesis to be correct in that no sustainability was realised for the deployed broadband wi-fi internet access project in Ratlou Local Municipality in the Northwest Province of South Africa. The following sections will consider recommendations as well the way forward on the findings of this research.

6.3 Recommendations based on the findings

It was discovered in this research that the broadband internet access project in Ratlou municipality plays an important role in lives of those who had the services. The services helped end-users to do their day-to-day jobs with ease. It helped people to relate to the outside world and it enables them to gain access to online educational platforms. Further, these services improved their livelihood in that they were able to connect to social media and to contact friends and family. Another benefit that was not mentioned but that is possible is the opportunity to search for employment using the free Wi-Fi internet. Based on these benefits, it would therefore be acceptable on the part of the researcher to give recommendations so that similar future projects can be sustainable for longer periods.

6.3.1 ICT Costs and Employment as means for continuous ICT services in rural areas

Cost of broadband services should be reduced such that it enables people with less means to access these services. On many occasions the participants in this research have highlighted the cost of services as one of the drivers for them not to be able to take up services for themselves. The literature gathered also suggested that one of the reasons for lack of proper broadband services and sustainability thereof in rural areas is the cost of having these services.

There is high unemployment rate in the municipality under study. The Government needs to establish programs that will assist the communities in these areas to find employment. There could be public private partnership programmes whereby the private sector and government meet to establish platforms that become agents of employment in rural communities. The literature that was reviewed in Chapter 2 showed that there is a little benefit that can be achieved, as implemented in Kenya and the USA.

Although the research did not look at the condition of other infrastructure such as reliable electricity supply, road infrastructure, etc. in the area, the literature that was gathered showed that some of the hindrances from establishing businesses in the rural areas are the lack of reliable infrastructure such as roads, electricity supplies, as well as water and sanitation. Therefore, government should improve the processes and programmes of building infrastructure as a catalyst to establishing business in rural areas. This could in turn provide opportunities for employment and further enable sustainability of services in rural areas.

6.3.2 ICT Skills, literacy, and education as pillars to sustainable services

One of the key enablers to sustainability of any deployed services in the form of projects is the ability of the end-users to be acquainted and be comfortable to utilise the services brought to them (Latortue, Minel, Pompidou, & Perry, 2015:2). Thus, it is of vital importance that ICT skills training and education be taken seriously by responsible government departments. The government of South Africa is trying to conduct the skills training through the Department of Communications and Digital Technologies (DCDT) entities such USAASA and NEMISA. The training, however, seems to have challenges, wherein fewer people access it. this is probably due to the fact that the facilities are situated at some universities within the.

Therefore, as the technology evolves and the world is moving towards the 4IR, more efforts and new strategies need to be derived and implemented to offer digital skills to the poorest of the poor. When more people know and are aware of the technologies being presented before them, it becomes less difficult to utilise the services.
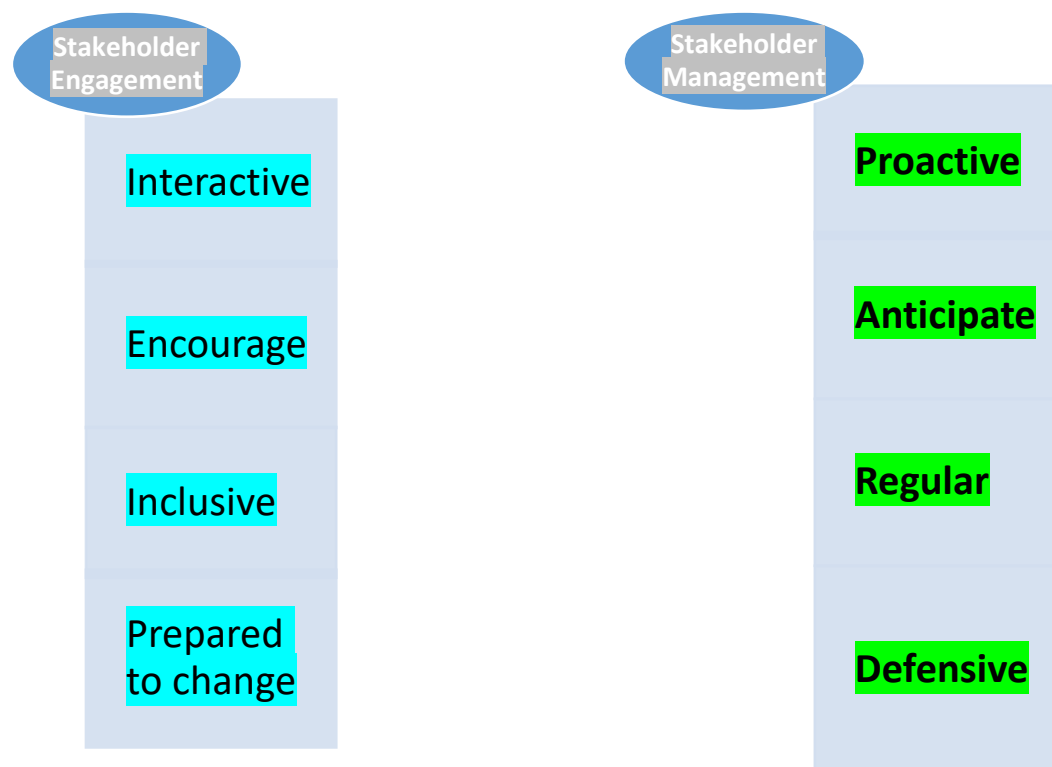
Additionally, the issue of appointing local suppliers or service providers has become a big issue when it comes to the implementation of projects in municipalities in rural areas. Therefore, there is an outcry that in most of these rural municipalities, more often than not, companies that come and implement the ICT projects are not from the local municipality nor district municipality and in some cases these companies are not from the province where the project is implemented. Usually, the response to this complaint is that there are no companies that have the know-how and appropriate skills to implement these projects. Therefore, SMMEs in the local or district municipalities require ICT skills so that they can be considered for ICT projects in their local municipalities.

6.3.3 Communication Strategy

Pivotal to the implementation of ICT projects is the communication strategy that is implemented to enable everyone affected to have insight into the project. Before implementing any broadband internet access project, needs analysis should be established whereby all the stakeholders are represented by appropriate persons or institutions. During project implementation and post implementation, there should be a continuous project communication plan that seeks to close gaps between affected parties. Of equal importance is the consultation of provincial and district leadership to pave the way for acceptance of the project. In these forums, local needs (end-user needs) should be addressed and be catered for prior to the implementation of the project.

The communication should be clear that the services will not be provided for free indefinitely and that government will cease to provide financial subsidy for internet access after a time

period. This should be presented upfront to community leaders as well to all those affected. Key to this communication strategy is the stakeholder engagement as well as the stakeholder management. The following diagrams provide a typical communication strategy that can be implemented when embarking on the free broadband Wi-Fi internet access projects in rural areas.

Stakeholder Engagement

Interactive

Encourage

Inclusive

Prepared to change

Stakeholder Management

Proactive

Anticipate

Regular

Defensive

Adopted: Jeffery, 2009:8

Figure 29 – Stakeholder Engagement and Management part of communication strategy

As the time goes on, things chang, and people also change the way they view and do things. So, when projects are conceptualised, a well-defined communication strategy must be developed as depicted in Figure 31. Meaningful stakeholder engagement and management occurs when organisations are aware of the changes in the wider society and how these changes relate to organisational performance (Jeffery, 2009:7). What the above diagram means is that for stakeholder engagement, there should be a well-rounded stakeholder interactive plan that encourages all affected parties to inclusively share their views to enable a change management approach. On the other hand, stakeholder management should not be a reactive approach, but rather a proactive one that anticipates risks and concerns of other

affected parties, thus enabling regular communication which assists in addressing possible challenges.

6.3.4 ICT policies and regulation enablers of sustainability

South Africa has established ICT policies to assist the government to implement its programs to bridge the digital divide and to realise the achievement of Vision 2030 targets as per the United Nations target. Some of latest policies are the Nation Broadband Policy (NBP) which is South Africa Connect (SA Connect) and National Integrated ICT White Paper. These policies integrate in them National Development Policy (NDP) goals which seek to ensure a lively and linked information community as well as a stimulating information economy using seamless information communication technology (ICT) infrastructure.

Notably, it is quite sad to note that the rural communities seem not to be benefiting fully to these aspirations of the government. For example, NDP linked with SA Connect should strive to connect all citizens of South Africa by 2030. But the report issued by ICASA in 2019 in its Bi-annual report - State of ICT sector painted a grim picture for South Africa, especially for rural community. It stated that 3% of rural people have their houses connected to internet and 45% of the rural people accessing internet use mobile phones outside their households.

This means that there should be a paradigm shift regarding the way these policies are executed. The New Growth Path (NGP) strategy needs to be integrated properly to projects relating to ICT in rural areas. For example, the ICT Regulator is mandated to collect funds from its licensees so that issues relating to universal access to ICT can be addressed through the Universal Service and Access Fund (USAF) managed by USAASA. USAASA in turn establishes programs and projects to connect people who are in areas that are underserviced which are mostly rural municipalities. Some similar projects are executed by BBI within the context of SA Connect policy.

There should be an emphasis on sustainability of the deployed services in rural areas. The implementing agencies of government should strengthen their strategies that drive implementation of these projects. For infrastructure sharing, there should be coordination with other state-owned entities such Sentech, Eskom, Transnet, and other government departments such as Public Works, Road and Transport as well as Energy Departments. They need to formulate a conclusive strategy that will enable leasing of infrastructure amongst these entities. Perhaps the service providers appointed to offer services in these areas could leverage on existing government infrastructure.

ICASA should continue to strengthen its efforts to enable ICT infrastructure sharing at a reasonable cost for smaller or new entrance entities. Further, TV White Space Regulation should be put to better use by the service providers because the usage of the frequencies in

this domain does not require spectrum fees. The government could further look at tax incentives for SMME's that deploy services in rural areas.

6.4 Way Forward

The research discovered that it is not possible for deployed free broadband Wi-Fi internet access project to be sustainable after the expiry of government subsidy period. This means there should be more study to discover possible intervention that could enable sustainability of the deployed ICT services in rural areas. The hypothesis was tested to be correct as far as the field responses and literature reviews are concerned.

The research has provided some recommendations for possible areas of improvement, but these suggestions could just be platforms to the better implementation and are not necessarily solutions. In the absence of solutions to the matter, it is worthwhile to explore these recommendations. Where possible, further research, needs to be done on these recommended probable solutions.

For example, research could be conducted to see where the improvement can be made in terms of policies and regulations or perhaps how new strategies could integrate these. Policies such as the DBE's e-Education White Paper of 2004 promotes the connection of schools via ICT platforms. This also needs to be integrated as part of the strategy for deployment of broadband services. Probably, revising this policy will assist in ensuring sustainable broadband services for rural areas.

E-Health services need to be strengthened in South Africa. In my opinion, there is no properly established policy on e-Health. The National Health Insurance (NHI) Policy seeks to address the issues relating to universal access to healthcare services but lacks to fully address the issues of usage of digital platforms by decentralised healthcare facilities. SA Connect touches on the aspect of connectivity bandwidth speeds for these facilities but on the part of the Department of Health, there needs to be a document/policy to complement the SA Connect targets. This is becoming urgent as the world is moving towards 4IR and even more so since the onslaught of Covid-19.

It could also be prudent to also check the possibility of giving tax incentives to SMMEs that deploy services in rural areas, so that cost of deploying as well providing services could be lessened, thus enabling cost relief for end-users. Lastly, the issue relating to the infrastructure sharing by other government entities (e.g., Eskom and Transnet) and departments (Public Works, Road and Transport, etc.) that are not necessarily providing ICT solutions as their core deliverables could also be explored as a matter of further research study.

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APPENDIX A
QUESTIONNAIRE

TITLE: SUSTAINABILITY OF FREE BROADBAND WI-FI INTERNET ACCESS PROJECTS IN RATLOU LOCAL MUNICIPALITY IN NORTHWEST PROVINCE.
This is an academic study which seeks to evaluate sustainability of free Broadband infrastructure connectivity project in Ratlou Local Municipality.

Note: Please tick the appropriate box next to your answer where necessary.

3. To which population group does the Participant belong?

Black		Coloured		Indian/Asian		white		Other:	

If other specify:

………………………………………………………………………………

4. What is the gender of the Participant? Please tick

MALE		FEMALE	

Age	

Employment status	Occupations

Objective 1: To determine the advantages and practicability (usefulness) of the free broadband Wi-Fi internet access and service contract duration.

1. How long have you had free Wi-Fi Internet Connectivity at your premises? Why is such a duration of contract?

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2. On what do you mostly use free Wi-Fi broadband internet for?

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3. How has the availability or non-availability of the internet services affected the day-today work routines or activities?

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Objective 2: Ascertain whether the appointed service provider can continue providing services beyond the government subsidy.

1. *How do ICT SMMEs make revenue in rural municipalities without help of the government?*

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2. *If the ICT SMMEs subsidy contract to provide internet services is not renewed, what happens to the deployed (built) ICT infrastructure?*

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3. *What other provisions are there or that could be made which could enable ICT SMMEs to make profit in disadvantaged rural communities?*

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4. *Is the local municipality, school, or clinic able to takeover payment of broadband internet services? Please elaborate on your answer.*

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Objective 3: To gauge the possibility of the end-user's ability to take up services for themselves upon expiry of government subsidy.

5. *As the end-user of the broadband services, how much are you prepared to pay each month upon expiry of government subsidy?*

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6. *Why are you prepared to pay the amount mentioned above?*

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Objective 4: To establish whether other interventions such as ICT policies, regulation and strategies could enable sustainability of the deployed free Wi-Fi broadband internet projects

1. In terms of the current government policies, do current policies fully respond to ICT broadband internet sustainability for rural communities?

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2. Considering South African ICT Strategy, does the country have a well-established ICT strategy that is aligned to the current ICT Policy?

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3. Do you think that the current ICT Regulations play an important/vital role in stimulating sustainability of ICT services, especially for rural municipalities?

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GENRAL QUESTIONS

Objective: To establish other important factors affecting sustainability of free Broadband Internet Project in Ratlou Municipality which are not mainly covered by the main objectives

1. In your opinion, what role does inter-governmental coordination play in ensuring sustainability of free broadband Wi-Fi internet service project in Ratlou municipality?

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2. What other challenges did you experience during the duration of the free broadband Wi-Fi internet services offered by the government?

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3. Based on the answers you have provided on 1 and 2 above, what recommendations can you give which could assist to address the issues relating to free broadband Wi-Fi internet project sustainability?

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