

**FACTORS AFFECTING INTERNET AND BROADBAND PENETRATION IN  
SOUTH AFRICAN ORDINARY SCHOOLS**

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**RESEARCH REPORT**

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## **Abstract**

This study is about investigating the supply-side factors affecting broadband connectivity in South African ordinary schools so as to determine the challenges of providing broadband in these schools. It focuses on understanding why only 25% of these schools (RIA, 2012) have broadband connectivity whereas South Africa has resources that include; policies, legislations and regulations; available infrastructure and funding, which are aimed at advancing the Internet connectivity in schools. In this regard, this study assesses the effectiveness of the existing policies and regulations, particularly in terms of implementation, to determine where the blockages are. It also identifies the areas that require intervention. The study also examines the challenges in the provision of the existing broadband infrastructure to these schools and the effectiveness of the current funding mechanisms. The main aim of the study is to identify and analyse the supply-side blockages in the rollout of broadband connectivity in schools and then make recommendations on how to address these barriers so as to improve broadband penetration in ordinary schools. The study is premised on the notion that broadband is an educational resource that can be used to improve the delivery of education, to widen access to online educational resources and to improve the teaching and learning processes, thereby contributing positively to the quality of education in South Africa.

## Declaration

I declare that this research report: *“factors affecting Internet and broadband penetration in ordinary schools in South Africa”* is my own work. It is submitted to the Faculty of Humanities, in partial fulfillment of the requirements for the degree of Master of Arts in the field of ICT Policy and Regulation [MA(ICT)PR] in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

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SIGNATURE

Tsholofelo Rebecca Mooketsi

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DATE

## **Acknowledgements**

In finalizing this research report, I had to critically analyse the challenges that are clouding and blocking the effective provision of broadband in ordinary schools and then develop appropriate solutions to resolve these long standing blockages. My drive and passion in so doing was to contribute my bit in creating opportunities and possibilities for realizing digital inclusion for all in education especially for the less fortunate learners, most of which having access to broadband Internet is still just a dream. My wish is that these research findings and recommendations find resonance with those who are empowered to implement the solutions I have proposed. Together, let us put South African learners in the digital map!

I wish to thank everyone who contributed to the development of this Paper. This was an enormous task that I wouldn't have been able to complete without being guided by other people's remarkable knowledge and experiences of the domain of ICTs in Education.

My special thanks goes to my family, my lovely daughter, Ditebogo, my loving partner, friends and colleagues who supported me in this process. Thank you for understanding that I had to produce this report. I'm grateful to all the people who granted me the privilege of interviewing them in this process. These are the souls whose drive is to attain positive change in this sector and would do anything to contribute to creating that change. I appreciate your time and efforts in assisting me to put this together. Lastly, I thank my supervisor, Ms Lucienne Abrahams, for her endless support, hope and inspiration that she instilled in me to complete this report.

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## Acronyms

BECTA	British Educational Communications and Technology Agency
DBE	Department of Basic Education
DOC	Department of Communications
DST	Department of Science and Technology
DTPS	Department of Telecommunications and Postal Services
ECA	Electronic Communications Act, No. 36 of 2005 as amended
ICASA	Independent Communications Authority of South Africa
ICT	Information and Communications Technology
IP	Internet Protocol
ISP	Internet Service Provider
ISPA	Internet Service Providers Association
ITU	International Telecommunication Union
LAN	Local Area Network
NDP	National Development Plan 2030
NGO	Non-Governmental Organisation
NPC	National Planning Commission
OECD	Organisation for Economic Co-operation and Development
PDEs	Provincial Departments of Education
PICC	Presidential Infrastructure coordinating Commission
POP	Point of Presence
R&D	Research & Development
SA	South Africa
SACF	South African Communications Forum
SIPs	Strategic Integrated Projects [consists of 18 strategic integrated projects]
SOC	State Owned Company
USAASA	Universal Service and Access Agency of South Africa
USAF	Universal Service and Access Fund
USAO	Universal Service and Access Obligation

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## **CHAPTER 1: INTRODUCTION TO BROADBAND CONNECTIVITY IN EDUCATION**

### **1.1 INTRODUCTION**

The advent of the twenty-first century has seen the rapid growth in technological developments, particularly in the use of information and communications technologies (ICTs), which refers to a global network that enables information dissemination, manipulation and consumption. The digital technology, particularly broadband (defined as high-speed Internet), has transformed the way people live, play, learn and communicate with each other. Of note, is how broadband is transforming the education sector, ranging from the delivery of instruction, its contribution in the improvement of the quality of education and the impact on role of teachers in the digital era. The broadband connectivity facilitates access to online educational resources and content and promotes innovation in the development and the delivery of educational instruction. Broadband technology is a tool that could be used to strengthen the administrative, teaching and learning processes so as to improve the delivery and the quality of education. South Africa with a low ranking in the global competitiveness is a primary example of a country than can benefit through the adoption of digital technologies in education.

South Africa has 25 720 public and independent schools, collectively referred to as ordinary schools (DBE, 2013a). The research has revealed that only 25% of these ordinary schools have broadband connectivity (RIA, 2012). Moreover, the quality of education in South African ordinary schools is below standard, with South Africa ranking as number 140 out of 144 countries in regard to its global competitiveness on the quality of education system in the world economic forum study (WEF, 2013, p.261).

This study focuses on investigating the factors affecting broadband connectivity in South African ordinary schools with the aim to understand the challenges that characterizes the current low broadband penetration. The broadband penetration in schools in this study refers to the number of schools that have broadband connectivity. The aim of this study is to use the research instruments to derive critical information

(from data collection sources), that will inform the development of relevant measures and recommendations required to address the challenges in providing broadband connectivity in schools. The premise for this research is that South Africa has policies and regulations that support the provision of broadband connectivity in schools and that these policy and regulatory tools should advance the rollout of broadband in schools. However, the current broadband penetration level in schools does not reflect this reality.

In investigating the challenges with the broadband provision in South African ordinary schools, the study focuses on examining the institutional arrangements, strengths and weaknesses of the existing policies and regulations that seek to promote broadband provision in schools. It looks at the effectiveness of the existing funding and investment mechanisms that aims at supporting schools connectivity to determine the appropriate funding model. The study also examines the adequacy of the available broadband infrastructure to connect schools, focusing on infrastructure rollout challenges. It also focuses on identifying other key barriers in providing broadband connectivity to schools, with a view to understand both education and ICT related factors that brought about the current state of affairs. The study sources data from documents review and interviews. It also explores the literature review that focuses on the rationale of integrating broadband connectivity in schools (exploring the opportunities and challenges), on understanding the educational value of broadband connectivity and on the provision of broadband infrastructure in schools.

This study focuses mainly on the supply-side factors affecting broadband connectivity and penetration, however, it acknowledges that broadband penetration is influenced by both the supply-side and demand-side factors. In order to pursue this notion, the study has therefore made provision, through data collection, to also explore critical demand-side factors that affect broadband provision in schools so as to holistically understand the general challenges of broadband provision and uptake in schools. The ultimate aim of this research is to contribute towards creating a digital education society in South Africa where every learner and every teacher has access to digital educational opportunities and content, particularly opportunities presented by broadband connectivity and services.

## 1.2 THE GLOBAL TRENDS IN ICTS IN SCHOOLS

The value of the use of ICTs in schools has been demonstrated in many case studies globally, mainly illustrating how ICTs could be of immeasurable significance to improving the quality of education. ICTs in schools can contribute to socio-economic development in a country and can strengthen participation in a global knowledge economy. The Internet provision in schools, particularly broadband connectivity, lies at the heart of ICTs in education as it enables connectivity, collaboration and creates an even access to digital educational content for all. It therefore presents a huge opportunity to contribute towards strengthening the teaching and learning processes, thus ultimately improving the quality of education.

The international telecommunications union (ITU) and UNESCO have launched the Broadband Commission to advocate access to broadband for all and to promote affordable and equitable access to high-quality online content and resources. This commission's working group on education has established that the power and potential of technology in improving education is through "increasing the efficiency of school systems, transforming traditional pedagogical models, extending learning opportunities beyond the limits of schools and classrooms and expanding educational access for disadvantage groups" (Broadband Commission, 2013, p.10). The Broadband Commission has also argued that access to quality education for all, which includes access to ICT, is an imperative for building inclusive and participatory knowledge societies. The Declaration of Broadband Inclusion for All, highlights the strategic importance of broadband access in ensuring quality education for all.

The ITU has also launched a public-private partnership called *Connect a School, Connect a Community* to promote broadband Internet connectivity for schools in the developing countries around the world. The driving force of this initiative centers around a notion that schools that have Internet connectivity have the potential to serve as community ICT centres, thereby providing access to ICT services for people in underserved areas.

The provision of broadband connectivity in schools can be seen as a vehicle that could be used to expedite the efforts of realizing the Information Society and Millennium

Development Goals. The World Summit on the Information Society (WSIS) has a target to connect all primary, secondary and post-secondary schools to ICTs by 2015.

At a continental level, the NEPAD e-Schools initiative was launched in 2003 and has been adopted as a continental priority undertaking of NEPAD e-Africa Commission. It is aimed at empowering the African schools and learners with ICT access and skills that will enable them to participate effectively in the global information society. South Africa is a member and partner in all these global initiatives.

### **1.3 THE GLOBAL TRENDS IN BROADBAND TECHNOLOGICAL DEVELOPMENT FOR EDUCATION**

The ICT sector has experienced a notable change in recent years largely owing to the emergence and evolution of the Internet and new media. This has resulted in the rapid expansion and fast-paced developments in technology. The technological development is driven by convergence of the technology platforms, applications, services and end-user devices. This convergence enables a single infrastructure to provide a multiplicity of content or services and also enables technological systems to perform multiple tasks with one device. This essentially means that digital information or content (voice, data and video) can be accessed by one device. This makes it possible for interactive educational material to be developed and accessed using a single device, thus reducing costs in accessing broadband services. This also enables the learners and teachers to interact with broader education communities, on a virtual space, thus widening access to educational resources. The digital information, including digital educational content, can be easily exchanged, manipulated and consumed through the World Wide Web, thus making Internet a very critical resource for the storage, distribution and sharing of information in the education sector. The search engines have accumulated and stored so much information that one just need to type a word or a phrase to retrieve information about anything anywhere.

Adding to the benefit of convergence is the deployment of new technologies such as fibre-optic and wireless technologies. The fibre-optic technologies have increased the speed and capacity of transmission of data, thereby introducing broadband

technologies, which enable high-quality video applications such as videoconference, which can provide meaningful two-way, interactive and real-time educational experiences between learners and teachers. Through broadband, distance education can be delivered, as huge amount of data can be transmitted at a faster speed reaching a wider range of people. The emergence and use of wireless technologies (satellite, WiMax and Wi-Fi signals) provides advantages of mobility and convenience, and allows for the provision of wireless broadband connectivity. Satellite technologies also enable the delivery of distance education in remote areas to promote digital inclusion of all.

The broadcasting environment is also changing through the migration of terrestrial TV from analogue frequencies to digital terrestrial television frequencies, and it presents digital opportunities for education. This digital migration process will free up the radio frequency spectrum for new technologies as digital signals are more spectrum efficient, thus resulting in an increase in the number of television channels which is essentially an increase in programming and content. This will make it possible for more educational content to be delivered through television. It creates opportunities for more television based educational material to be developed and distributed. Some 'freed' spectrum, sometimes referred to as the 'digital dividend' can be used for other wireless broadband services.

The development of Internet has also made it possible for data and programs to be stored and accessed over the Internet instead of the computer's hard drive, through cloud computing services such as the Dropbox and Google drive. This reduces spending on technology infrastructure in schools and improves accessibility. Likewise, educational information can be stored in the cloud, thereby savings costs on the hardware and benefiting from more secured networks.

The technological developments, through the virtual world full of information, have created the wealth of information that can provide learning opportunities when learners are connected to it. There is an expanding Internet based content environment which also display educational content. Moreover, the digital technologies offers opportunities for the delivery of any form of content through any smart device. In education, the technological development means that educational digital content can

be developed and shared with all learners who have access to broadband infrastructure. Access to this infrastructure therefore becomes a bridge to access to on-line educational information and content.

#### **1.4 UNDERSTANDING THE CHALLENGES IN BASIC EDUCATION SYSTEM IN SOUTH AFRICA**

The benefits of broadband connectivity and services in schools can only be realized if broadband is used as a tool to address the education challenges. It is important to understand the nature of these education challenges so as to determine the relevant broadband technology interventions required to address them as part and parcel of the educational reform programme. This therefore necessitates this study to provide the perspective on the background to the basic education system in South Africa and on the current state of the performance of the system. This perspective highlights the current challenges of the education system that affects the educational outcomes.

The main education factors of concern in this study include the use of ICTs, particularly broadband technology, to effectively deliver instruction in education, to widen access to education and to improve the quality of education.

##### ***1.4.1 Background to basic education system in South Africa***

South Africa is a country that is characterized by high levels of socio-economic inequalities that largely emanate from its historical legacy of apartheid regime where provision of services was distributed in an unequal manner. The current problems experienced in education system draw also to a large extent from the apartheid inspired Bantu Education that sought to limit access to education for the majority of South Africans. The Bantu Education Act No 47 of 1953 is the legislation that introduced and institutionalized a system of racial segregation in the provision of education in the then apartheid South Africa. Access to educational resources and services for learners was determined by race. Schools for white people were given priority in terms of financing and resourcing over those of black people, resulting in an uneven distribution of educational resources and services to learners and consequently unequal education. For example, in 1982, the apartheid government spending on education per child was: R1211 (White child), R771 (Indian child), R498

(Coloured child) and R146 (Black child) (Equal Education, 2011). This Bantu education system deprived and disadvantaged millions of black people for decades from accessing quality education, thereby creating an education system that is largely characterized by issues of inequity and exclusion of the majority of South Africans.

In 1994, South Africa became a democratic country after decades of apartheid. The post-apartheid government was then faced with a huge challenge of addressing the inherited educational imbalances of the past so as to improve the quality of education and increase access to education for all in South Africa. The government thus focused on implementing the principles of social justice, redress, inclusiveness, access and equity, in line with the country's 1996 Constitution, so as to transform and democratize education.

In order to do away with the previous Apartheid era disintegration and racially based education institutions, the democratic government introduced a single system of government, which consists of three spheres of government (national, provincial and local government) in education. The national and provincial governments having a concurrent responsibility for education, where the national government is responsible for policy development and the provincial government is in charge of policy implementation.

Through the Education Laws Amendment Act of 2005 (DBE, 2005), the democratic government has also introduced a "no-fee" schooling programme to exempt poor learners from paying school fees and to ensure inclusion of all learners to quality education. About 80.5% of South African ordinary schools have been declared no-fee schools (DBE, 2013b, p.19). The government invested heavily in teacher development programmes in order to raise the qualification level of teachers over the past twenty years. The Education for All: 2012 Country Progress Report SA (DBE, 2013b) reveals that the percentage of the qualified teachers in basic education has increased to 97.4% in 2012, from 53.0% in 1990. The report also illustrates that in 2012 the national average learner to educator ratio (LER) was improved to 30.4 to 1 (it was 43:1 in 1996). Other priorities of transforming education in South African ordinary schools such as providing access to water, sanitary facilities, electricity, supplies of teaching and

learning materials have also improved. The 2013 DBE Annual Report (DBE, 2013c, p.19) indicates that only 3000 ordinary schools did not have electricity in 2013.

In the period of 20 years, the democratic government has created improved teaching and learning conditions, thus enabling South African learners to experience a more equitable, inclusive, efficient and better quality system of education. However, the democratic government has not yet fully succeeded in eradicating all the education challenges. The education system is still faced with deep-rooted challenges such as: poor quality of education, inequitable infrastructure provision and poor learning outcomes. This is apparent even in the current approach in the provision of broadband connectivity in schools. The 25% of broadband penetration in ordinary schools means that about 75% of these schools do not have opportunities to access the digital educational resources and content presented by the broadband technology. Moreover, it means that the majority of the learners are still digitally excluded from accessing the existing online educational material, thereby also highlighting the disparity in the provision of educational resources in South African ordinary schools.

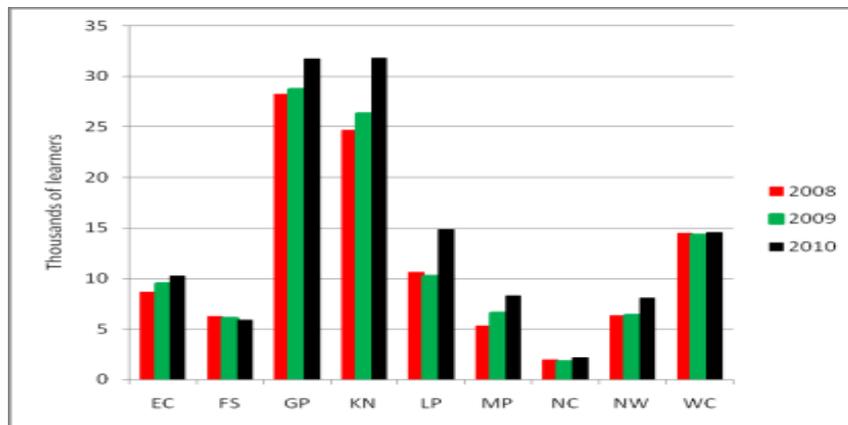
#### ***1.4.2 The current state of performance in educational outcomes***

The performance of an education system is generally measured by the matriculation examination results, as they denote the evident indicator of the throughput. These matriculation results also determine options for university entry, bursaries, post matriculation career choice and labor market prospects. The matriculation performance is critical for enrolment in higher education institutions and consequently for the economic development of the country. This is because it is mostly higher education graduates who largely contribute towards the socio-economic development through either joining the work force or contributing towards job creation.

The Figure 1 below shows that there has been a minimal increase in the number of learners obtaining a bachelor's degree in the years 2008-2010. This gives a direct reflection on the state of the educational throughput in the country. This figure also shows the unevenness of the performance of the education system across all nine provinces of South Africa. It clearly illustrates that the education field is not leveled in all parts of the country as few provinces (Gauteng, Kwa-Zulu Natal, Limpopo and

Mpumalanga) have recorded a significant increase in 2010 as compared to previous years.

**Figure 3: Learners obtaining a Bachelors level**



Source: DBE, 2011

According to the Annual Sector Review Report (DBE, 2011), there has been a steady increase of the number of Grade 12 examination passes qualifying for Bachelors studies. There has been an improvement in matric pass rate since 1994, from 58% (1994), 67.8% (2010) and 78.2% (2013) (DBE, 2013c) even though this increase has not been steady.

Spaull (2013, p.57) argues that the pass rate is not an accurate indication of the quality of education in the country as it only reflect the performance of the best-performing 50% of those that make it to Grade12. He further elaborates that ‘Of 100 pupils that starts school, only 50 will make it to grade 12, 40 will pass, and only 12 will qualify for university’.

The DBE’s new Annual National Assessments programme (DBE, 2011) has indicated that learner performance is below what it should be by any standards. This challenge in South Africa’s education system has been highlighted at an international level. The world economic forum (WEF, 2013, p.261) ranks the country as number 140 out of 144 countries in regard to its global competitiveness on the quality of education system.

## **1.5 THE CURRENT STATE OF BROADBAND CONNECTIVITY AND PENETRATION IN SOUTH AFRICA**

The broadband market in South Africa illustrates high levels of inequalities in the provision of services, particularly between rural and urban areas. The 2011 census (Statistics South Africa, 2011) reveals that only 35.2% of households have access to the Internet and that only 14.5 % of households had access to landline in 2011. In 2013, the broadband penetration in the country stands at 33.7% (DoC, 2013b). According to Gilwald, Moyo and Stork (2013, p.5), the number of Internet users in South Africa is 34% of the adult population.

The broadband market structure in South Africa is characterised by the dominant and vertically integrated market players in the fixed market and mobile market. The fixed infrastructure market is dominated by Telkom and the mobile and wireless market is dominated by MTN and Vodacom. The other market players including Neotel (fixed), Cell C and Telkom mobile (wireless) do not effectively compete against these dominant players. Most of these market players have invested considerably in the deployment of broadband networks in economically feasible high density population areas. Most of the rural areas remain underserved or unserved, largely owing to failure of government policies and regulatory interventions to promote effective competition in the broadband sector.

South Africa has made considerable investments in the rollout of national broadband backbone infrastructure, which is provided by a number of private and state-owned enterprises. This provides the country with an extensive long distance fibre network. The BMI-T study on broadband penetration reveals that about 86% of the South African population is within 10km of access to fibre (DoC, 2013b). This study also shows that fixed line penetration was at 7.9 % in 2012 and mobile penetration rate at 136%. The broadband market is primarily driven by an increasing growth of the mobile services, thereby making mobile broadband the primary form of broadband access for most people. In line with this study, multiple undersea cables have landed in the country since 2009 and this led to increased availability of and more affordable international bandwidth. However, the development of national terrestrial networks still remains the critical infrastructure challenge, particularly in delivering high capacity

access network. The broadband infrastructure coverage gap is therefore largely in the access network.

In addition to infrastructure challenges, the high costs of accessing and using communication services are a barrier to the growth of broadband uptake in South Africa. The study by Gilwald, Moyo & Stork (2013) also reveals that the cost of communication in South Africa remains relatively high in comparison to other African countries. In the ITU's ICT price basket that compares the cost of communication in various countries, South Africa declined from 70th position in 2009 to 98th in 2011 (ITU, 2012) and this cost remains high compared to global decline. The bottlenecks around spectrum allocation has also been cited as a challenge for the deployment of wireless broadband services.

In order to address the broadband challenge, South Africa has developed a National Broadband Policy and the associated strategy referred to as "South Africa Connect" (DoC, 2013a, p.4), which focuses on "creating an enabling environment for the rollout of broadband infrastructure and the production of associated content, applications and services". This Broadband Policy advocates for inclusion of reach, availability and affordability of the different elements of the national broadband landscape, as imperatives for policy interventions to enhance broadband access.

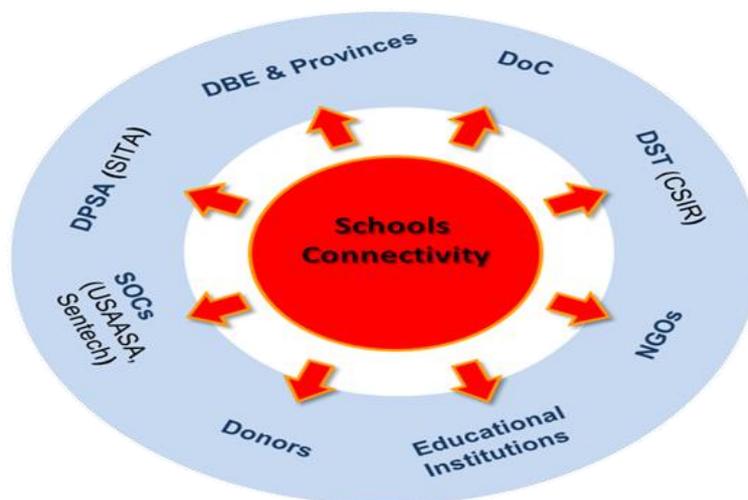
### ***1.7.1 The rollout of broadband services in schools***

The provision of broadband connectivity to schools requires access to telecommunications and broadband networks to provide education services. Broadband connectivity in schools therefore depends largely on the status of broadband provision in the country. Consequently, the market dynamics in the ICT sector, particularly telecommunications, therefore impact on the provision of broadband connectivity to schools.

The national Department of Basic Education does not provide Internet or broadband connectivity to schools. Schools are currently receiving Internet connectivity in an uncoordinated manner and through various ICT initiatives led by various stakeholders, including public and private sector stakeholders. The implementation of Internet

connectivity to schools therefore takes place at different levels of government. The national departments such as Basic Education (DBE), Communications (DoC) and Science and Technology (DST) are indirectly and/or directly facilitating the provision of connectivity to schools. On the other hand, some provinces are subsidizing Internet connectivity to their schools. For instance, Gauteng Province through the Gauteng-on-Line (GoL) project and Western Cape Province through Khanya project are currently in the lead. Other provinces are lagging behind as they do not even have the connectivity plans or strategies for e-education. The private sector is also involved in implementing ICTs particularly Internet connectivity and computers in schools through the corporate social investment (CSIs) programmes. Schools are therefore at different levels of development in regard to the provision of Internet connectivity. The non-governmental organizations (NGOs) such as SchoolNet, Intel and Mindset are also involved in the implementation of ICTs in education. Figure 2 below illustrates the stakeholders involved in the implementation of schools connectivity in South Africa.

**Figure 4: Stakeholders involved in providing Internet connectivity to schools in South Africa**



Source: Adapted from various reports (DBE, 2013b; DoC, 2013a; ICASA, 2012)

## 1.6 THE POLICY AND LEGISLATIVE ENVIRONMENT ON SCHOOLS CONNECTIVITY

South Africa has policies and plans that support the rollout of Internet connectivity in ordinary schools. Currently, both the Departments of Basic Education and Telecommunications and Postal Services are driving the schools connectivity

initiatives. As shown in Table 1 below, the country set a vision to establish an education network to link all schools in 1996. As illustrated, subsequent to this vision was a string of policies/plans that supported the provision of Internet connectivity in schools.

Table 3: Legislative and policy environment for broadband in schools

<b>Legislation/ Policy/Plan</b>	<b>Year</b>	<b>Implications of Internet connectivity in schools</b>
Telecommunications Act	1996	Advocated for establishment of an education network (EduNet) to link all schools
Telecommunications Amendment Act	2001	Introduced a discounted e-rate provision to facilitate subsidy to Internet connections to schools.
White Paper of e-Education	2004	Places Internet connectivity as the key pillar to providing ICTs in schools.
Electronic Communication Act (ECA)	2005	Repealed the Telecommunications Act and its amendments but retained the e-rate, thus putting more impetus on the provision of Internet connectivity to schools.
Feasibility Study in e-Education	2009	To determine the financial and technical feasibility of implementing e-Education.
National Development Plan – National Planning Commission (NPC)	2012	Calls for the availability and incorporation of high speed broadband into a design of schools infrastructure
Presidential Infrastructure Coordinating Committee (PICC) - Strategic Integrated Project 15.	2012	Priorities schools connectivity as one of the deliverables to expand access to communications technology
National Broadband Policy (RSA)	2013	Sets broadband targets for schools connectivity

Sources: (RSA, 1996; RSA, 2001; DBE, 2004; RSA, 2005; DBE, 2009; NPC, 2012; RSA, 2012; DoC, 2013a)

Table 1 above illustrates government's commitment in providing Internet connectivity to schools, starting in 1996 with the enactment of the Telecommunications Act which advocated for establishment of an education network (EduNet) to link all schools. This commitment was carried in various policy documents, legislations, regulations and government plans as indicated in the Table 1.

South Africa's e-Education White Paper of 2004 (DBE, 2004) advocates for the Internet connection in schools: *'every teacher and learner in General and Further education and training must have access to an educational network and the Internet'*. As a key milestone in implementing the White Paper, the DBE conducted a Feasibility Study in ICTs in education in 2008 (DBE, 2008) to assess the feasibility of providing ICTs to schools.

The provision of broadband to schools is also supported by the overarching government policy such as the National Development Plan (NPC, 2012) which advocates for the availability and incorporation of high speed broadband into a design of schools infrastructure. In 2012, the Presidential Infrastructure Coordinating Commission (PICC) launched Strategic Integrated Project (SIP) 15 with a focus on expanding access to ICTs and priorities schools connectivity as one of its key deliverables (PICC, 2012, p.23). It aims *"to ensure universal service and access to reliable, affordable and secure broadband services by all South Africans, prioritising rural and under-serviced areas and stimulating economic growth"*. This vision is carried further in the National Broadband Policy of South Africa (DoC, 2013a), which put policy measures in place by setting broadband targets for schools connectivity.

## **1.7 THE REGULATORY PROVISIONS FOR INTERNET CONNECTIVITY IN SCHOOLS**

The implementation of broadband infrastructure in schools is supported by the legislative and regulatory provisions, particularly on e-Rate, universal service and access obligations (USAO) framework and universal service and access fund (USAF). All these provisions are contained in the Electronic Communications Act (ECA) of 2005, and its amendment of 2014. The sector regulator, Independent Communications Authority of South Africa (ICASA), uses the development of regulations as regulatory tools for implementation.

The regulatory provisions are outlined as follows:

### **1.7.1 The Education Rate (e-Rate)**

The ECA of 2005 (RSA, 2005, section 73 (2)) empowers ICASA to prescribe regulations regarding the e-rate, which is a 50% discounted rate for provision of Internet services to schools. The e-rate was introduced to address Internet access challenges for schools. The e-rate regulations specify the manner of implementing the discount to be offered by service providers to public schools for access to Internet services. The schools are entitled to a total minimum discounted rate of 50% of the total charge levied by Internet Service Providers. The discount is applicable off the total charge levied by the licensee which includes but is not limited to:

- any connectivity charges for access to the Internet;
- charges for any equipment used for or in association with connectivity to the Internet; and
- all calls made to an Internet Service Provider

### **1.7.2 The universal service and access obligations (USAOs) for schools connectivity**

In an effort to expand ICT infrastructure to under-served areas and to rollout connectivity to schools, ICASA had imposed obligations on the awarding of the operating license and of the 1800 MHz and the 3G spectrum to licensees (ICASA, 2010a). The allocation of the number of schools to licensees with these obligations (Table 2) indicates that about 23 500 schools, out of the current 25 000 ordinary schools in South Africa were set to benefit from these license obligations regulatory initiative.

**TABLE 4: LICENSEES WITH 1800 MHZ AND THE 3G SPECTRUM  
OBLIGATIONS TO CONNECT SCHOOLS**

<b>Licensee</b>	<b>No. of schools allocated</b>
Neotel	2500
MTN	5000
Vodacom	5000
Cell C	5000
Sentech	5000
iBurst	1000
<b>Total no of schools</b>	<b>23 500</b>

Source: ICASA (2010a)

### **1.7.2 The universal service and access fund (USAF)**

The Electronic Communications Act (ECA) 36 of 2005 supports the continued existence and control of the USAF (RSA, 2005, section 87(1)). This fund provides for projects and programmes that aims to realize the universal service and access goals to ICTs. The ECA requires all license-holders to make prescribed contributions to this fund. This fund has been used by most schools for Internet connectivity where schools cannot afford the operational cost of connectivity.

### **1.8 THE PROBLEM STATEMENT**

The low Internet penetration level of 25% (RIA, 2012) in South African ordinary schools in schools denies many learners access to digital educational opportunities and educational resources (Trucano, 2005). This low Internet penetration means that learners and teachers in most of these schools (75% of them) will not be able to access and use the available online digital educational resources to enhance teaching and learning processes, so as to improve the already challenged quality of education in the country. This leads to the digital exclusion in the learning environment as it creates, uneven access to educational resources. It therefore opposes South Africa's constitutional imperatives of creating equal educational opportunities to all learners. It is also not aligned with the *Declaration of Broadband Inclusion for All* which highlights

the strategic importance of broadband access in ensuring quality education for all (Broadband Commission, 2013).

South Africa has available resources that could be used to increase Internet penetration in schools. Such resources include policy and regulatory instruments such as the national broadband policy, e-rate, USAOs for schools connectivity and funding resources (USAF, national and provincial budgets for education). Moreover, South Africa has significant broadband infrastructure coverage, considering that 73% of ordinary schools fall geographically within the national broadband coverage as revealed in the study by BMI-T (DoC, 2013b). However, these schools do not have Internet connectivity and therefore cannot use the Internet. South Africa can, and should have, leverage on these existing policy and regulatory resources to improve the rollout of Internet connectivity in schools. Regrettably, most ordinary schools still do not have an Internet connection and there has been no comprehensive analysis that is publicly available on this issue. This therefore provides the rationale for this research.

There is a shortage of research that focuses on the barriers to Internet provision in South African ordinary schools and this study seeks to close this gap by creating this knowledge base.

## **1.9 RESEARCH OBJECTIVES**

The primary objective of this research is to examine how supply-side factors affect Internet and broadband penetration in ordinary schools and to propose recommendations to overcome the challenges identified.

The following objectives will be addressed:

- To investigate the challenges in implementing the existing policies and strategies for the advancement of the provision of broadband connectivity to schools.
- To provide insight into the current state of schools that fall within the broadband coverage but which are not connected to broadband and the challenges that arise in this respect.

- To determine the extent to which the current funding mechanisms address funding requirements for Internet connectivity in schools.
- To explore the challenges with implementing USAOs and e-Rate to provide Internet connectivity to schools.
- To understand the proper coordination structure for implementing broadband in schools and to understand roles of various stakeholders.

### **1.10 THE PURPOSE OF THE RESEARCH**

The purpose of this research is to investigate the challenges around broadband provision in ordinary schools in South Africa. The research is intended to study the supply-side factors affecting Internet and broadband penetration in schools with a purpose of identifying the areas that requires intervention so as to improve broadband penetration.

The study will assess the effectiveness of the existing policies, regulations and strategies for broadband adoption. It will highlight the policy implementation gaps and challenges and will make recommendations on the required interventions. The study will also investigate the challenges of providing broadband connectivity to schools that have broadband coverage to determine why these schools do not have broadband connectivity. This will include the challenges on the implementation of USAOs to determine why most schools are not connected.

The study will also assess the effectiveness and adequacy of existing funding mechanisms in addressing funding requirements for broadband access in schools. The aim is to provide clarity on the role of government in providing funding for broadband connectivity, usage and end-user devices.

In addition, this study is intended to provide guidance to the policy development processes of the national Department of Education and Telecommunications and Postal Services, on how to speed up the roll out of broadband connectivity to schools so as to deliver on the country's responsibility of providing an inclusive quality education.

## 1.11 THE RESEARCH QUESTIONS

The central question in this research is: How is Internet and broadband penetration in schools affected by supply-side factors?

In seeking to respond to this key question the research will ask the following sub questions:

1. What are the challenges in implementing the existing policies and strategies for the advancement of the provision of broadband connectivity to schools?
2. Why are schools that fall within the broadband coverage not connected to broadband?
3. To what extent do current funding mechanisms address funding requirements for Internet connectivity in schools?
4. What are the challenges with implementing USOs and e-Rate to provide Internet connectivity to schools?
5. What is the proper coordination structure for implementing broadband in schools and what are the roles of various stakeholders?

## 1.12 THE STRUCTURE OF THE REPORT

**Chapter 1:** This chapter sets the scene for the study. It provides the national and international perspective on the integration of broadband technology in schools thereby highlighting the educational value of broadband. It highlights the research problem, presents the rationale for the study and it gives an overview of the state of education and broadband in South Africa.

**Chapter 2:** This chapter provides the literature review on the concepts of integrating ICTs (particularly broadband technology) in schools, understanding the educational value of broadband connectivity in schools and opportunities and challenges of providing broadband connectivity in schools. The literature review provides critical analysis of the literature, identifies key concepts and theories on broadband connectivity in schools to establish the conceptual framework.

**Chapter 3:** This chapter focuses on the research design and method, as well as the data collection and data analysis techniques. It describes the research methods selected for this study and provides rationale for choosing these methods.

**Chapter 4:** This chapter presents the findings of the data collection based on the two research methods, i.e. the document review and analysis as well as the interviews conducted. These findings are aligned with the research objectives and research questions.

**Chapter 5:** This chapter takes a diagnostic view on the research findings presented in order to understand the underlying challenges that creates barriers to the provision of broadband connectivity in schools. It provides critical analysis of the issues, identifies the gaps and areas that requires interventions to pave the way for the development of recommendations.

**Chapter 6:** This chapter outlines the key recommendations to address the gaps that are delineated in chapter 5. It seeks to provide solutions to the identified challenges of providing broadband connectivity to schools, with the aim to improve the current broadband penetration level in South African ordinary schools. It reflects on the research questions, provides responses to these questions also draws conclusion on the issues.

### **1.13 LIMITATIONS OF THE STUDY**

This research is limited by its scope of orientation, that is, its main focus on the supply side of broadband connectivity. It is believed that the research could gain more value if it is to focus on both the supply side and the demand side of broadband provision in schools as there are critical demand-side factors, such as skills development and appropriate education content, which could have potential effect on broadband penetration in schools. Unfortunately, the focus is only on the supply side of broadband, mainly due to the large scope of work involved on issues related to broadband connectivity and usage in schools. The restricted research schedule and time frame for this degree does not allow for the exploration of the entire value-chain of broadband connectivity in schools.

## **CHAPTER 2: LITERATURE REVIEW ON BROADBAND CONNECTIVITY IN SCHOOLS**

### **2.1 INTRODUCTION**

This chapter establishes the knowledge foundation on broadband connectivity in schools. It presents an outline of key concepts from the literature review and outlines the knowledge gap. It also positions the proposed research question and clearly outlines other researcher's views with respect to the scope of the research problem and purpose.

The key research question that this literature is supporting is: what are the supply-side factors that affect broadband penetration in South African ordinary schools? As a starting point, the literature review explores the literature on the definition of broadband to provide the context and then discusses the educational value of broadband connectivity to schools, the rollout of infrastructure rollout and investment and it looks at the implications of integrating ICTs in schools.

The approach to the literature review acknowledges that the supply of broadband connectivity in schools is not a challenge that stems from the ICT sector alone but that an education sector also plays a key role in driving this initiative. That is, for broadband penetration in schools to increase, it is critical to also understand both the ICT and Education environment. This approach is referred to as "broadband supply-side factors" in this research. The literature review thus focuses on the broadband supply-side factors of both the ICT and Education sectors.

### **2.2 PERSPECTIVE ON THE DEFINITION OF BROADBAND**

Broadband has been defined in various ways. The need to specify the speed and the bandwidth has been at the core of the debate in defining broadband. The International Telecommunication Union (ITU) defines broadband as a transmission speed of 1.5 to 2 Mbps. The Broadband Commission (2013, p.12) has argued that "the level of

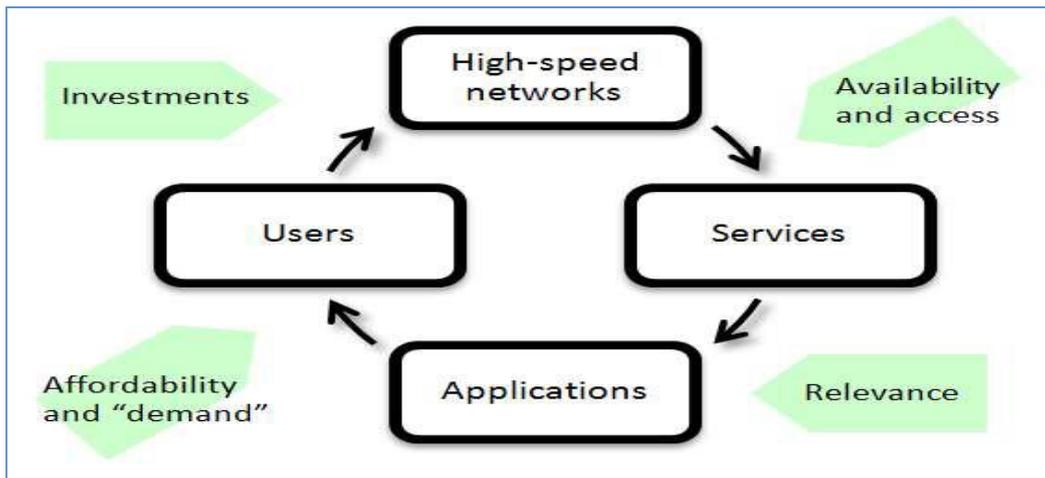
broadband speed is a key determinant of the range of online educational activities possible”. This Commission has highlighted the need to distinguish between types of Internet access that is narrowband and broadband, particularly when addressing the need for broadband connectivity in education. The Commission also argues that broadband Internet presents more teaching and learning digital opportunities largely due to its greater capacity to carry information at higher speeds than narrowband Internet connection. Such digital educational opportunities include video streaming, educational gaming, podcasts and other audio-visual files and live virtual tutoring. Broadband has therefore been regarded as the appropriate technology in delivering the educational material to learners and teachers.

Bauer, Kim and Wildman (2003, p.4) defines broadband as a “set of general-purpose electronic communications technologies rather than one specific technological solution”. These researchers highlights that broadband networks are better than traditional networks in terms of latency, higher bandwidth and "always on" functionality, therefore making it more suitable for delivering education. Kelly, Kim and Raja (2010, p.4) defines broadband as “an interconnected, multi-layered ecosystem that includes networks, services, applications and users”. Broadband therefore includes both the supply and demand sides of the market. In line with this definition, it is required that broadband policies and plans address both the supply-side and demand-side of the provision of broadband infrastructure and services.

#### *Defining Broadband as an “ecosystem”*

The InfoDev paper (2009, p.4) argues that broadband is more than just a network but includes elements that use high-speed connectivity to interact in various ways. The paper further elaborate that broadband network is part of an ecosystem that is evolving and that includes demanding users who continuously create and share more content and applications that require more bandwidth. The broadband *ecosystem* is therefore defined as a “multi-layered system of interconnected high-capacity communications networks, bandwidth-intensive services and applications, and users”, as illustrated in Figure 3 below.

**Figure 3: Broadband elements**



Adapted from InfoDev (2009)

This notion of broadband as an ecosystem also depicts the critical elements involved in the value chain of providing ICTs in education. Such elements include broadband infrastructure and connectivity, broadband services, educational applications and users (which will be learners, teachers and administrators) in the context of ICTs in education. Of note is the “connectedness” of all these elements that this notion of broadband as an ecosystem exhibits. Other factors that are critical to this notion include the affordability of services, investment, relevance of services and applications as well as ensuring the availability and accessibility of broadband services.

The literature review has also revealed that various countries define broadband differently to suit their country demands. In South Africa, the national broadband policy, SA Connect, defines Broadband as “*an ecosystem of high capacity, high speed and high quality electronic networks, services and applications, and content that enhances the variety, uses and value of information and communications for different types of users*” (DoC, 2013a, p.18). This definition mirrors the holistic notion of the “ecosystem” approach as it incorporates the key broadband elements illustrated in the figure above. The definition of broadband in this research is therefore informed by the SA Connect definition.

## **2.3 THE EDUCATIONAL VALUE AND BENEFITS OF BROADBAND SERVICES IN SCHOOLS**

The information and communications technologies (ICTs) have been regarded as tools that can be used to contribute to the improvement of the delivery of education. This notion has been adopted in many countries and it has proved to be effective in most of these countries. ICTs have been used to enhance administrative, teaching and learning processes in schools. There have been varying views in terms of whether ICTs can assist in improving performance of learners in schools. However, literature review has revealed that there is enough body of knowledge to ascertain that ICTs, particularly broadband connectivity, can contribute towards improving the quality of education in schools. ICTs and broadband provide alternative tools to address the education challenges (Goktas, Yildirim & Yildirim, 2009).

The British Educational Communications and Technology Agency (BECTA, 2007) argues that the integration of a number of technologies (the Internet, computers, interactive whiteboards and etc.) enables the educators to develop innovative approaches to learning and teaching, thereby enhancing the teaching and learning experience. The ITU and UNESCO Broadband Commission (2013) have also argued that broadband technology can be a catalyst for pedagogical change in the classroom through transforming the delivery of education.

### **2.3.1 *Broadband facilitates e-learning***

#### *Defining e-learning*

The literature review has revealed various definitions for e-learning. According to the International Telecommunication Union (ITU) (2005), e-learning comprise a set of applications and processes which use electronic media to deliver vocational education and training. ITU further elaborates that e-learning include computer-based learning, web-based learning, the use of mobile technologies, virtual classrooms and digital collaboration. In support of this definition, Mason and Rennie (2004, p.18) further argues that e-learning include “a range of informal learning opportunities ranging from information portals to community networking, as well as the obvious formal education and training courses”. Mikre (2011, p.2) describes e-learning as “a learning program

that makes use of an information network – such as the Internet, an intranet (LAN) or extranet (WAN) whether wholly or in part, for course delivery, interaction and/or facilitation”.

These definitions essentially encompass various elements of the e-learning value-chain and clearly demonstrate that e-learning basically entails the delivery of education using the information and communication technologies, including the mobile technologies.

Even though there have been success stories on the adoption of e-learning in schools, particularly in terms of its potential to enhance teaching and learning processes, in some cases it has not been adopted without challenges. Lennon and Maurer (2003) argue that it has proved difficult to introduce e-learning as a new learning paradigm, as there is little progress made in the transition from conventional teaching paradigms. (Goktas, Yildirim, & Yildirim, 2009, p.193) have also indicated that “The use of ICTs is complicated because it involves not only the use of alternative tools for dealing with old, conventional problems but also expectations that these technologies will help in meeting new challenges”. In contrast, Jhurree (2005) argues that the integration of ICTs in the education system has proved to be transforming the delivery of education in schools. The findings above indicate that although there has been a wide acknowledgement of the positive impact that e-learning has in schools, it has not replaced the traditional mode of teaching and learning. In fact, in most cases e-learning has been used as a complementary and or supplementary technology to enhance the delivery and the quality of education. It is also very clear that the potential of integrating ICTs into the education curriculum has not been fully exploited.

The literature on the definition of e-learning reveals that at the core of these definitions is the emphasis of broadband connectivity as the critical component of e-learning. The characteristics of e-learning that includes information portals, information network, web based learning and the virtual classrooms, as mentioned by these researchers all depend on broadband connectivity. This therefore makes broadband a critical tool in facilitating e-learning.

### **2.3.2 *Broadband facilitates access to educational resources for all***

The literature review has revealed that ICTs, particularly through broadband connectivity, have a potential to expand access to education to all learners, regardless of their physical location. This is a very critical advantage of integrating broadband in education as it will ensure inclusion of all learners to education, thereby realizing the Education for All (EFA) objectives. Evoh (2007, p.11) argues that “ICT environments provide borderless global access to information for educators and learners. Internet connectivity makes it possible for educational resources, such as lesson plans, books articles and other resources, to be exchanged with relative ease”. The broadband connectivity therefore provides the advantage of its ability to reach more people and widen access to educational resources.

In support of this assertion, the Broadband Commission (2013, p.2) further argues that the use of broadband connectivity will extend access to quality education for all and it will ensure that all citizens benefit from the digital age knowledge and skills. Broadband connectivity is therefore seen as a critical catalyst towards the realizing inclusivity in the provision of education for all and in building a participatory knowledge society.

As indicated by Castells (2002, p. 248), access to the Internet is “a requisite for overcoming inequality in a society which dominant functions and social groups are increasingly organized around the Internet”. Internet infrastructure facilitates access to educational resources (Trucano, 2005). Internet and broadband connectivity can thus also be used to promote digital inclusion in schools. The use of Internet also equalizes access to education (Grace & Kenny, 2003) thus providing learners and teachers with equal digital educational opportunities in schools. Mason and Rennie (2004) argue that broadband will equalise access to educational materials and courses to rural and remote learners’ through its faster speed and more reliable connection. The broadband connectivity in schools can thus be used to decrease the disparities in the provision of educational resources in schools.

### ***2.3.3 ICTs and broadband enhance administrative, teaching and learning processes***

The literature review has revealed that ICTs, including broadband connectivity, can enhance teaching and learning processes through enabling data collection to inform instruction, sharing of educational resources, customization of teaching materials and methods to accommodate the individual needs of students. Ungerleider and Burns (2002, p.15) attest that “The use of ICTs for mathematics instruction has a significantly positive effect on teaching high level concepts to students in grade eight or above.” BECTA (2007, p.32) has also established that “the use of ICT has made a major contribution to developing problem-solving skills, practicing number skills and exploring patterns and relationships”.

Khan, Hasan and Clement (2012) asserts that computers enhance teaching and learning by providing opportunities to learners and teachers to practice and to analyze and when connected to the Internet, they offer better access to relevant educational articles, teaching and learning materials. Broadband Commission (2013, p.18) has also argued that technology can increase the efficiency of educators in and outside the classroom through the use of digital blackboards, which makes it easier to search for and update educational material and share resources with students. This research further reveals that ICTs can facilitate and improve communication between educators, learners, parents and administrators. Ott and Pozzi (2010) attested to capabilities of broadband in contributing to innovate, tune, channel and improve educational interventions. The literature has also shown that the use of ICTs in schools is not only an essential tool for teachers to support them with delivering content and curriculum, but that it also provide digital opportunities for their professional development (Kirschner & Selinger, 2003).

Broadband connectivity in schools has proved to be an educational resource that strengthens administrative processes by connecting various educational institutions to each other to ensure seamless flow of information (Hausmant & Shelanskitt, 1999). A study indicated that broadband connectivity in South Korea has been central to the changes and evolution that have taken place in education (Harris, Salinas & Sanchez, 2010). Broadband connectivity has been seen as a critical education resource that

serves as a catalyst for curriculum change (BECTA, 2005), through increasing participation in learning. BECTA argues that broadband effectively improves the administrative, teaching and learning processes in schools; and offers educational services such as video conferencing and online interactions where learners act as both receivers and creators of knowledge.

## **2.4 THE BROADBAND INFRASTRUCTURE ROLLOUT AND INVESTMENT IN SCHOOLS**

The literature review explores how the broadband infrastructure and funding availability, broadband policies and plans as well as the role of government affect broadband rollout in schools. It also looks at the factors that promote the uptake of broadband in schools. The purpose of this section of the literature review is to delineate the challenges with broadband infrastructure rollout in schools and to highlight the supply-side factors that affect broadband penetration in schools.

### ***2.4.1 Broadband infrastructure and funding availability in schools***

Even though ICTs in schools has proved to have more benefits than shortcomings, there are still challenges and limitations of integrating it in schools. These challenges ranges from technology related limitations which includes: the high cost of infrastructure and technology deployment in schools and maintenance, the management of software and computer virus attacks as well as poor power supply in some schools (Mikre, 2011).

Apart from technology related challenges, studies have shown that funding is another important element for the successful integration of broadband technology in the classroom (Jhurree, 2005). In support of this view, Kelly, Kim and Raja (2010) acknowledge that broadband access in schools is costly as it involves having more than broadband connectivity. Broadband access requires the connectivity, the ownership of an end-user device such as a computer or smartphone as well as being digitally literate. Isaacs (2007) has also argued that the availability of computing devices in schools is a critical cost challenge on the rollout of broadband connectivity in schools.

In recognition of this cost challenge, Ghoord (2013) has therefore advised that the responsibility of implementing technology in schools should not be left to the school as not all schools will advance at the same pace largely due to the resource disparity between schools. This is especially the case in developing countries. It is therefore critical to determine which stakeholder should be responsible for funding the provision of broadband connectivity and its usage in schools. That is, what role should the public and private sector play in the value chain of providing funding for ICTs, particularly broadband connectivity in schools.

#### ***2.4.2 How the broadband policies and plans affect broadband rollout***

There is a body of evidence that attest that effective broadband policies and plans have a positive impact on the broadband penetration in the country. The literature review has established a correlation between the existence of a coherent national strategy and broadband diffusion. InfoDev (2009, p.5) argues that countries with broadband policies and strategies are inclined to be more successful in promoting broadband diffusion. The research substantiate this statement through revealing that “most of the OECD countries that lead broadband penetration, including Denmark, the Netherlands, Norway, Korea, Sweden and Finland, have coherent broadband strategies”.

Research has also revealed that it is critical to determine the relevant policy interventions required by government so as to determine which policy measures and instruments are appropriate for increasing broadband penetration. For example, Goldstuck (2013) supports the view that the broadband policy should promote effective competition but he also see government’s role as developing policy framework that allows for the lowering of costs and the promotion of digital literacy and innovation. Kozma (2005) assert that the privatization of telecommunications would result in infrastructure development in urban areas, the subsidy of Internet services to schools and the extension of telecommunications infrastructure to rural areas. Wallsten (2005) argued that access to ordinary rights-of-way by broadband providers and unbundling regulations are correlated with penetration. However, on universal service provision, he dispute that universal service mechanisms targeted at underserved areas do not

promote broadband penetration and may even slow it, particularly when one type of service provider is given more advantage over another.

The Broadband Commission (2013, p.15) reveals that barriers to broadband coverage are high for developing countries than developed countries. The study mentions obstacles including: broadband costs, accessibility, shortage of local content and applications and insufficient broadband literacy as the key barriers to broadband development. The InfoDev (2009, p.6) paper highlights that the “dominance of incumbent public telecommunications operators arising from their historical monopoly position has been one of the key obstacles to the development of effective competition in the broadband market”.

The literature review therefore reveals varying views on the government’s role in broadband provision particularly in terms of the policy priorities for the realization of universal service and access in broadband services. Of particular importance is the need for broadband policies and plans to incorporate both the supply-side and demand-side of broadband market so as to increase the broadband penetration. The literature also highlights that broadband rollout in schools, relies largely on the broadband rollout in the country.

### ***2.4.3 Defining the role of government in broadband rollout in schools***

In most economies, the provision of broadband infrastructure is largely driven by the private sector. However, broadband infrastructure rollout by private business is normally commercially driven, this tendency therefore leaves the communities that are commercially unviable or unattractive “under-served” or “un-served”, thereby creating market failures in terms of broadband infrastructure provision. These market failures create a need for government to intervene, so as to deliver on the universal service and access objectives. Governments around the world are required to develop policies that promote the creation of an enabling environment for infrastructure development and effective competition, so as to deliver affordable broadband services.

Most researchers have alluded to the role of government in broadband development as policy making to create an enabling environment for the provision of ICT infrastructure and the development of the ICT sector (InfoDev, 2009). InfoDev sees government's role as evolving to the development of strategies that seeks to promote digital literacy, establish an appropriate legal framework, and strategies that promote the development of applications and local content. It further highlights the two essential roles of government in promoting broadband development is to make markets work more efficiently and to ensure equitable access for all. The paper further defines the specific role of government as intervening where there is market failure in broadband deployment. It further acknowledges that market failure usually results from the persistence of monopoly type structures (InfoDev, 2009, p.5).

Picot and Wernick (2007) argues that government tends to focus on both the supply- and demand-side strategies foster broadband. They further argue that this approach is made apparent in the South Korea case where government has focused on establishing a high-speed backbone network as well as on the stimulating the broadband demand through public programmes.

Evoh (2007, p.3) argues that the role of government is to “regulate, structure and aggregate learning materials to facilitate the realization of a knowledge-intensive economy”. This researcher also acknowledges the key role of private sector as being responsible for the provision and distribution of the technological innovations.

#### ***2.4.4 The factors that stimulate broadband uptake in schools***

Studies have revealed several factors that stimulate the broadband uptake. Mason & Rennie (2004, p.18) argues that readiness of the population is a crucial factor for the uptake and sustainability of broadband services. This readiness includes digital literacy of the population. The availability of ICT access devices in schools, particularly computers, is critical for Internet uptake in schools. A study has established correlation between the usage of computers and the use of the Internet (Gillwald, Moyo, & Stork, 2013, p.49). These researchers have argued that the rise in Internet use can to some extent be attributed to increased use of computers. Bauer, Kim and Wildman (2003) examined the influence of economic and policy variables on the diffusion patterns of

broadband in OECD countries. Their study determined that the readiness of the country and the cost conditions of deploying broadband networks are the key factors driving broadband uptake.

Bazar and Boalch (1997) contended that adequate infrastructure in a country facilitates the adoption of the Internet. Broadband connectivity in schools depends largely on the status of broadband provision in the country. The broadband infrastructure rollout in schools is driven by the implementation of broadband policy or strategy. Research has revealed that the broadband infrastructure rollout in schools requires effective leadership and planning at a school level. BECTA (2007) points out a need for schools to have an e-strategy that addresses future development and sustainability of broadband.

The benefits of broadband connectivity in schools have been demonstrated to be mostly around the provision of faster and more stable access to learning materials and digital opportunities such as multimedia and interactive educational content. BECTA (2005, p.5) argues that “broadband is enhancing learning by being an additional tool to aid research”. Mason and Rennie (2004, p.15) argues that broadband connectivity in schools enables learners to re-think lectures as online activities and provides them with more opportunities to develop self-directed learning skills and resources. Broadband enables access to large databases of educational resources and documents, and provides multimedia communication through both audio and video. Mason and Rennie argues that this interactive element provide the kind of immediacy for distant learners.

Most researchers recognize that broadband deployment is very costly and that the cost goes beyond the deployment of infrastructure but also include the cost of providing the increased technical support for sustainability of broadband (BECTA, 2005, p.3).

## **2.5 THE KEY CHALLENGES AND LIMITATIONS OF INTEGRATING BROADBAND IN SCHOOLS**

The literature has revealed the key challenges of integrating broadband in schools to include the government-led ICT vision, infrastructure and funding availability (including connectivity, cost of hardware and software, maintenance, etc) as well as teacher development amongst others.

### ***2.5.1 Developing ICT and broadband vision for education***

A study has shown that Internet provision in schools becomes a success when government has a unified vision and when it plays an active role like in facilitating the provision of ICTs in schools like in South Korea (Harris, Salinas & Sanchez, 2010), where the development of ICTs within the educational systems has proved to be doing well. As in South Korea, the government vision should be translated into a plan for it to be executed. In their studies on *barriers to the introduction of ICTs into education in developing countries*, Khan, Hasan and Clement (2012, p.69) maintains that “Effective implementation of ICT in education is not merely a vision. Rather, it needs a proper plan, policies, execution and monitoring”. Other researchers highlight the need for schools to also play an active role in implementing ICTs in education. Tondeur, van Keer et al. (2008) argues that schools cannot have a passive role in this as ICT integration is related to actions taken at the school level. Such actions include the development of an ICT plan, ICT support and ICT training, therefore schools should be an active role player in order to effectively deliver ICT integration in schools.

Another study also recommends that the education sector should work together with the telecommunication sector and other private funding agencies at various levels to ensure that the investment in schools is utilized effectively (Chong, Park & Sinha, 2007).

The research also shows that it is also important to leverage on the existing funding mechanisms such as e-rate, which is a legislated discount to the Internet connection provided to schools.

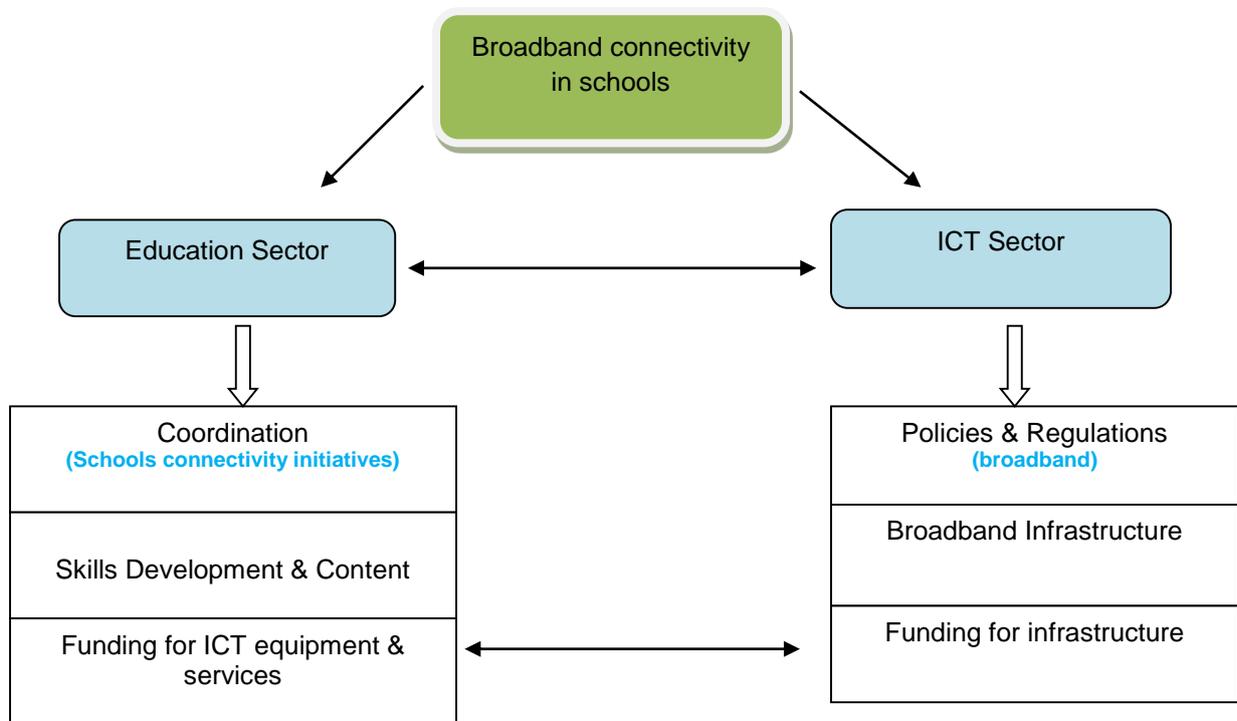
A study has shown the success of e-rate implementation in improving the provision of access to information technology in schools in the United States (Chong, Park & Sinha, 2007). However, this study has also concurred that providing only Internet connectivity to schools does not necessarily bring value to the education sector and that ICTs in schools needs more than Internet connectivity.

It is therefore clear that there is a need to have a multi-stakeholder approach in providing ICTs to schools and that this governance model should be preceded by the establishment of a unified vision and a plan for providing ICTs in schools by government. The research also highlights the need to consider various funding models for integrating ICTs in schools.

## **2.6 CONCEPTUAL FRAMEWORK**

The literature review has revealed that the provision of broadband connectivity in schools entails the use of broadband infrastructure and services to deliver education, and that it concerns both the ICT and Education sectors. The literature has made it clear that it is critical to have adequate broadband infrastructure in place so as to benefit from the online educational opportunities brought by the broadband connectivity and services. Furthermore, the policies that informs the broadband development are also critical as they determine the availability, affordability and to a large extent accessibility of broadband infrastructure. The broadband segment of the ICT value-chain then becomes the critical aspect of the framework. Equally important is the support from Education sector particularly in terms of developing the digital literacy skills for the learners and teachers as well as integrating broadband into school curriculum so as to fully realize the potential of broadband technology and derive the educational value from it. Apart from the infrastructure provision, the literature has also revealed that funding provision for ICT equipments and Internet service fees in schools, from the education sector also stems out as a critical component of delivering on broadband connectivity in schools. The diagram below illustrates the conceptual framework.

**Figure 4: Conceptual Framework**



## CHAPTER 3: RESEARCH METHODS

### 3.1 INTRODUCTION

This chapter presents the research design supporting this study. It also focuses on the orientation of the research undertaken, data collection and data analysis methods. It introduces the research site and participants. Additionally, it presents the research methodologies and tools as well as the data analysis methods employed in this study.

The main focus of this research is to investigate the supply-side factors that affect Internet and broadband penetration in ordinary schools in South Africa. The purpose is to examine the challenges around broadband provision in these schools, so as to determine the interventions required to improve broadband penetration. It is recognized that broadband penetration is driven by both the supply-side and the demand-side factors, in this regard the study focuses mainly on the supply-side factors. In addition, the researcher asks why broadband penetration in these ordinary schools is low when there are policies, regulations, strategies and funding mechanisms to improve the broadband penetration in schools.

### 3.2 RESEARCH DESIGN AND METHOD

The research methodology is based on a qualitative constructivism approach. The research orientation is that of a constructivist, where data was constructed with interacting interpretations (Glaser, 2002) from the interviews. The data collection technique is qualitative, as insights and generalizations were developed out of the data collected.

The research is largely concerned in examining the factors affecting Internet penetration in schools. This was realized through conducting interviews, which were guided by a semi-structured interview guide. The participants in this study were largely the 'suppliers' of Internet service and 'decision makers' of Internet rollout at an implementation level, and those responsible for funding provision in schools.

This approach is consistent with the fact that the research focuses largely on the supply side of the Internet as a service to the schools. These suppliers and decision makers included government, sector regulator, private sector and researchers.

### **3.2.1 *The qualitative approach***

The nature of this research question necessitated the use of qualitative research approach to data collection as it is more concerned with exploring and understanding the perspective of participants, as opposed to a quantitative approach which is more concerned with numerical reflections (Brikci & Green, 2007). This research approach allows for various ways of soliciting information, which is critical for providing the depth analysis of the challenges of providing broadband connectivity to schools.

Various research participants (data collection sources) in various areas of the ICT sector (service providers, policy makers, regulator, etc.) were interviewed to give various views and perspectives of the problem. The research aimed at soliciting information from mainly the decision makers responsible for broadband provision in schools, hence this method is deemed appropriate for this study as it is highly dependent on the knowledge and skills of all the research participants (Sofaer, 2002). The researcher intended to enrich and strengthen the validity of the results by using different sources for data collection, including the document review and analysis.

### **3.2.2 *The constructivism paradigm***

This research is located in the constructivist theory of knowledge, which is a theory that describes both what “knowing” is and how one “comes to know” (Fosnot, 1996, p.29-30). Learning is viewed as a self-regulatory process, described as a ‘search for meaning’, which must be based on the issues that require personal interpretation. Fosnot further explains that the “construction of meaning requires an understanding of *wholes* (the bigger picture) as well as *parts*, and parts must be understood in the *context* of wholes”. Therefore, the learning process focuses on primary concepts, not on isolated facts.

Construction involves interpretation influenced by prior knowledge (Cobern, 1996), as emphasis is placed on the application of knowledge as opposed to a mere acquisition of decontextualised facts (Fosnot, 1996). This allows a researcher to see the naturalness of variation on issues.

The research angle took a social constructivist approach as it emphasizes social interaction through communication as the foundation for construction of knowledge (Fosnot, 1996). This was achieved through narrative interaction with participants in interviews, to enable both the researcher and the participant to learn from each other. As Bonner, Frances and Mills (2006) argue, in this social constructivist approach, the interview becomes the place where knowledge is constructed. All the interviews in this research adopted this form of narrative interaction. The researcher and the interviewee produced this knowledge together.

The study looked at the entire value chain of stakeholders involved in providing broadband connectivity to schools and targeted them as participants, with the premise that various stakeholders have various perspectives on issues. The evidence on issues was gathered, assessed, and arbitrated among explanations. The interpretation of evidence was compared with alternative explanations (Finnemore & Sikkink, 2005) to derive thorough understanding of issues in question. This was achieved through comparing and contrasting the findings from both the documents review and analysis method and the interviews. In line with the constructivism approach, this study required the use of multiple datasets for analysis and construction of interpretations from the collected data.

### **3.3 DATA COLLECTION**

The primary research instrument was open-ended questions used in semi-structured interviews, to allow respondents to present their own insights gained in applying theory in practice. Both primary and secondary data sets were used for data collection to ensure that various perspectives are taken into account. This approach was aimed at strengthening the validity of the information for analysis.

### **3.3.1 Data collection**

The data collection method that was employed in this study is documents review and analysis and interviews. The data from the interviews was collected by means of a semi-structured interview guide instrument. Both primary and secondary data were used for data analysis.

#### ***Secondary data: Document review and analysis***

A desktop research was conducted to assist the process of data collection and analysis. The secondary data included extensive literature review to gain more insight on the available literature. The literature review was also very useful in developing the conceptual framework for this research. Reports on ICTs in schools, particularly those on Internet and broadband connectivity in schools, were studied and analysed to provide useful information on the global and national stance on the use of ICTs in schools. This included critical information pertaining to the technological and educational developments, which was used to situate this research and to validate its global relevance.

The related policies in the education and ICT sectors, legislations and regulations were studied and analysed to provide the context of this study. The national and provincial budgets of education departments, and annual reports were analysed to determine budgets allocation and expenditure on Internet provision and support in schools. The reports on other existing funding mechanisms, such as USAF and provincial schools connectivity initiatives, were also analysed to determine the impact of these funding mechanisms on connecting schools.

The reports on: e-Rate implementation, the USAOs and the usage of the USAF for Internet connectivity were used to support the discussions around the effectiveness of policy and regulatory resources. These reports were also considered as source of information for determining the challenges of implementing these regulatory interventions. The research reports on broadband mapping in South Africa were used to determine the status quo of broadband infrastructure in the country, both backbone and last mile infrastructure were studied and the challenges were highlighted.

The objective was to determine the adequacy of broadband infrastructure for schools connectivity, particularly the last mile infrastructure. This data was used to assist data analysis. The list of data sets that support the research questions is as follows:

**TABLE 3: RESEARCH DATA SETS**

Data set type	Data sets
Policies and legislations	E-Education White Paper Policy (2004) EC Amendment Act (2005) EC Amendment Act (2014) ICASA Amendment Act (2013) National Broadband Policy – “SA Connect” (2013) National Integrated ICT Policy Green Paper (2014) National Integrated ICT Policy Discussion Paper (2014)
Regulations	e-Rate USAOs
Plans/Strategies/Budgets	National Development Plan (2012) National and Provincial ICT plans and budgets PICC (SIP 15) Feasibility study on e-education policy Stakeholder submissions to the ICT Policy review process National Infrastructure Development Plan Norms and Standards for Education
Reports	Annual reports (DTPS, DBE, DST, etc) Research Reports (BMI-T, ResearchICT Africa, etc) USAF; USAO’s framework ITU

**Primary data:** *Interviews: semi-structured interviews*

The one-on-one interviews were conducted at various premises of the stakeholders at various times and on various dates to collect research data (see Table 3). About 12 face-to-face interviews were conducted with various participants from both the ICT and Education sectors to provide various perspectives to the research areas. The confidentiality of the interviews were discussed with all respondents to make provision for anonymity for the purpose of the research, accordingly no names will be mentioned in this research report to preserve this confidentiality status. Instead, all respondents are assigned titles such as “Respondent A DBE”, “Respondent B Neotel”, “Respondent C CSIR”, and so on.

The names of organizations and the designations (work titles) of participant are also mentioned to provide more context on the candidates interviewed.

The questions that the interviewees were asked were developed specifically to solicit inputs that will be used to provide responses to the research questions. The five key themes were developed from these research questions and were used to categorise the responses from the interviewees. This approach proved to be useful and effective for the analysis process. The responses were carefully studied, analysed and summarized.

The semi-structured interview guide was formulated around the key research questions with the aim of soliciting more inputs from the interviewees on the challenges around the provision of broadband connectivity in schools. The interview initially focused on investigating the challenges of implementing existing policies and strategies for the provision of broadband connectivity in schools. The aim was to determine whether or not the current policies and strategies are adequate for addressing the provision of broadband connectivity in schools, and if so, what the challenges are. The interview also made provision for recommendations on the policy gaps and strategic interventions required to address the broadband infrastructure rollout gap in schools. The interview questions then explored the challenges with the implementation of the regulatory interventions such as USO/USAO's & e-Rate. The third part of the interview questions was structured around determining the extent to which the current funding mechanisms addresses (if at all) funding requirements for Internet connectivity in schools. The fourth section focused on determining why schools that fall within the broadband coverage do not have connectivity. And lastly, the questions also focused on understanding the proper coordination structure for implementing broadband in schools and to understand the roles of various stakeholders.

The interview questions focused on critical issues including:

1. existing policies and strategies for the provision broadband connectivity in schools;
2. the provision of broadband connectivity to schools;
3. the challenges of implementing USO/USAO's and the e-Rate;

4. the coordination of schools connectivity initiatives and role definition of stakeholders;
5. the effectiveness of current funding mechanisms in addressing funding requirements for Internet connectivity in schools.

The following interview participants were interviewed:

**TABLE 4: INTERVIEW PARTICIPANTS**

Respondents	Designation	Institutions	Date of Interview
Respondent A	Policy Maker – Director	DBE	24 November 2014
Respondent B	Senior Manager	Neotel	27 November 2014
Respondent C	Senior Manager	CSIR	26 November 2014
Respondent D	Senior Executive	USAASA	03 December 2014
Respondent E	Provincial ICT Coordinator	PDE (NC)	04 December 2014
Respondent F	ICT Policy Review Panel Chairperson	DTPS - ICT Policy Review Panel	15 December 2014
Respondent G	Policy Maker – Deputy Director General	DTPS	06 February 2015
Respondent H	Chief Executive Officer	ICASA	29 January 2015
Respondent I	ICT Specialist	ICT Specialist	26 February 2015
Respondent J	Senior Manager	Vodacom	19 January 2015
Respondent K	Senior Manager	iBurst	29 January 2015
Respondent L	Senior Manager	Telkom	20 March 2015

### 3.4 DATA ANALYSIS

The data analysis technique is qualitative. The data analysis process entailed the coding of the interview data and categorization of this data in common themes. Multiple codes were used to recognize and articulate emergent ideas about patterns, themes, explanations and hypothesis (Sofaer, 2002). The research used open coding to develop codes from the data and theoretical coding to connect concepts and develop themes, in line with research questions. The coding enables the “classification and unique identification of responses” in the data analysis process (Bonner, Francis & Mills, 2006, P. 5).

This analysis was then conceptualized to create an analytical perspective based on the findings from the data, and it has provided an understanding of the research problem. The recommendations and conclusion were drawn from this 'new knowledge', generated from both the findings of the document analysis and the research interviews

### **3.5 SIGNIFICANCE OF THE STUDY**

The significance of this study stems from the need to understand the challenges that affect broadband penetration South African ordinary schools. It is assumed that understanding these challenges will inform the development of appropriate interventions required to address the broadband provision challenges so as to improve the broadband penetration rate in these schools. Broadband connectivity has proved to be an additional education resource that has a potential to improve the quality of teaching and learning in schools, through enhancing the teaching, learning and administrative processes, availing online educational resources and expanding access to these resources to all. This study therefore aims to make a meaningful contribution and improvement to the current condition of South African basic education system.

## **CHAPTER 4: UNDERSTANDING THE BROADBAND ROLLOUT CHALLENGES IN SCHOOLS**

### **4.1 INTRODUCTION**

This chapter presents the research findings of the document review and analysis and the interviews research methods. The documents that were reviewed include the policies, legislations, regulations and annual reports of the selected entities involved in the rollout of broadband connectivity to schools. The review and analysis of these documents were aimed at extracting critical information to respond to the research questions. The interviews were also conducted with the selected interviewees, as identified in the previous chapter, to solicit additional information for the research questions. These combined methodologies made it possible to develop a holistic view in understanding the concrete issues and/or challenges surrounding the provision of broadband connectivity in schools.

The research findings are structured according to various research question themes that are outlined as follows: policies and strategies for schools connectivity, regulatory interventions, funding, broadband infrastructure coverage and implementation and coordination of schools connectivity initiatives. These research findings were used to inform the development of the research recommendations and conclusion, as reflected in the next chapter.

The key research findings presented in this chapter include poor implementation of policies that support the rollout of broadband connectivity in schools, poor coordination of schools connectivity initiatives in the country and lack of adequate broadband infrastructure, particularly in the last mile segment of the infrastructure market.

The chapter also highlights the fundamental challenges on these issues, as reflected on the documents review and as accentuated by the interviewees. The research findings are as follows:

## **4.2 THE INSTITUTIONAL ARRANGEMENT FOR POLICY IMPLEMENTATION ON SCHOOLS**

### **CONNECTIVITY**

South Africa has various policies and strategies in place that provide the vision to rollout the broadband connectivity in schools. Such policies and strategies and their implementation thereof are currently driven by various Ministries. The White Paper in e-Education (2004) that advocates for the rollout of ICTs in schools was developed by the Ministry of Basic Education. This Ministry, through its provincial departments of education, is also responsible for the management and administration of schools including the allocation of funding for infrastructure and operations in schools. The Ministry is currently facilitating the provision of ICTs in schools, including broadband connectivity, through partnerships with the private sector organizations and international donor organizations. The various provincial governments and departments of education have a mandate to manage educational activities at provincial levels. Some provinces, Gauteng and the Western Cape in particular, have initiated provincial broadband initiatives that all focus on the provision of infrastructure and services in schools.

The Ministry of Telecommunications and Postal Services is responsible for the development of the national broadband policy (SA Connect) and its implementation. This Ministry is also responsible for the development of legislations such as the Electronic Communications Act (ECA) that governs the implementation of broadband connectivity in the country and in schools. The ECA also provides for the imposition of the e-Rate discount on the Internet provision to schools on the licensees in the ICT sector. The agency responsible for universal service, USAASA, reports to the Ministry of Telecommunications and Postal Services. This Agency plays a limited role in the roll-out of school connectivity through subsidizing connectivity and computer laboratories in schools. This activity is not the primary mandate but one of the many the agency has to undertake.

The ICT sector regulator, ICASA, which is responsible for the enforcement of compliance to the universal service and access obligations on schools connectivity and to e-Rate, reports to the new Department of Communications and not to

Department of Telecommunications and Postal Services anymore, as it was previously the case. This then makes three Ministries responsible for facilitating the provision of broadband connectivity to schools in the country.

#### **4.3 THE NATIONAL POLICIES AND LEGISLATIONS TO IMPLEMENT ICTS IN SCHOOLS**

The rollout of ICTs in schools largely involves two primary sectors, that is, the education sector and the ICT sector. The formulation of policies and its implementation thereof, from both these sectors therefore determines the potential to implement ICTs in schools. The level of coordination and cooperation amongst various stakeholders in these sectors is also key to policy implementation. The policies and legislations that provide the vision for broadband rollout in schools are as follows:

##### ***4.3.1 The White Paper in e-Education (2004) and its implementation***

The goal set by the White Paper in e-Education (2004) for the use of ICTs by learners in 2013 is that: *“Every South African learner in the general and further education and training bands will be able to use ICTs confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community by 2013.”* (DoE, 2004, section 2.23).

According to The White Paper, the level of ICT infrastructure provisioning to schools is largely dependent on the capacity of the provincial education departments (PEDs) particularly with regard to budgetary constraints. The White Paper also indicated that the competing priorities in schools, poverty and inherited backlogs have resulted in ICT infrastructure disparities among provinces and that most schools were not at a reasonable state of e-readiness and awareness for the effective implementation of ICTs in 2004. This policy document also highlighted digital literacy as another challenge experienced in schools by teachers and that technology is used to replicate the traditional mode of teaching, thus lacking innovation that can enhance teaching and learning processes.

In an effort to implement the White Paper Policy of 2004, the DBE conducted the feasibility study on ICTs in Education in 2008 with a purpose to assess the feasibility of implementing this policy. The study investigated all the segments of the value chain

of providing ICTs in schools including: the physical infrastructure in schools, ICT infrastructure rollout (both backbone and last mile), the provision of ICT end-user devices, the need professional development in ICTs, the need for content and curriculum development, the implications on the required financial resources and the appropriate procurement models. This feasibility study has proven that it is feasible but costly to provide ICTs in schools particularly The Internet connectivity alone had absorbed more than 50% of the estimated cost in providing ICTs in schools, therefore posing as the biggest cost challenge to providing ICTs in education. The Internet connectivity included the WAN backbone and the last-mile connectivity for all public schools. The study recommended that the schools should be connected to the backbone network through the virtual private networks (VPNs) to ensure security of the network. The schools were to have two VPNs, one for administration purpose and the other for teaching and learning. This recommended option further entailed the use of the existing education VPN, which is used for logistics and administration only and which is hosted on the government Next Generation Network (NGN).

The study further highlighted that the network extensions to schools and upgrades to existing networks were still required and that a dedicated education network should be established. The study acknowledged that there is a huge infrastructure gap particularly in the last mile network provision. The study further recommended that the national Department of Education should invest in content development to prepare for the uptake of e-education content, through ensuring that high quality digital resources are available free of charge via Thutong portal, which was (and still is) in existence. The feasibility study also proposed that a pilot phase should be conducted prior to providing connectivity to all schools.

In 2012, the DTSPS (then called DoC) initiated a project to provide broadband connectivity to 1650 schools as a pilot phase towards rolling out broadband to all schools. This project was conceptualized and implemented in collaboration with the DBE. All these 1650 schools are currently connected and lessons learnt are being drawn from this pilot phase to inform the future schools connectivity projects, which are now implemented as part of the national broadband policy.

#### **4.3.2 The National Broadband Policy: “South Africa Connect”**

South Africa has a National Broadband Policy (DoC, 2013a) called “South Africa Connect: Creating Opportunities, Ensuring Inclusion”, briefly referred to as “South Africa Connect”. This Policy was adopted by Cabinet and was published in 2013. South Africa Connect is an overarching policy for broadband infrastructure and it also entails the associated high level strategy and plan. This Policy seeks to provide a vision for broadband in line with the objectives of the National Development Plan (NDP) of “*a seamless information infrastructure by 2030 that will underpin the development of a dynamic and connected information society and a vibrant knowledge economy that is more inclusive and prosperous*” (NDP, 2012, pg. 194).

The objectives of South Africa Connect Policy include the provision of a broadband vision and the development of a roadmap to achieve this vision. The policy also provides a model for the development of a national broadband network on an open access basis to allow other service providers to connect to this network and compete on services. It identifies the required market structure and appropriate regulatory regime that will attract investment to extend the availability of broadband to areas that are not adequately services. This policy also acknowledges the challenges of broadband coordination and therefore aims at creating a framework that will promote greater co-ordination at all tiers of government to counter these challenges. It aims at removing the policy limitations and regulatory bottlenecks to promote the diffusion and adoption of broadband services and also identifies measures to be implemented in stimulating the broadband demand, including the support for content and applications development to ensure broader uptake and usage of broadband by all citizens. In brief, the broadband policy seeks to address the hurdles in the policy and regulatory environment as well as in the private sector that currently poses as hurdles in expanding broadband access so as to improve the broadband penetration. The successful implementation of this policy will contribute towards advancing the broadband penetration in the education sector, particularly the broadband adoption and usage in schools. The policy entails both the supply-side and the demand-side high level strategies that should drive broadband rollout to all citizens. The policy sets target for broadband connectivity in schools as follows:

**TABLE 5: THE NATIONAL BROADBAND POLICY TARGETS**

Target	Penetration measure	Baseline (2013)	By 2016	By 2020	By 2030
Broadband access in Mbps user experience	% of population	33.7% Internet access	50% at 5 Mbps	90% at 5Mbps 50% at 100Mbps	100% at 10Mbps 80% at 100Mbps
Schools	% of schools	25% connected	50% at 10 Mbps	100% at 10 Mbps 80% at 100Mbps	100% at 1Gbps

Source: DoC (2013a)

#### ***4.3.3 The ICT policy review: The development of the White Paper in ICTs***

The ICT policy review process commenced in 2012 following the cabinet approval of the National Development Plan (NDP), which called for the review of the policies in the ICT sector. The aim of the policy review process is to develop a White Paper on ICT policy for South Africa. It is envisaged that the White Paper will facilitate the amendments on the current sector legislations to reflect convergence of the sector and promote the 2030 vision of a South Africa that is dynamic, has a vibrant knowledge economy and has an information society that is more inclusive and prosperous. In essence, the policy review process entails the reviewing of the ICT related policies with a focus to identify the existing barriers towards achieving a more connected digital society and a digital economy informed by the universal provisioning of broadband services in the main. This process also focuses on identifying various proposals (policy options) in addressing challenges to the diffusion and use of ICTs so as to develop policy decisions for the White Paper. Such challenges include those that were largely highlighted by SA Connect such as the management and allocation of radio frequency spectrum, broadband infrastructure sharing, demand stimulation measures, sector regulation, and etc.

In terms of schools connectivity, the review process deals with the current bottlenecks for broadband supply as well as the need to review the regulatory resources such as e-rate and USAO's for schools connectivity. The policy review process also seeks to develop an appropriate model for the management and control of the USAF to ensure its efficiency and to put proper institutional arrangements in place. The policy decisions in the White Paper will contribute immensely towards the universal provisioning of broadband connectivity and services in the country, and therefore in schools, as well as define sustainable models for schools connectivity.

#### **4.3.4 The Electronic Communications Act (ECA)**

The ECA was promulgated in 2005 to provide the legal framework for convergence in the ICT sector in the main. The Act also made new provision for the regulation of the electronic communications network and services and also for the granting of new licenses and new social obligations, amongst other things. The ECA was then amended in 2014 to make further provision towards ensuring effective competition in the sector, to remove regulatory bottlenecks and to refine the licensing issues, amongst other things.

The critical developments that the ECA amendments have introduced in regard to this research include issues related to: broadband, universal services and access fund and e-Rate. The ECA amendment provides a definition of Broadband as "*an always available, multimedia capable connection with a minimum download speed as determined by the Minister by notice in the Gazette*" (RSA, 2014, section 1(c)). The broadband policy, SA Connect, defines Broadband as "*an ecosystem of high capacity, high speed and high quality electronic networks, services and applications, and content that enhances the variety, uses and value of information and communications for different types of users*" (DoC, 2013a. p.18). SA Connect further defines various incremental broadband speeds for various broadband services and also sets the targets for broadband, for example, the policy states that 50% of schools should be connected at 10Mbps by 2016, 100% at 10Mbps and 80% at 100Mbps by 2020.

The amended ECA also makes provision for the creation of a National Broadband Council (NBC), through the introduction of a section (section 72A) that empowers the Minister to establish a National Broadband Council (NBC), which advises the Minister

on broadband policy and its implementation. The Council has already been established and it comprises of members drawn from both the public and the private sectors. In terms of the ECA amendments, the functions of the NBC includes: providing *coordination for the overall broadband implementation; facilitating the monitoring and measurement of broadband penetration; recommend measures to increase uptake and usage of broadband* (RSA, 2014, section 72A in Act 36 of 2005), amongst other things. According to Respondent G DTPS (2015), there are currently no key deliverables that have been achieved to date by the Council yet, since its establishment in 2014. It is understood that the Council is currently finalizing their programme with the DTPS.

#### **4.4 THE NATIONAL STRATEGIES IN IMPLEMENTING ICTs IN SCHOOLS**

There are various strategies in place to support the advancement of ICTs in schools. All the respondents have argued that South Africa have adequate strategies in place to support the rollout of ICTs but that the main challenge lies at the implementation level of these strategies. It is clear though that no coordination exists between the different strategies leading to the situation in which the adequately resourced provinces are able to move forwards while poorly resourced provinces stagnate. The strategies that most respondents referred to are as follows:

##### **4.4.1 The National Development Plan (NDP)**

The National Development Plan was published in 2012 by the National Planning Commission with a purpose to eliminate poverty, reduce inequality and encourage the economic development of the country by 2030. The education sector is one of the key priorities for South Africa's development and life-long learning, with a focus to develop capacity and skills amongst South Africa's people and to promote innovation in order to transform the economy. In this regard, this plan stresses on the importance of building an ICT-capable society and highlights the impact of ICTs in improving the quality of education. The Chapter 9 of the NDP on "*Improving Education, Training and Innovation*" sets priorities on improving school infrastructure.

Such priorities include, the deployment of *high speed broadband in schools to enable greater use of technology in education and enhance the teaching and learning experience. The plan also encourages the use of mobile devices such as phones and tablets in distributing learning content and promotes distance education through the support of advanced ICT, to expand learning opportunities for different groups of learners.* (NDP, 2012, pg.317).

The NDP further outlines the long-term goals to include: improving literacy, numeracy/mathematics and science outcomes as well as improving performance in international comparative studies. The plan outlines actions to be undertaken to achieve the set goals. These actions include the development of *a joint plan to roll out broadband infrastructure to schools by DBE, DoC (now DTSP), DPE and Infracore. It also calls for an establishment of a multi-stakeholder structure that includes the government, corporate foundations, NGOs, and international donors to develop open source educational software and content* (NDP, 2012, pg. 317).

#### **4.4.2 The Presidential Strategic Infrastructure Committee and Strategic Integrated Projects**

The government of South Africa adopted the National Infrastructure Development Plan in 2012, in order to promote infrastructure development in the country. This plan outlines the infrastructure challenges, across all sectors, as well as enablers and interventions required to respond to the planning and the development of an enabling infrastructure that fosters economic growth. This plan includes 18 comprehensive strategic integrated projects (SIPs) that aim at improving infrastructure development in the country. These SIPs are led by various Ministries and are coordinated by the Presidential Infrastructure Coordinating Committee (PICC). SIP 15 is chaired by the Minister of Telecommunications and Postal Services and it focuses on expanding access to communication technology with the aim to provide for broadband coverage to all households by 2020. SIP 15 was launched in Dec 2012 and it prioritises broadband provision to schools as one of the key areas of focus, in alignment with its vision to achieve the NDP target of providing for 100% broadband coverage to all households by 2020. In line with this target, about 1650 schools have been connected to date.

The Respondent G DTPS (2015) has indicated that the DTPS has established the broadband steering committee with short-term focus on the broadband connectivity to schools, health and other government facilities, as part of the implementation of the National Broadband Plan. This steering committee consist of stakeholders from other government departments and state owned companies. In terms of this plan, broadband connectivity to these institutions will be rolled out in a phased approach. The first phase entails delivering connectivity to the prioritised schools (about 3000 schools) and prioritised health facilities in the selected eight districts. The second phase will provide for the rollout of broadband connectivity to all schools and other government institutions in line with the 2020 Broadband Policy targets. The Respondent G DTPS (2015) further indicated that the first phase of the project will be implemented in 2015/2016 financial year. This will provide for more broadband coverage of schools and it will consequently increase the broadband penetration in schools.

#### **4.5 THE STATE OF THE BROADBAND INFRASTRUCTURE IN SOUTH AFRICA**

The research discovered that the challenges of broadband infrastructure coverage in schools mirror the broader challenges of broadband infrastructure provision in the country. As highlighted by Respondent F DTPS (2014) the broadband penetration in schools is defined within ambit of broadband penetration in the country. This therefore necessitated the research to explore the broader framework of broadband provision in the country as the premise towards determining the broadband challenges in the schools environment.

The study conducted by BMI-Technologies, a research company in ICTs, on broadband infrastructure mapping in South Africa (DoC, 2013b) revealed that the broadband penetration in the country stands at 33.7% in 2013. According to Gilwald, Moyo & Stork (2013, p.5), the number of Internet users in South Africa is 34% of the adult population. The BMI-T study further reveals that about 86% of the South African population is within 10km of access to fibre. This study also shows that fixed line penetration was at 7.9 % in 2012 and mobile penetration rate at 136%.

The mobile broadband is the primary form of broadband access in South African currently for most people. As mentioned in chapter 1, there are still major disparities in the rollout of broadband infrastructure in South Africa, particularly between rural and urban areas. The rural areas are mostly underserved but other areas do not have broadband infrastructure at all while the urban areas, deemed as competitive markets, normally enjoy the benefits of duplicated infrastructure. The challenges of broadband infrastructure in South Africa are as follows:

#### ***4.5.1 The challenges of broadband infrastructure in South Africa***

The broadband penetration in schools is largely driven by the availability and accessibility of broadband infrastructure as well as the affordability of broadband connectivity services. That is, for broadband Internet service penetration in schools to increase, broadband infrastructure has to be available and accessible to schools at affordable prices. Moreover funding should be available to schools for the adoption of broadband Internet service and to ensure sustainability in the uptake of this Internet service. Funding should also cater for the provision of end-user equipments for both learners and teachers as well as for the development of the required digital literacy skills.

The National Broadband Policy highlights the policy and regulatory bottlenecks affecting broadband infrastructure provision as follows: market structure and competition, challenges with the effectiveness of the sector regulator, infrastructure reach and availability, funding and coordination of broadband activities.

##### **a) Market structure and competition**

SA Connect highlight that there are structural constraints in the telecommunications market that arise from the dominance of some vertically integrated operators. In an effort to promote convergence within the ICT sector, the Electronic Communications Act (2005) introduced a horizontal licensing regime, which enabled licenses to be converted into network, service, and content licenses. The ECA also introduced a competition framework that also required the regulator to act against adverse market dominance. As Gillwald, Moyo & Stork (2012) argues, this has not effectively changed the structure of the market.

The market remains structured around the dominance of a number of vertically integrated operators as the incumbents have acquired multiple licenses to protect their vertical integration advantage. The failure of the regulator to effect a comprehensive competition framework as it is empowered to do in the Act has also led to this state of affairs.

The challenge with the vertically integrated operators is that they tend to display some anti-competitive behaviour which therefore constrains competition in the market. The policy therefore, as part of addressing the ineffective market structure, proposes the establishment of a wholesale open access to networks regime to create a more competitive services sector and to drive down prices for communications services. In addition policy advocates for strengthening and resourcing the regulator to deal effectively with anti competitive behaviour.

b) Effectiveness of the sector regulator (ICASA)

The Broadband Policy points out the challenges around the capacity and effectiveness of the regulator. Such challenges include poor regulatory oversight, poor governance and accountability, lack of adequate capacity and funding. These challenges are said to hamstring the regulator to effectively regulate the ICT sector and this affects the broadband rollout in the country and consequently the broadband penetration in schools. In line with the views from the majority of interview respondents, the policy emphasises that the sector regulator in its current state poses as a serious challenge that needs to be urgently addressed for broadband to be effectively realised in South Africa.

The Discussion Paper on ICT policy review outlines possible policy interventions to address the effectiveness of ICASA as follows: using parliamentary oversight to address accountability, amending the Constitution to reinforce ICASA's independence and strengthening the requirements on ICASA to fulfill policy objectives (DTPS, 2014b, p276). The ICT policy review process is also reviewing other issues that affect the effectiveness of the regulator, including its current structure and funding model, to improve its effectiveness. The policy decisions on this will be made on the finalization of the White Paper in ICT.

c) Infrastructure reach

The SA Connect policy also highlights some disparity in broadband infrastructure provision particularly between urban and rural areas, with most rural areas not having adequate backbone infrastructure. The majority of South African population is in reach of wireless broadband services, particularly in urban areas where there is high population densities. The fibre backbone coverage reaches to within 10km of most communities.

In an attempt to address this backbone infrastructure challenge, the Discussion Paper on ICT policy review (DTPS, 2014b, p58) proposed various policy options. The options includes: *creating a single national broadband network* built on an open access basis, in line with the National Broadband Policy. Another policy option is to create a *new state-owned company* that will focus on providing broadband connectivity to rural areas. The discussion paper indicated that the *definition* of the rural areas by the regulator and the viability of creating this new state owned company and its management and operations are critical considerations for this option. The third policy option involves awarding a contract to a private sector firm to construct and operate a national broadband network on behalf of government. This option would give government an advantage of infrastructure ownership but government would fund this infrastructure rollout. The last option involves a market-led approach that allows market forces to provide broadband infrastructure in the country with public resources used in areas that are not commercially viable for private sector to operate in. This approach relies heavily on effective regulatory tools and mechanisms. The Discussion Paper also highlights the deployment of points of presence in all 270 municipalities as a critical policy intervention to address the backbone infrastructure gap in the country. It further indicate that there is duplication of infrastructure particularly in high demand metropolitan areas, highlighting lack of coordination and harmonisation of infrastructure plans as the major cause for duplication.

In support of the Broadband Policy, the research has also identified the access network (the last-mile infrastructure) as the largest gap in national broadband infrastructure provision in South Africa (DoC, 2013b, Gillwald, 2012). In acknowledgement of last mile infrastructure gap, the Discussion Paper proposes various policy options as possible interventions required to address this gap. It thus proposes that this infrastructure gap may be addressed through the regulation of

infrastructure sharing and through mandating open access on all access platforms (fixed, wireless and fibre). These policy interventions includes the advancement of the local loop unbundling (LLU) and making it accessible as an essential facility on non-discriminatory and reasonable terms and with a price control. This will promote infrastructure sharing amongst various ECNS licensees and this could potentially also promote service-based competition and thus reduces the costs of communications.

d) Diffusion of broadband

The broadband penetration is determined by the extent of the diffusion of broadband in the country. SA Connect highlighted that the factors that currently restrain the diffusion of broadband in South Africa include the high cost of broadband services, skills development particularly low levels of computer and e-literacy, insufficient research and development (R&D) and innovation and application and service development in the sector. Of these factors, the literature review has revealed that the high cost of broadband services, skills development, low levels of computer and e-literacy largely affects the broadband diffusion in schools (Gilwald, Moyo & Stork (2013). The negative impact of the high cost of broadband services in schools connectivity was also highlighted by most respondents (8 respondents) as the key inhibitor towards the diffusion and adoption of broadband services.

The Broadband Policy further proposes ways to address the skills development imperative and the existing skills gap through prioritising the provision of broadband connectivity to schools and through introducing ICT skills development in the school curriculum. The policy also mentions the lack of government uptake of digital services as an inhibitor to the diffusion of broadband. The National Integrated ICT Policy Green Paper highlighted that there are various uncoordinated government initiatives that addresses the broadband diffusion and that the lack of an existing national e-government framework contributes to the poor diffusion of broadband services in the country (DTPS, 2014c).

e) The development of content and applications

The uptake and usage of broadband is also very low. The SA Connect policy advocates for Government to play a significant role in promoting and encouraging uptake and usage through facilitating the development of relevant content to drive

demand for broadband. This includes the development of e-education content and applications. The policy also pronounces that other stakeholders such as civil society and community based organisations, along with the private sector should get involved by seeking ways to encourage the development of local content and applications to drive usage. The development of e-education content and applications is critical as a demand stimulation measure for broadband uptake in schools. The e-education content creates a need for learners and teachers to want to have access to broadband connectivity and to use broadband services, which then increases the broadband penetration in schools.

f) The coordination of broadband activities

As indicated, the rollout of broadband has been uncoordinated in the country until the recent developments on the implementation of SA Connect. The provinces and municipalities have been driving their own broadband connectivity initiatives with Gauteng and Western Cape provinces in the lead. Other provinces are currently working on their plans. This means that funding for broadband infrastructure deployment by government has also not been coordinated. As Respondent C CSIR (2014) has indicated, this lack of coordination on infrastructure rollout and funding provisions by government has caused much duplication of infrastructure, particularly in urban areas and has also created many infrastructure gaps in rural areas. This therefore leaves most public ordinary schools located in these rural areas not connected.

SA Connect highlighted that the governance of the sector and the ability of the State to coordinate broadband initiatives and activities across the ICT ecosystem, including all three spheres of government as key to leveraging the benefits of broadband. It further revealed the need to develop a national strategy that “*enables the country to deal effectively with: the cross-cutting nature of ICTs; the coordination of activities across different sectors, state-owned entities and tiers of government; the creation of institutional capacity to regulate the sector effectively; and the stimulation of demand through the development of people’s digital literacy, computer skills, and availability of devices, relevant content and applications (including e-government services and applications)*”(DoC, 2013a).

#### **4.5.2 The framework to address the broadband challenges**

As part of the SA Connect programme, the broadband policy provides a framework to address the challenges above, such a framework entails a four-pronged strategy with both supply-side and demand-side interventions to close the broadband gaps. This strategy includes four pillars as follows: Digital Readiness, Digital Future, Digital Development and Digital Opportunity. The Digital Readiness pillar focuses on supply side interventions that include addressing the market structure and institutional arrangements challenges and addressing existing bottlenecks on supply side factors such as spectrum, open access, competition and facilitating rapid deployment of infrastructure. The Digital Future pillar involves the definition and the deployment of an open access national broadband network (NBN).

The Digital Development focuses on the coordination of network planning and rollout, the need to aggregate the demand in the public sector and the public sector network that will provide connectivity to government institutions including schools and health facilities. Lastly, the Digital Opportunity focuses on the demand side interventions that include the demand stimulation measures, the need to promote research and development in the ICT sector and develop the requisite e-literacy skills as well as the required content and applications. The implementation of these pillars largely involves various stakeholders that include both the public and the private sector at various levels of engagement.

#### **4.5.3 The challenges of broadband infrastructure rollout in schools**

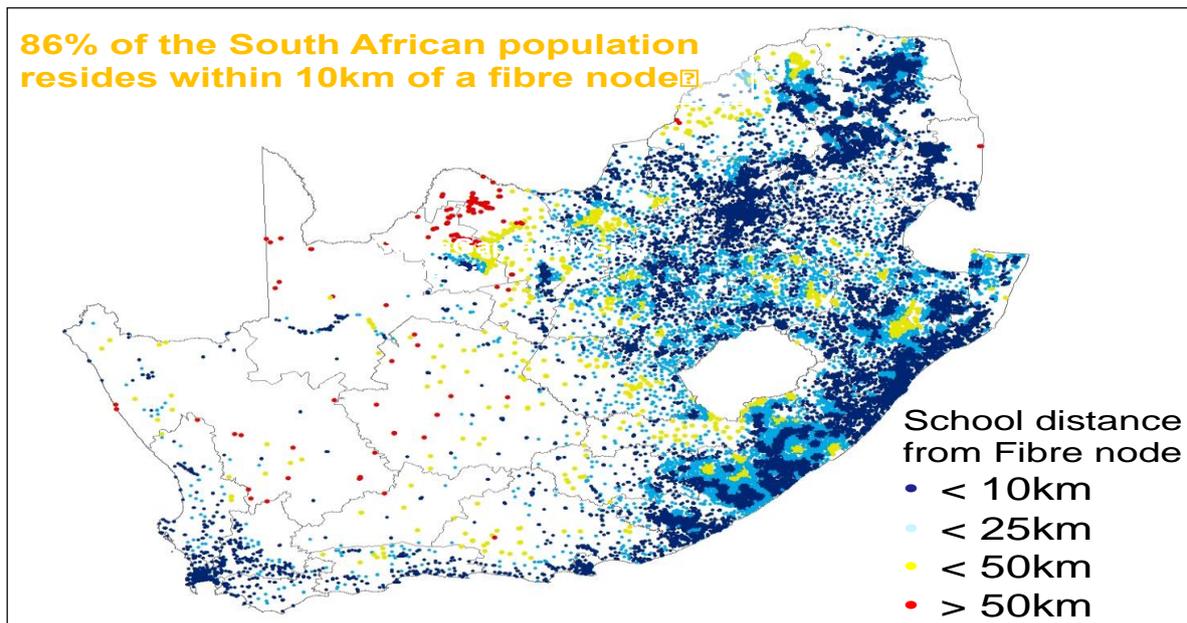
As highlighted in the interviews conducted (Respondent A DBE (2014) & Respondent E PDE (2014)), have indicated that the challenges of broadband infrastructure rollout in schools are multi-faceted and arise mainly from the challenges of coordination between the Education and the ICT sectors. Respondent A DBE (2014) argued that broadband infrastructure should be provided to schools by the private sector. Respondent E PDE (2014) on the other hand, highlighted that the lack of awareness in schools on why they should use broadband services is the major problem around the broadband rollout. Other key challenges that were highlighted from both the interviews and documents review and analysis include the following:

a) The broadband infrastructure coverage gap in schools

Bazar & Boalch (1997) contended that adequate infrastructure in a country facilitates the adoption of the Internet. Currently, only 25% of schools have Internet connectivity (RIA, 2012). The national Broadband Policy (DoC, 2013b) indicates that the short term target for the rollout of Internet connectivity in schools is to connect 50% of schools at 10Mbps in 2016 and the long term vision is to connect 100% of schools at 1Gbps in 2030.

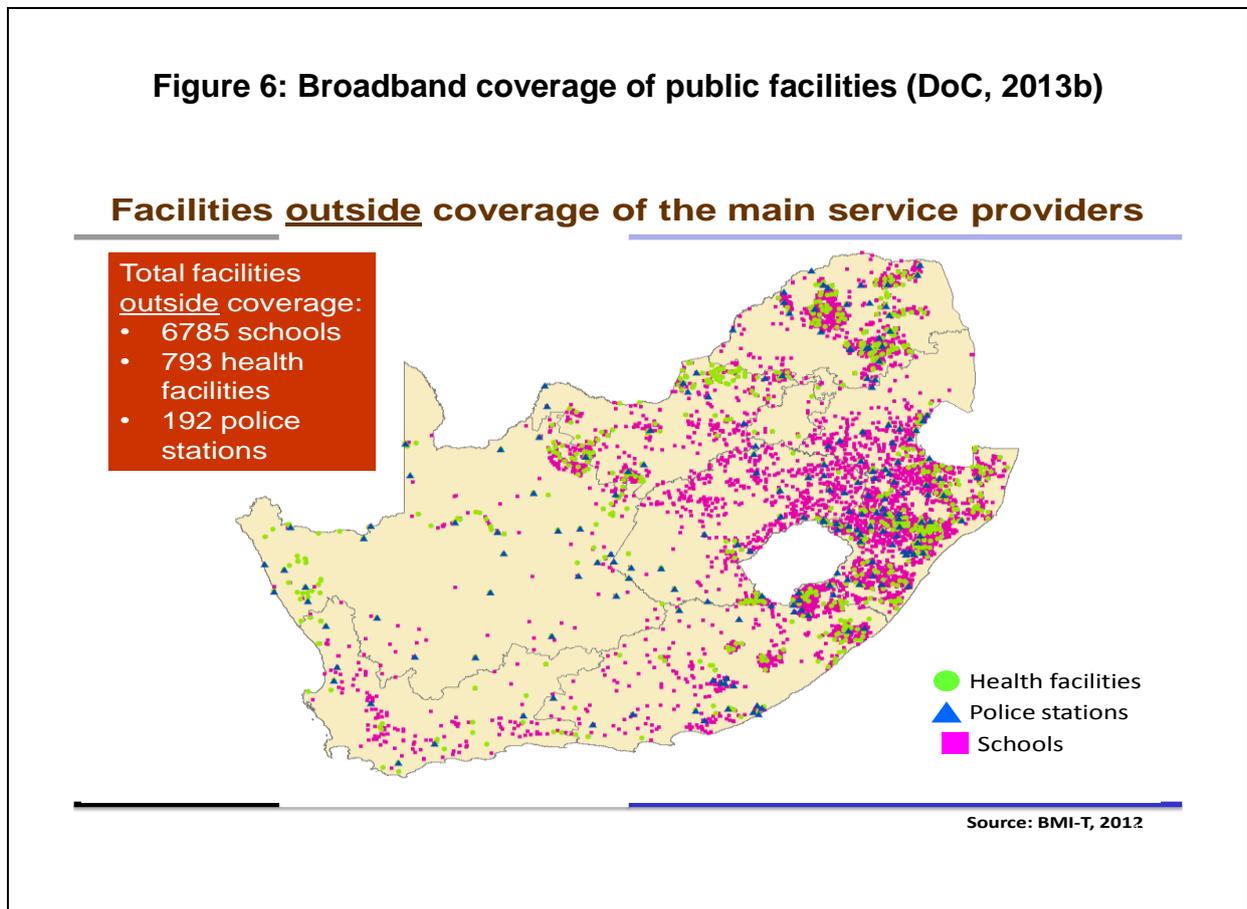
As indicated above, the infrastructure challenge for broadband is mainly on the access network. The map below (figure 1) shows a spatial illustration that most ordinary schools are geographically located within 10km of the fibre nodes, implying that most schools can be connected through fibre backbone network with the deployment of the required access network. The focus on this section will therefore be on the access networks.

**Figure 5: National fibre distribution (DOC, 2013b)**



To further illustrate the extent of broadband coverage in South African ordinary schools, the broadband mapping study by BMI-T (DoC, 2013b) shows that only 6785 or (27%) of ordinary schools were geographically located outside the broadband coverage infrastructure in 2012 (see Figure 2 below).

This study conducted the mapping of the existing broadband infrastructure in South Africa to identify where infrastructure access gaps are.



This map shows that even though infrastructure availability, particularly on the access level, still poses as a challenge in many areas of the country, most ordinary schools are within the existing infrastructure coverage. South Africa has satisfactory backbone infrastructure and wide mobile coverage, which could enable last mile connectivity.

The Mason Analysis study on the South African broadband market structure and infrastructure coverage (DTPS, 2014a) reveals that broadband infrastructure gap is largely on the broadband access (last mile) infrastructure provision. The study further reveals that there is a need to develop the national terrestrial networks, the backbone infrastructure and a high capacity access network so as to achieve universal provision of broadband infrastructure.

Furthermore, the study also reveals that other challenges in providing broadband infrastructure includes the availability of radio frequency spectrum for wireless

communications and lack of effective regulation of infrastructure sharing between operators.

b) Coordination of schools connectivity initiatives

As mentioned in Chapter 1 and as confirmed by Respondent A DBE (2014), there are various public and private sector stakeholders involved in providing ICTs to schools. This Respondent has indicated that the DBE has established a coordination structure with the 9 provincial governments to discuss the ICT issues in schools but this structure does not sufficiently deal with broadband provision in schools. Broadband infrastructure and services in schools is therefore being provided in an uncoordinated manner.

The DBE Annual report of 2012/13, (DBE, 2013c, p.73) indicates that a total of 4 140 schools received connectivity for administration and learning and teaching purposes in the year 2012/2013. The DTPS facilitated the provision of broadband connectivity to 1650 schools in 2013/2014 financial year, as part of the SIP 15 programme of action. There is currently no proper or formal audit on the actual number of schools that have Internet or broadband connectivity. Respondent A DBE (2014) indicated that there is no formal national strategy or plan that provides guidelines on how schools should be connected.

c) Availability and development of the e-Education content

Currently in terms of e-education content, apart from workbooks, the DBE has developed an online portal to support South African teachers ([www.thutong.doe.gov.za](http://www.thutong.doe.gov.za)). This portal serves as an interface between the teachers and the community members. The DBE provides learning and teaching support materials to schools to support the curriculum implementation. The Department printed and distributed 117 million workbooks, textbooks and study guides between 2011 and 2013 (DBE, 2013b).

There are many uncoordinated e-education content initiatives led by public, private sector and non-governmental organizations stakeholders.

In its submission to the Discussion Paper on ICT policy review process, MTN indicated that it is involved in the digitization of curriculum based content to develop interactive workbooks for schools (MTN, 2015, p 39). Respondent J Vodacom (2015) has also indicated that Vodacom is involved, through partnership with other stakeholders, in facilitating access to e-education content for the schools to which it provides Internet connectivity.

The public ordinary schools rely on these existing initiatives to gain access to the existing e-education content, most of which is limited to only schools that receives connectivity from these providers as this access to e-education content is delivered as a *package* of connectivity to these schools. Access to other e-education content is available on commercial terms, for example, pearson's academic e-books on [www.pearson.co.za](http://www.pearson.co.za).

#### **4.6 THE CHALLENGES WITH REGULATORY INSTRUMENTS FOR SCHOOLS CONNECTIVITY**

The regulatory instruments that are being considered for facilitating the rollout of schools connectivity include the USAOs, e-Rate and USAF, as per the research questions. The research focuses on evaluating the effectiveness of these instruments and the challenges in implementing them. Such findings are outlined as follows:

##### ***4.6.1 The implementation of Universal Service and Access Obligations (USAOs)***

The ECA empowers ICASA to impose universal access and service obligations on licensees. These license obligations are set to address universal service and universal access gaps. These obligations have historically been included in the licenses of major telecommunications operators such as Telkom, Vodacom, MTN, Cell C, and Neotel as well as in some spectrum licenses. These license obligations include the geographic coverage, the provision of payphones (or community service telephones) and the provision of connectivity to schools and public health institutions. The enforcement of compliance on these obligations has been characterized by challenges. Most of the general implementation challenges, as mentioned by the licensees interviewed and from documents review and analysis include: the lack of

coordination, lack of clarity on the definition of connectivity, challenges on the provision of end-user equipments and funding challenges.

In 2010, ICASA embarked on a comprehensive review of the universal service and access obligations (USAO) framework. This exercise led to the publication of a “Findings document” in 2012 (ICASA, 2012), that determined that the license obligations imposed on licensees to date remain binding and that any obligations that is not yet implemented should be suspended. This document also concludes that the determination of obligations should be influenced by a broader range of considerations than merely the category of license and that the imposition of obligations should not be subject to detailed market access gap studies.

Subsequent to this review exercise, ICASA then issued the revised universal service and access obligations regulations on schools connectivity applicable to Cell C, MTN, Neotel and Vodacom. These revised regulations reduced the number of public schools to be connected by these licensees and included a requirement to provide connectivity to schools (Internet access) subject to an allocation of schools to be determined by ICASA (ICASA, 2014). The proposed USAO framework also requires licensees to provide Internet access, computers, servers, printers and other local area network related equipment as stated in the ICT Solution provided by the DBE for school connectivity purposes (ICASA, 2013). Other issues regarding the USAO framework are as follows:

a) The state of compliance to USAO: monitoring and evaluation

The ICASA report on compliance to the license obligations (ICASA, 2010) indicates that the licensees are required to submit reports, including those on progress in implementing the USAOs to ICASA. In this regard, the mobile operators were required to submit compliance reports within two months after the end of each rollout period in relation to Internet connectivity in schools. ICASA is authorised to assess the mobile operators’ level of compliance from time to time.

The BMI-T report on compliance on license obligations (BMI-T, 2010) reveals that there has been minimal compliance with the USAOs by the licensees with regards to

the roll out of Internet connectivity to schools and that this rollout was not within the prescribed time periods. The report also indicates that the licensees cite challenges relating to the implementation of the USAOs and coordination as major reasons for non-compliance. These issues include the regulatory issues such as lack of definition of key concepts such as rural areas and lack of allocation of roles and responsibilities for the implementation of the USAOs. This report also highlights that some operators have indicated that they have submitted compliance reports to ICASA but that they have had no response from ICASA. The BMI-T (2010) and ICASA (2013) reports reveals the state of compliance with USAOs on schools connectivity as follows:

**TABLE 6: STATE OF COMPLIANCE WITH USAO's**

Licensee	No. of schools allocated	Progress on compliance	Date of issue of license obligations	Implementation period
Neotel	2500	2 public schools and 50 FETs	Obligations carried over on ECNS license, dated the 16 January 2009	
MTN	5000	593 schools(at e-rate)	2004	Within 8 years of issue of spectrum license
Vodacom	5000	703 schools	2004	Within 8 years of issue of spectrum license
Cell C	5000	81 schools	2005	Within 8 years of issue of spectrum license
Sentech	5000	103 schools		Within 9 years
iBurst	1000 by 2011	1800 schools		within 7 years
Total	23 500	3282 schools		

Compiled from: BMI-T, 2010; ICASA, 2013

This essentially means that in 2013, only about 14% of the target was achieved in terms of providing Internet connectivity to schools through the license obligations regulatory intervention programme. Respondent K iBurst (2015) has indicated that iBurst has provided connectivity to more than 3000 schools.

This essentially means that they have complied to their spectrum license obligations. Respondent B Neotel (2014) has also indicated that Neotel is planning to provide Internet connectivity to 200 schools in 2015/16, as per the USAO programme.

b) The amended universal service and access obligations for schools

There seems to be lack of clarity on the final agreement of the amended obligations for schools connectivity, particularly with regarding to funding of the monthly Internet service fees. Respondent D USAASA (2014) has indicated that ICASA has decided that the licensees will provide full subsidy of monthly Internet service fees to schools for an initial period of 3 months, after which USAASA will then take over the subsidy (through e-Rate) to keep these schools connected. However, the Respondent H ICASA (2015) says that an agreement hasn't been reached with regard to this. Meanwhile, Respondent J Vodacom (2015) says they have already commenced with the rollout of broadband connectivity in schools and that they're targeting to connect all 500 schools, in 2015, which they were allocated by ICASA. This Respondent confirmed that their understanding is to provide connectivity for only 3months, after which USAASA takes over. This respondent also mentioned that they have struggled with receiving an allocation of schools list from ICASA and DBE and that they had to be proactive and assist with the selection of schools. Their selection of schools was mainly informed by the coverage area of their ICT Resource Centre project, which entails the setting up of ICT Resource Centres (ICT labs) in the selected districts of Education. Vodacom therefore selected the schools that are in proximity to these ICT Resource Centres that they have deployed. According to the Respondent J Vodacom (2015), Vodacom also facilitate the provision of access to the existing online education to these schools in partnership with Mindset and other stakeholders. The gazette on amended obligations for schools (ICASA, 2014) is silent on the specifics with regard to the period of payment. They just indicate that USAASA will provide subsidy for these schools.

Respondent K iBurst (2015) says they've complied with the license obligations as they have long reached their target of connecting 1000 schools that were previously allocated to them, having connected more than 3000 schools to date. According to the gazette on amended obligations (ICASA, 2014), the revised allocation of schools is as follows:

**TABLE 7: THE AMENDED LICENSE OBLIGATIONS FOR SCHOOLS CONNECTIVITY**

Licensee	No. of schools allocated
Neotel	750
MTN	1500
Vodacom	1500
Cell C	1500
iBurst	300
Total no of schools	5550

Source: ICASA (2014)

ICASA, through the revised universal service and obligations framework has reduced the number of schools that can potentially benefit from Internet connectivity through the license obligations programme from 23 500 to 5550 schools (24% of the initial allocation). ICASA has also set the timeframe for connecting these schools within 3years and each licensee is to connect no less than 300 schools in the financial year 2013/2014 (ICASA, 2014).

c) The future of universal service and access obligations

There have been varying views regarding whether or not to continue to impose universal service and access obligations to licensees or to increase the USAF contribution. According to the BMIT (2010) report on the compliance review on the USAO, the licensees that have obligations to provide Internet connectivity to schools made a general recommendation for proposed new USAO framework under the ECA that Section 90 of the ECA must be fully implemented in lieu of the obligations. Section 90 of the ECA allows for the competitive tender for universal service and access projects. This includes providing incentives to ECNS licensees to construct, operate and maintain networks through the award of subsidies, to be paid out of the USAF.

In its written submission to the Green Paper process of the ICT policy review, the National Treasury held a view that licensees across all services should be required to make a specific contribution to the USAF rather than assigning obligations to the

different licensees (National Treasury, 2014). In advancing these discussions, the Discussion Paper on the ICT policy review process provides various policy options on whether or not the universal service and access obligations framework should be changed, it also asks questions to solicit further inputs on the form that these obligations should take (DTPS, 2014b).

Furthermore, section 8 of the ECA amendments (RSA, 2014, section 8) clarifies that ICASA can designate licensees to which the license obligations on universal service and universal access apply, and then prescribe additional terms and conditions on such licensees. The Act clarifies that this must be done after consultation with USAASA and that ICASA should also allow for any determinations regarding universal service and universal access made by the Minister under section 82 of the ECA.

#### ***4.6.2 The challenges with the implementation of e-Rate***

In order to address the affordability of accessing services by schools, the electronic communications act empowers ICASA to prescribe regulations regarding the e-Rate provision. E-Rate is a legislative provision that entitles qualifying public schools to a total minimum discounted rate of 50% of the total charge levied by Internet service providers (ISPs). E-Rate can also address broadband universal access challenges for schools that already have and/or no broadband infrastructure connection. The implementation of e-Rate has been characterised by challenges such as poor coordination, lack of awareness for schools, lack of enforcement by ICASA, funding particularly for end-user equipments at schools and for monthly service fees, ambiguities in the Act, etc.

In response to these challenges, ICASA published regulations in 2009 on e-Rate to specify the manner of implementing the discount to be offered by service providers to qualifying public schools for access to Internet services(ICASA, 2009).

The ECA amendment (RSA, 2014) extended the scope of e-Rate provision to also include institutions such as independent schools, public and private colleges, private further educations and training institutions, public and private higher education institutions and all public health establishments.

The amendment also clarifies that the discount applies against the total charge levied, including (but not limited to):

- any connectivity charges for access to the Internet
- charges for any electronic communications facilities used for or in association with connectivity to the Internet
- all call charges for access to the Internet

The ECA amendment also asserts that an ECS licensee providing e-Rate discount is entitled to a minimum of 50% off the wholesale rate charged to it by the ECNS licensee for the facilities under consideration, the discount of which shall be passed on to qualifying institutions. The amendment also makes provision for USAASA to pay the charges for Internet services on behalf of a qualifying institution such as a school, thereby making USAASA entitled to the discount in this case.

#### ***4.6.3 The Discussion Paper submissions on e-Rate***

The Discussion Paper in ICT policy review (DTPS, 2014b) posed a question on whether or not the e-Rate should be claimable from the USAF. There were varying responses to this question, with most stakeholders supporting, that e-Rate should be claimable from the USAF, e.g. MTN (2015), IS (2015) & WAPA (2015). In its submission to the Discussion Paper policy review process, most members of the South African Communications Forum (SACF), with the exclusion of Telkom, have indicated that it is of the view that USAF should be used to subsidise infrastructure which would ultimately eliminate the need for e-rate (SACF, 2015, p40).

In its written submission to the Discussion Paper on ICT policy review, the Internet Service Providers Association (ISPA) indicated that e-Rate will not be meaningfully implemented in its current form. It further stated that e-Rate is a disincentive to provide Internet services to schools to licensees as there is no way to claim the discount from an upstream provider (ISPA, 2015, p.24). As most interview Respondents indicated, these discussions are clouded by the general belief that when e-rates are proffer Internet service providers use these for their general business as opposed to ring fenced services for the schools as there are no accounting measures

to ring fence school connectivity. The e-Rate has always been criticised by most industry stakeholders since its introduction under a 2001 amendment to the then Telecommunications Act. The 2014 amendments to the EC Act sought to address some of the criticism by ensuring that the e-Rate is applicable at both wholesale and retail levels. In the main, the submissions to the Discussion Paper policy document by stakeholders' highlights the ongoing challenges with the implementation of e-Rate in its current form.

#### **4.7 FUNDING FOR SCHOOLS CONNECTIVITY**

The National Broadband Policy underlines the funding requirements for the effective roll-out of broadband in the country as a challenge for expanding broadband in South Africa. It further highlights that the scale of funding of the existing funding mechanisms such as the universal service and access fund (USAF) and through the universal service and access obligations (USAOs) is inadequate for the required scale of funding for large-scale infrastructure expansion. Funding has also been referred to by most interview respondents as the serious challenge for schools connectivity. Respondent A DBE (2014) and Respondent E PDE (2014) specifically highlighted that schools cannot afford to pay for the monthly Internet service fees and ICT end-user equipments required for broadband uptake. Respondent A DBE (2014) further indicated that there is no funding allocation for broadband connectivity for schools and that this should be borne by the DTSPS.

Whilst Respondent G DTSPS (2015) has agreed that DTSPS should be responsible for funding broadband infrastructure rollout in schools, he further clarified that the DBE should provide funding for uptake of this network (monthly Internet service fees). This view was further supported by Respondent B Neotel (2014) and Respondent I ICT Specialist (2014). Respondent L Telkom (2015) indicated that this required funding should be provided for in the national fiscus.

The following section outlines the current funding arrangements for ICTs in schools:

#### **4.7.1 *The national and provincial budgets for ICTs in schools***

According to Respondent A DBE (2014), the funding for education is split between the national government and nine provincial governments. There is no dedicated budget to fund ICTs, allocated by Treasury. He indicated that provinces fund their ICTs initiatives from the provincial line function budget allocated by Treasury and that the percentage is determined by the province, based on its priorities. The provinces develop the provincial investment plan that informs the funding requirements for school education.

The national treasury allocates funding for Education Infrastructure to the DBE. The DBE then provides Conditional Grants for Education Infrastructure to Provincial Departments of Education (PDEs). The Education Infrastructure grant is intended to accelerate construction, maintenance, upgrading and rehabilitation of new and existing infrastructure in education. In addition, the grant is also used to enhance capacity to deliver infrastructure and to address damage to infrastructure caused by natural disasters such as floods. According to the DBE Annual report (DBE, 2013c), the allocated budget for basic education for the 2012/13 financial year was R5 822.389 million. A total of R5 609.839 million or 96% of the adjusted budget was spent by PDEs.

The DBE has also amended the national norms and standards for school funding so as to update the national table of targets for the school allocation within the 2013 MTEF. These amendments make provision for the equalization of the school allocations to all no-fee schools, regardless of their quintile ranking. The no-fee schooling was introduced to improve access and equity to education and to mitigate poverty as a barrier to education. The 2013 DBE Annual Report (DBE, 2013c, p.19) reveals that eight in ten schools (80%) are no-fee schools and that only 3000 public ordinary schools still do not have electricity.

Respondent E PDE (2014) has also indicated that the schools budget is managed by the provincial departments. Also, that the Education Infrastructure Grant does not specifically make provision for ICT infrastructure, as basic services such as water,

sanitation and electrification are normally prioritised. This Respondent also revealed that schools acquire ICT equipments in different ways. That is, computers and associated devices can be procured using provincial funds (where the province prioritises ICT equipments), schools can also procure ICT end-user devices directly (controlled by school governing bodies), computers (mostly old) sometimes gets donated to schools by other government departments and that the schools sometimes depend on private donations for computers. In essence, there's no amount that is ring-fenced for ICTs in schools within the education budget.

#### ***4.7.2 The universal service and access fund (USAF)***

According to BMI-T report (BMI-T, 2010, p.18), in order to attain universal service and access in the provision of ICTs, the sector regulator, ICASA, prescribed that all operators have obligations to contribute 0.2% of the annual turnover to the USAF. However, ICASA does not administer the USAF but simply collects contributions to the fund on behalf of USAASA and submits to Treasury. USAASA therefore administers the fund in line with the determinations from the Minister. In line with the views expressed by Respondent L Telkom (2015), there have been concerns around the lack of audit and the lack of transparency in the amount received by ICASA and the money USAASA receives from the fund since this fund was established in 1998. Respondent F DTPS (2014) also indicated that the role of the national treasury should also be considered in this debate, to ensure that there is alignment of priorities in the disbursement of this fund.

The BMI-T report also reveals that currently, the disbursements from the fund are limited to subsidies in a range of areas, including the network rollout by ECNS licensees (subject to competitive tender), the acquisition of services by schools and colleges, the establishment and operation of ICT community centres, or any other area as determined by the Minister with the concurrence of the Minister of Finance. The ECA Amendment (2014) made provision that the Minister of Communications (now Minister of Telecommunications and Postal Services), acting with the concurrence of the Minister of Finance, may prescribe additional uses of money held in the USAF (RSA, 2014, section 88(g)).

This research finding on USAF therefore indicates that schools connectivity is one of the many areas that this fund subsidizes, which therefore puts the issue of adequacy and sustainability of this funding arrangement for schools connectivity in question.

#### **4.8 OTHER KEY ISSUES THAT EMERGED FROM THE RESEARCH FINDINGS**

The research findings revealed other key issues that affect the broadband penetration in the country as well as in schools. These were the issues that were not covered in the scope of the interview guide but still emerged as key issues from both the document review and the interviews. The current **high broadband pricing** emerged as a barrier to the exponential growth of broadband. As Gillwald, Moyo & Stork (2012, p.5) have indicated in their research on the supply and demand-side analysis in the ICT sector in South Africa, *“International bandwidth prices (once the major factor in South African data prices) have plummeted, and it is now domestic terrestrial and IP transit prices which are the major cost drivers”*. The high pricing of broadband services generally affects the uptake of broadband. Most interview respondents also underlined high pricing of broadband data services as the area that needs regulatory intervention.

Other respondents mentioned the delayed release of the **high demand spectrum** (700MHz and 2300MHz) as another key barrier towards the provisioning of broadband (wireless connectivity). The **delayed digital migration** (migrating the transmission of broadcasting services from the current analogue platforms to digital platform) as another barrier for broadband rollout. The general view on this was that this digital migration will release the spectrum that could be prioritized for broadband services, particularly in rural areas.

The current **ineffective regulation** by the sector regulator, ICASA, emerged as a key regulatory bottleneck towards broadband supply. The ability of the regulator to regulate the ICT sector came in question several times, the focus was mostly on the current challenges of ICASA around the issues of capacity, governance, accountability, and independence. Most respondents were adamant that until ICASA's challenges are attended to, the industry will continue to move sluggishly on the provision of broadband.

Another emphasis was placed on the need for **government to intervene**, particularly in areas that are either not served or are under-served Respondents from (Neotel, DTPS, Vodacom, iBurst). These respondents, except for Respondent F DTPS (2014) indicated that government's intervention should be around providing incentives to enable the private sector to rollout broadband infrastructure in areas that are deemed to not be commercially viable, mostly rural areas. However, the Respondent F DTPS (2014) indicated that government's intervention should be on direct infrastructure deployment in these areas, leveraging on existing infrastructure of both private and public sector but prioritizing the state-owned companies in areas where there is currently no broadband infrastructure. This view was also supported by Respondent C CSIR (2014).

Respondent F DTPS (2014) also emphasized on the need to have **proper stakeholder engagement structures** in place to address issues pertaining to the delivery and the impact of e-education in schools. He further stated that stakeholders in education, particularly educators, are not properly engaged to indicate what programmes have to be put in place in order to empower them and to change them into being facilitators. He also alluded to the need to have **change management programmes** in place so as to be empowered with the resources on how to deal with the anxiety as a result of lack of understanding of the new technology tools, etc. To further elaborate this point, he advised that *"it is critical to establish measures to create consensus as change is always met with skepticisms and refusal to embrace it, people in general accepts changes when they've been consulted and when they've been party to a process of change"* (Respondent F DTPS, 2014).

#### **4.9 THE SUMMARY OF THE RESEARCH FINDINGS**

On the whole, the research findings highlighted the correlation between broadband penetration in the country and broadband penetration in schools. The availability of broadband infrastructure in the country has proved to be proportional to the broadband penetration in schools.

The research findings revealed that South Africa has adequate policies, legislative provisions and strategies in place but that implementation of these policies remains a challenge. The findings also highlighted lack of coordination and coherence in the rollout of broadband in the main, and thus broadband services to schools. The schools connectivity initiatives are also uncoordinated thus leading to fragmentation in providing broadband services to schools.

The research findings also revealed that most schools are located in the broadband backbone infrastructure coverage and that there is a huge gap in the last mile infrastructure provision. The poor enforcement of compliance on regulatory provisions such as the license obligations and e-Rate, as well as lack of proper funding mechanisms for schools connectivity also affects broadband penetration in schools. The research findings adequately answered the research questions.

## **CHAPTER 5: ANALYSING THE BROADBAND ROLLOUT CHALLENGES IN SCHOOLS**

### **5.1 INTRODUCTION**

This section outlines the analysis of the broadband rollout challenges in the South African ordinary schools, with the aim to thoroughly understand the nature and the cause of these challenges. It is premised on the notion that understanding the fundamental challenges on the current status quo of low broadband penetration in schools will assist in developing the relevant intervention measures required to address such challenges. The ultimate aim is to contribute towards improving broadband penetration and usage in schools, thereby leveraging on broadband educational opportunities to strengthen the administrative, teaching and learning processes in schools.

This analysis takes into account the findings from the two methods of collecting data that was employed in this research, that is, the document review and analysis, as well as the interviews conducted with various stakeholders. The document review method was used to analyse government policies, legislations, strategies and reports relating to ICTs in schools. This includes examining the strategies and reports of state owned companies such as Universal Service Access Agency of South Africa (USAASA) and Sentech that are involved in the provision of broadband connectivity to schools. The regulations and reports of the sector regulator, Independent Communications Authority of South Africa (ICASA) were also reviewed. These institutions policies stem from Bills and Acts of Parliament which have been examined in this research. The legislations dealing with Internet access, ICTs and telecommunications were also reviewed in this study. The analysis of these legislations was made to determine the effectiveness of these legislative provisions in facilitating the rollout of ICTs and Internet access, the level of adherence to these provisions and the challenges of implementation thereof.

This section also focuses on analysing the findings from the interviews to determine the effectiveness of policy implementation, the regulatory provisions for schools connectivity and the challenges thereof. The semi-structured interview guide was used for all the interviews to ensure a more focused data collection process. The guide was centered around the research questions with the aim of soliciting focused inputs that will be used to address the research problem.

The processing of the findings from these two research methodologies provides a more informed understanding of the research problem as well as a holistic view to the fundamental challenges of providing broadband connectivity to schools. This holistic approach played a crucial role in developing appropriate recommendations and in drawing relevant conclusion to the research problem. The data analysis exercise has also revealed common themes that emerged as critical areas that require appropriate interventions to address the challenge of the poor broadband penetration in schools.

Equally key to this analysis is the conceptual framework mainly in terms of the concepts that emerged from the literature review as key issues for broadband connectivity in schools.

The key emerging issues from the data analysis that affects the broadband penetration in schools are poor implementation of existing policies, poor coordination of the broadband connectivity initiatives, inadequate broadband infrastructure availability, high broadband prices and ineffective regulatory environment, lack of integration of ICTs, particularly broadband connectivity into the school curriculum, to mention but few examples. This section outlines these challenges in details as follows:

## **5.2 POLICIES IN PLACE BUT POOR IMPLEMENTATION**

The research findings have revealed that the major challenge with the existing policies to address broadband implementation is poor or lack of implementation of these policies. The policies referred to, and as mentioned by most respondents, include the White Paper in e-Education (2004) and the national broadband policy, SA Connect. Even though the White Paper in e-Education was enacted in 2004, it was not

supported by the broadband policy as it took South Africa a long time to develop a broadband policy. The White Paper in e-Education provided a vision for schools connectivity but there was no broadband plan to carry out that vision. The SA Connect was approved in 2013, nine years later, since the enactment of the White Paper in e-Education (2004).

In the absence of SA Connect, the DBE did not develop any plan to implement the e-education policy. The DBE conducted the study in (2008) to assess the feasibility of implementing the White Paper, which then recommended the development of an implementation plan, but this was never carried out. The absence of a plan to implement the rollout of broadband connectivity to schools has largely contributed to the current poor broadband penetration in schools. It also led to the current fragmented approach of providing broadband and ICTs in the main to schools. The lack of awareness of the existence of these policies and regulations also emerged as a key challenge of poor implementation, especially at a provincial and a school level.

As mentioned by Respondent F DTSPS (2014), another key challenge is that the current policies do not address the fundamentals of providing connectivity in schools. The Broadband Policy, SA Connect, gives strategic guidance on how to attain schools connectivity but there is no clarity around how the usage of ICTs and broadband in teaching and learning will be transformed into the learning environment and also what the role of teachers is in the digital world. Most of the interview respondents pointed out on a need to migrate paper based learning resource and chalk environment into a digital environment that is interactive and that provides an accessible learning platform. This need should be supported by a policy that guides the current teachers to migrate from being teachers who are instructors to teachers who are keen to adopt new ways of using technologies to interact with students. This therefore means that teachers should be re-educated with an understanding that the role of teachers will change in future due to the technological developments. Teachers should be facilitators as opposed to being the instructors.

The DBE has not yet defined the education requirements for broadband connectivity and this adversely affects the uptake of broadband in schools. The DBE has also not developed a programme to integrate ICTs into the school curriculum so there is

essentially no guiding document on the need and the use of ICTs and broadband in schools. This affects the implementation of the current policies.

### **5.3 LACK OF COORDINATION OF SCHOOLS CONNECTIVITY INITIATIVES**

The research revealed that there are several existing schools connectivity initiatives at different levels of government, and that some are driven by private sector, but all these initiatives are not coordinated. ICTs in schools are therefore provided in a fragmented and incoherent manner and this makes it difficult to monitor and measure progress achieved and the existing gaps. This fragmented approach creates the digital division in providing access to digital educational opportunities to learners. This therefore creates a need to integrate all the existing schools connectivity initiatives and to implement ICTs in schools in a more coordinated and uniform manner.

The research findings also highlighted a gap in setting national standards for implementing broadband connectivity in schools so as to create a more uniform and integrated approach in delivering ICTs in schools. The document review and analysis indicated that some of this information already exists in various documents, e.g. SA Connect, led by DTSP, has defined the broadband targets and speed for schools. The DBE has developed guidelines for providing ICTs in schools including defining the specifications for hardware and software, the definition of what constitute connectivity in schools is also defined in a small scale and in a different document. There are bits and pieces of initiatives that address some key elements in the value chain of providing ICTs in schools but there is no plan at a national level that guides, coordinates and measures the impact of these initiatives. Other elements of the value chain in providing ICTs in schools are not defined anywhere, e.g. the development of educational applications and content, procurement of end-user devices, etc. All these documents need to be aligned and harmonized into a single and integrated national strategy for implementing e-education in South Africa.

The provision of ICTs in schools is in essence left to be delivered by market forces and this approach has demonstrated to be ineffective, which then calls for government to intervene. This plan should provide coordination of all schools connectivity initiatives

and should describe how ICT, particularly broadband connectivity, can contribute to education reform and improvement in the quality of education, as well as its impact on the socio-economic development.

The DBE also does not have any proper or formal audit mechanism in place on the actual number of schools that have broadband connectivity. Currently, the DBE relies on ICASA to report on these numbers but ICASA does not record all schools initiatives as it does not collate data from all operators. It collects data from mostly those operators with license and/or spectrum obligations so small licensees are normally left out of this data collection equation. This affects the coordination of schools connectivity initiatives.

#### **5.4 REGULATORY INTERVENTIONS FOR SCHOOLS CONNECTIVITY (USAO'S, E-RATE, USAF)**

The research findings have highlighted the current arrangements in regard to the regulatory instruments for schools connectivity. The findings also highlighted the challenges with these arrangements including poor implementation and general ineffectiveness of the current frameworks. Other key challenges that have been noted include the following:

##### ***5.4.1 Poor enforcement on compliance of the Universal Service and Access Obligations (USAO's) by the regulator***

When asked about his view on implementing the USAO for Internet connectivity in schools, Respondent F DTSPS responded as follows: "*There is not much that has been realized out of the allocation of 3G spectrum to licensees. Years later an audit was conducted and operators dropped a sim card in exchange of access to frequencies. USAASA should monitor all these things and timeously inform both the regulator on what is happening with all these things but no report was submitted. The question of who does what should be addressed, entities should also be held to account*" (Respondent F DTSPS, 2014). Most respondents, except for the licensees affected, expressed their dissatisfaction on the implementation of USAO for schools connectivity.

The research observations and analysis is that ICASA has been very lenient in enforcing compliance to the license obligations that were imposed on the licensees almost a decade ago. This reveals the continuing challenge of the impact of regulatory failure on realizing socio-economic objectives. About 23 500 schools were allocated to licensees as early as 2004 to connect to the Internet as part of the license obligations but to date, only about 3282 (14%) were reported as schools that were connected in the compliance report on obligations (ICASA, 2013). ICASA has not been effective in assessing the mobile operators' level of compliance to these obligations and it has not implemented any punitive measures for lack of compliance. It has poorly executed its regulatory functions with regard to lack of enforcement and monitoring of compliance on this, thus failing to facilitate the provision of Internet connectivity to 23 500 ordinary schools.

#### ***5.4.2 Weaknesses of the current USAO's framework and the funding model***

ICASA, through the amended universal service obligations framework has reduced the number of schools that can potentially benefit from Internet connectivity through the license obligations programme from 23 500 to 5550 schools (24% of the initial allocation). This challenges the effectiveness of enforcing regulation and it highlights its impact on realizing social and economic objectives in the country. About 23 500 schools (94% of South African ordinary schools) would've been connected to date if this regulatory function was successfully executed. As it is, the major operators in the mobile and fixed network market are required to provide Internet connectivity to only 35% of the total number (25 000) of ordinary schools in the country through the license obligation programme. The 35 % comprise those schools that are currently connected through obligations (3282) plus the recent amended allocation of 5550 schools, as discussed in chapter 4. This current institutional arrangements on the enforcement of license obligations is not universal as it is not applicable to all schools but to a third of schools. The right to receive something should be applicable to all and more so, if it is coined 'universal'. This highlights a regulatory shortcoming that needs to be resolved at a policy level.

Furthermore, the current amended USAO framework on schools connectivity seems to be a partial solution to the problem. According to Respondents D USAASA (2014) & Respondents J Vodacom (2015), the framework provides for the payment of the Internet services by licensees for an initial period of only three months. This is a very short period of time, thus making this to be a temporary solution which is highly unlikely to be sustainable. According to these respondents, the question of who should fund connectivity after the set period of time, as per the current amended obligations is not addressed. They indicated that it appears that USAASA, by using USAF, is expected to take over the funding for monthly Internet service fee post the initial three months of subsidy by operators. However, section 3.1 of the amended obligations of Vodacom (ICASA, 2014, p.20) reads: “*The licensee must provide service at discounted rate as stated under section 73 of the ECA, USAASA shall pay to the licensee the balance of the discounted rate as stated by section 73 of the ECA*”. Section 73 of the ECA imposes e-Rate discount on the total charge levied by the licensee on provision of Internet service to the school. This therefore gives an indication that ICASA is mandating USAASA to subsidize the implementation of the USAOs for schools through USAF. This decision on this issue of funding remains unclear and if it is not addressed, it could potentially affect the usage of this broadband connectivity service in schools.

In addition, the revised framework does not provide the rationale for reducing the number of schools particularly if funding of the monthly Internet services is to remain the same. It appears that the number of schools has been replaced by the purchasing of the ICT end-user devices in schools, such as computers/tablets, printers, etc. to enable the licensees to walk away with the 3G spectrum and other benefits of owning the spectrum license. This is in spite of the fact that they haven't actually delivered on their long-standing initial license obligations. It seems the regulator simplified or rewarded the licensees for non-compliance with this new framework instead of applying more punitive and stringent measures for non-compliance.

The lack of clarity on funding therefore poses sustainability challenges as the availability and adequacy of the USAF is currently unclear. The need to enforce compliance on the licensees to realise universal service and access through license obligations is a regulatory function that aims at expanding the provision of services to

especially under-served areas. This therefore implies that the licensees should take a large portion to ensure sustainability in the provision of Internet or broadband services to schools. However, this does not appear to be the case with the current framework.

#### **5.4.3 Lengthy time frame to provide Internet connectivity to schools**

The other concerning discovery is the time frame that the regulator has given the licensees to provide connectivity to these schools as part of the license obligations. As confirmed by the regulator and the licensees interviewed, and as outlined in the regulations on this new USAO framework (ICASA, 2014), the licensees are given 3-years to comply to their obligations to provide broadband connectivity to schools allocated to them. This basically means that the mobile operators are allowed to provide connectivity to a minimum number of 500 schools per year. Neotel can connect only 250 schools per year and iBurst only 100 schools per year. Sadly, this approach shows no regard of the regulator's responsibility in advancing the government's agenda through implementing the objectives of the SA Connect on broadband targets for schools connectivity which basically states that 50% of schools should be connected by 2016.

There's absolutely no alignment of plans with the government's objectives by the regulator in this regard. One of the mobile operator interviewee has indicated that they were also surprised by the regulator to give them such a time frame to connect these schools as they can actually connect all of them in one year. He further indicated that it is in their interest as licensees to provide connectivity to these schools over three years as the model allows for cost savings on their side so they could not have opposed this.

This new USAO framework which has drastically reduced the number of schools to be connected by licensees (e.g. from 5000 to 1500 schools in the case of mobile operators), and is said to have limited the subsidy on Internet connectivity by licensees to 3months (although still remains unclear), as well as extended the period of implementation to three years, seems like a free ride for licensees.

#### **5.4.4 Lack of consistency in the allocation of schools to operators**

In line with Annexure C of the amended USAOs on roles and responsibilities of the stakeholders involved (ICASA, 2014, p.26), ICASA is supposed to drive the allocation of schools to the licensees in close collaboration with the DBE (which should assist with the selection of schools). However, the research has found that in the case of Vodacom, this was not the case. Respondent J Vodacom (2014) indicated that Vodacom assisted in selecting the schools that they should connect for themselves, as the ICASA was delaying the process. This approach obviously undermines the regulatory process and especially the regulatory objective of facilitating the expansion of broadband connectivity to the under-served and/or unserved communities through the spectrum obligations instrument. ICASA, with DBE, should allocate schools and prioritise the areas that are currently under-served in order to achieve universal service and access objectives, for which the license obligations are intended.

#### **5.4.5 Maintenance and support of equipment is still a challenge**

The relationship between the licensees and schools was also deemed critical. Other interview respondents expressed a view that the approach to the effective delivery of the USAO should include a similar model as that of an ordinary client of these companies. That is, in the provision of broadband connectivity services to schools, the licensees should take into account the service level agreement (SLA), the quality assurance, maintenance plan and provide backup systems that they normally deploy to a client. Schools should be treated as clients as they will be contributing to the largely to the revenues of these licensees. Respondent F DTSPS (2014) mentioned that *“the problem with the current system displays an attitude that computers will be dropped to schools by the licensees and they will then dissociate with them and leave them in the hands of others for maintenance and this is unheard of”*. This respondent further stated that a box drop without any intention for it to be effective is a poor business model.

This concern proved to be a valid concern. The document review and analysis indicated that the amended obligations did not make any provision for the maintenance of end-user devices but only provided for the maintenance of the network connection

by the licensee (ICASA, 2014, p.20). This means that the maintenance and support of equipments in schools still remains a challenge as schools do not have technicians who will attend to this problem. The lack of technical support at a school level therefore emerges as a key concern.

#### **5.4.6 Poor implementation of e-Rate**

The research findings support the view that e-Rate provision of the ECA is a good initiative but it is poorly implemented. Most respondents argued that procedures to e-rate are not simplified and this is also aligned with the findings of the document analysis. It became very clear that the view of most respondents is that licensees' wants to make profit from improving education outcomes. The challenges of e-Rate, as revealed by the document review and analysis includes: the definition of connectivity for schools, lack of clarity on the required funding to provide for the 50% balance, lack of coordination, poor enforcement by the regulator, lack of awareness by schools, end-user devices and training, etc.

It is not clear as to what the uptake of e-Rate in schools is as there is no audit or research report on the implementation of e-Rate that has ever been developed and published by the sector Regulator. It is therefore not known how many schools have actually benefited from this e-Rate legislative provision. This concern was also echoed by Respondent E PDE (NC) (2014) and Respondent L Telkom (2015), highlighting that no one knows whether e-Rate is implementable or not as there are no public records on it. It has been 14 years since e-Rate was introduced under a 2001 amendment to the then Telecommunications Act but ICASA still does not have records of how many schools have benefited from this provision.

#### **5.4.7 Definition of connectivity or "Internet service" for schools**

Most respondents were pleased that the current USAO framework is providing a clear definition of what connectivity should entail in schools. Reference was made to the specifications developed by the Department of Basic Education on this (DBE, 2014d, p.4) which defines connectivity as:

“...connecting schools through a dedicated educational network and to external environments to facilitate, both, the flow of information for logistics and operations and to support teaching and learning processes”.

This specification also states that schools will be connected to the hosting operator, as an interim measure, until the education network is established and is operational. However, the DBE does not indicate when the education network will be established. The DBE also provides the hardware and software guidelines for end-user devices.

Apart from the definition of connectivity for schools, the other critical challenge that has been highlighted by many around the implementation of e-rate provision has been on the interpretation of what the 50% discount entail. Respondent F DTSPS (2014) clarified that the network operators and equipment suppliers should give the 50% discount to the provision of Internet connectivity to schools. E-Rate provision refers to both the connectivity (Internet service) and the associated equipments (this includes the router). There has been a serious contention by the network operators that they cannot be expected to provide 50% on the *total levied charge to schools*, as per the e-Rate provision because the equipment suppliers (vendors) do not give the network operators the discount when they purchase these equipments. The revised e-Rate regulations (ICASA, 2009) did not clearly address this shortcoming.

#### **5.4.8 Identifying loopholes in the current e-Rate regulations**

The e-Rate regulations (ICASA, 2009) were intended to address the bottlenecks in the implementation of e-Rate. However, the regulations do not sufficiently address the challenges. For example, the Regulations have attempted to address the passing down of the e-Rate discount on Internet capacity from upstream (wholesale) providers to downstream (retail) providers, in instances where the downstream providers are to provide Internet connectivity to educational institutions. However, the current regulations do not specify any formal procedure/measures to be implemented for the downstream providers to claim the e-Rate discount from upstream providers. The question of “what happens next” if the upstream providers refuses to give the downstream providers discount on the Internet service is not addressed.

Also, at an administrative level, ICASA does not specify the process on how e-Rate will be administered in terms of the application process, that is, creating e-Rate awareness in schools, assisting schools to apply (and to choose a service provider) for this Internet discount, etc. The administrative process should also address how the potential abuse of e-Rate discount such as over pricing of Internet services by licensees to recover the money spent on this discount, will be managed. The current regulations are silent on these critical issues that affect the implementation of e-Rate.

#### **5.4.9 Coordination and implementation of e-Rate**

On the issue of coordination and implementation of e-Rate, the view expressed by most respondents is that there is a need for the establishment of a focal point to facilitate the implementation of e-Rate as it is not in the business of the principal or the schools to interact with service providers. There is no liaison between schools and the licensees in regard to the implementation of this legislative provision. There is also a need to create awareness on e-Rate, to facilitate the requests from schools, to discuss the arrangements with the operators and to aggregate the demand on behalf of schools and currently neither USAASA nor ICASA is providing this function. ICASA is not facilitating the monitoring and evaluation of the impact of e-Rate implementation. The DBE coordinate the training of teachers and learners but not in a structured manner for this project. There is no proper and integrated coordination mechanism in place for e-Rate implementation and the roles and responsibilities for all stakeholders concerned are not clarified. In essence, there is no driver for e-Rate implementation.

#### **5.5 OTHER CONSIDERATIONS**

Other important factors for the success of an e-Rate programme includes the quality bandwidth and the existence of Internet service providers (ISPs) in the targeted geographical areas for the schools to choose from. The issue of support and maintenance also needs to be taken into account.

### **5.5.1 No monitoring of compliance by ICASA**

The split of the DoC into the new DoC and the DTSPS has a potential to introduce further fragmentation in the coordination of the schools connectivity initiatives. ICASA is now reporting to the new DoC. ICASA, being the converged sector regulator is also responsible for enforcement of compliance on the license obligations by the licensees as well as monitoring. This therefore makes ICASA responsible for the facilitation of schools connectivity (with other key stakeholders) through the license obligations. On the other hand, DTSPS is responsible for delivering on broadband in the country and schools connectivity is an integral part of the broadband plan, as indicated in SA Connect.

The lack of clarity and uncertainties on how the e-Rate provision should be administered and funded appears to be the major hindrance towards the implementation of e-Rate. There was no one who opposed the relevance of e-Rate from the respondents, but most people mentioned that e-Rate is not implementable in its current form and that further interventions are required to address the current challenges. This finding resonated with the written submissions to the Discussion Paper made by various stakeholders on the question of the relevance and effectiveness of e-Rate.

## **5.6 HOW SHOULD BROADBAND CONNECTIVITY IN SCHOOLS BE FUNDED**

The research posed a question on how should broadband connectivity in schools be funded, particularly the monthly Internet service fees to ensure sustainability in the uptake of broadband services. The research question aimed at exploring the appropriate funding model for schools connectivity. The observations from the findings are as follows:

### **5.6.1 There is no funding model for schools connectivity**

The required funding (of the 50% balance on e-Rate discount) for the monthly Internet service fee for schools remains a challenge as the expectation is that this fund should come from USAF, particularly in cases where schools cannot afford to pay for the Internet service.

Respondent D USAASA (2014) has indicated that it costs the schools an average of R700 per month to pay for the usage of Internet connectivity in a computer lab. Apart from funding for the monthly operational costs of Internet service in schools, there is also a need to provide the end-user equipments such as computers/tablets, printers, scanners and etc in schools. The current e-Rate regulations do not make provision for this funding, they are very silent on where this funding would come from. There is currently no identified and standard funding model for schools connectivity.

Most interview respondents have expressed the view that USAF should be used to subsidize connectivity to schools and that all licensees should contribute a portion to this fund. A measurement of this contribution was flagged as important, most expressed the views that this contribution should be linked to the size of an organization. That is, those licensees who generate more revenue should make more contribution to the fund. There was no indication of how much should the percentage of the contribution be. Other respondents have raised a concern that other funding models should be explored to provide connectivity to schools as the reliance on USAF only is not sustainable.

The current arrangement with the administration, management and control of USAF, in terms of the legislative provision, is somewhat complex. USAF is administered by USAASA, in compliant with instructions of the Minister. However, ICASA determines the level of contribution to the fund, collects the money from licensees and submit it to National Treasury. ICASA does not account for this money to USAASA, neither does it keep records of how much is collected. There is no audit or financial statement available on USAF. The ECA Amendments (RSA, 2014, section 89 of Act 36 of 2005) amended section 89 with a clause that states that: "The Agency must collect all money that is due and payable to the Universal Service and Access Fund from the Authority". However, there is no implementation mechanism that has been put in place to bring this clause into effect yet. The parameters on how this clause will be implemented still need to be defined. This therefore puts the issue of the management and administration of the USAF in a state of uncertainty, particularly if USAF has to be used as the primary funding model for schools connectivity.

Another consideration for the funding model is that of the national fiscus. It is clear that ordinary schools cannot afford to pay for the deployment of broadband infrastructure and services, more so that 80% of these schools are declared as no-fee schools. Government should therefore provide funding for connectivity and its usage in schools. Like most countries that drive the provision of broadband connectivity at a national level, SA should priorities funding for the rollout of broadband connectivity to schools.

There is currently no policy on budget patterns in education. The current budget is still aligned to the traditional forms of delivering educational resources such as text books. There is a need to explore the provision of e-books and a need to migrate to a multi-format resource based materials. The fact that the national department of basic education does not budget for ICT enabled education is a huge concern. Currently, the DTPS and some of its agencies seem to assume responsibility for funding connectivity, its usage and devices. This need not be as delivering education is not the core mandate of the DPTS. The DBE needs to play a pro-active role in delivering ICTs in education.

Other existing funding models that were mentioned includes: donor funding, private sector funding, etc. It is important to coordinate all the existing funding models for schools connectivity as the critical milestone towards realizing connectivity in schools. The findings clearly highlighted that there is no funding model for schools connectivity.

## **5.7 THE CHALLENGES WITH THE EXISTING BROADBAND INFRASTRUCTURE COVERAGE**

In an attempt to respond to the research question of: *why do schools that fall within the broadband coverage not connected to broadband?* It is important to first define the requirements for schools connectivity particularly from the supply-side. These requirements includes; the availability of broadband infrastructure in areas where schools are located. This infrastructure includes the national backbone (long distance) network that connects the major cities and towns through the fibre-optic cables. This also includes the availability of the last mile network that extends the infrastructure to the site.

It became very clear from the interviews and document analysis that there are various interventions required to achieve universal broadband infrastructure provision. Firstly, there are areas that do not have adequate broadband infrastructure, particularly in the last mile provision. These areas would therefore need infrastructure investments in order to realize the universal broadband provision.

### ***5.7.1 The existing broadband infrastructure is inadequate for schools connectivity***

As indicated in Chapter 4, the BMI-T (DoC, 2013b) study showed that only 27% of the 25 000 public ordinary schools were located outside the broadband infrastructure coverage area in 2013, with 73% being within the broadband coverage. This broadband coverage area largely refers to the available backbone infrastructure. The CSIR research on broadband mapping (DTPS, 2014c) has shown that about 86% of the population resides within 10 km of a fibre access node. This highlights the backbone infrastructure access gap of about 14% of the population that do not currently have backbone coverage.

However, this research has also revealed that the majority of schools are located within 50km of fiber nodes. This means that the broadband infrastructure is passing through many schools but it cannot be rolled out to these schools in the absence of investments in the last mile connectivity segment of the broadband infrastructure value chain. This requires the provision of the network links, through last mile (local loop) infrastructure to these fibre nodes so as to extend this fiber backbone infrastructure to schools. There is a massive infrastructure provisioning problem in the last mile segment that needs effective regulation by ICASA, so as to meet the schools connectivity targets set in SA Connect Policy. This also reveals that the remaining 73% of ordinary schools could have broadband connectivity, under conditions where last mile access was provided.

Secondly, there are areas that have broadband coverage, including last mile connectivity, but there is less or no uptake of broadband services, as is the case in schools. Such areas require different intervention approaches such as developing the demand stimulating measures that will drive the uptake of broadband services. Such measures could include focusing on skills development and content development

areas. It is therefore very clear that there should be various solutions to various challenges and that each case should be carefully examined.

In order for *connectivity* in schools to be established, schools will need to *want* (establish the need) this connectivity, to *afford* this connectivity and to be able to *use* this connectivity. This therefore means that schools will need to first demonstrate their needs for this connectivity, that is, assess the educational value that broadband connectivity will bring into the schooling system and highlight what problem this connectivity will address when integrated into the school curriculum. Schools can only *want* this connectivity when this *need* is established and this will drive the uptake of connectivity particularly in schools that already have broadband coverage.

As mentioned above, another critical element is affordability of this connectivity. This is another mammoth challenge as most public ordinary schools in South Africa are no-fee schools which cannot afford monthly Internet services, nor can these schools afford to buy the ICT end-user devices, which will enable them to *use* the broadband services. Funding therefore poses as a critical impediment towards the uptake of broadband connectivity by schools.

The DBE should focus on schools as a priority for them but there is a need to ascertain that there will be value on this. It is important for the country to discuss the role of broadband in transforming education and its potential to improve educational outcomes.

### ***5.7.2 The lack of effective regulation in the ICT sector has adverse effects on broadband penetration in schools***

The research findings have revealed that **high pricing** of broadband service poses as a key barrier towards the adoption of broadband in South Africa. ICASA is legislatively empowered to regulate pricing of broadband services. Most interview respondents alluded that ICASA has been ineffective in executing its regulatory functions. Such ineffectiveness has been pointed out to include the delayed release of the high demand spectrum, lack of enforcement of compliance on the USO and e-Rate, poor regulation of competition in the sector, to mention but few issues.

In addition, ICASA has developed regulations to facilitate **infrastructure sharing** amongst licensees so as to grant other ECNS licensees access to the incumbent's electronic communications facility, including antennae's, cables, masts and satellite transponders. This would allow them to be able to provide a wide range of services such as voice and broadband to customers. Such regulations include the facilities leasing and the interconnection regulations. These legislative provisions enables linking two or more electronic communications networks so as to allow customers of one network or service provider to have access to the customers of another network. Regrettably, these regulations haven't been fully implemented. The research findings have proved that the lack of effective regulation in the ICT sector has adverse effects on broadband penetration in schools.

### ***5.7.3 Poor coordination of broadband infrastructure rollout***

Even though the Respondent G DTPS (2015) has indicated that the DTPS is consulting stakeholders in developing the broadband implementation plan, Respondent A DBE (2014) has pointed out that the DTPS does not consult with them in developing plans about the rollout of broadband connectivity and the requirements thereof in schools. The interview with the DTPS also revealed that there doesn't seem to be an official coordination mechanism or structure established for consultation with other primary stakeholders, particularly those that are the potential beneficiary to the very broadband network that will be deployed through the facilitation by DTPS.

The other challenge that this study has observed on the coordination of the broadband process is the reluctance for other stakeholders particularly government Departments to report to the DTPS as their counterpart. Respondent C CSIR (2014) also highlighted that CSIR, as the SIP 15 coordinator, is also experiencing similar resistance by other stakeholders even in SIP 15 meetings. It would seem that stakeholders prefer to report to a central office such as the office of Presidency as a coordinating vehicle for broadband. Broadband initiatives are also implemented in an uncoordinated manner by various stakeholders including both the private and the public stakeholders.

The research revealed several regulatory bottlenecks that impede the universal provision of broadband network. Such blockages include lack of effective competition in the ICT sector, ineffective regulation and lack of coordination of infrastructure rollout.

In the case of the provision of broadband connectivity to schools, inadequate availability of last mile infrastructure poses as a mammoth challenge towards infrastructure provisioning in schools. Even though most schools are geographically located in areas where there is fair coverage of broadband backbone infrastructure, the research has demonstrated that there is no adequate points of presence in most municipalities, neither is there adequate infrastructure in the local loop that links the national backbone network to the schools.

## **5.8 IMPLEMENTATION OF SCHOOLS CONNECTIVITY INITIATIVES**

The research has established that there is currently no coordinated mechanism in providing broadband to schools. The schools connectivity initiatives are not coordinated and are driven by various stakeholders in both private sector and public sector. The following observations have been made around the issue of broadband rollout in schools:

### ***5.8.1 Lack of clarity in role definition of key stakeholders (who does what)***

In responding to the research question of what should be the proper coordination structure for implementing broadband in schools and what the roles of various stakeholders should be, the research revealed a need for the DBE to lead and coordinate schools connectivity initiatives, in collaboration with the DTPS (on broadband) and other stakeholders. The research also revealed that ICTs in schools should be about how to use ICTs to improve the delivery of and expand access to education. Respondent E PDE (NC) (2014), in particular, emphasized that the underlying challenges in the education system should first be resolved so that ICTs can be used as an enabler and not as a panacea to solve education problem. This means that ICTs should not be imposed to education but rather that education should establish the need to use ICTs, particularly broadband connectivity. Respondent F DTPS (2014) also indicated that the DTPS should focus on facilitating the provision of broadband connectivity to public facilities, including schools, and that sector Departments of these public facilities (beneficiaries of broadband connectivity) should then drive the transformation of their business models to improve efficiency through the use of ICTs.

The role of various stakeholders in providing broadband connectivity in schools is as follows:

- The DBE should focus on policy development in education including coordination and securing of funding for ICTs in schools
- The PDE – policy implementation and coordination within the province
- The DTPS – policy development in ICTs including broadband coordination
- ICASA – create an enabling environment in the ICT sector, enforcement of compliance on e-Rate and USAO's
- USAASA – e-Rate coordinator,

### ***5.8.2 Lack of coherence in rollout broadband connectivity to schools***

In line with what the document analysis has revealed, the interviews also attested to the fragmented approaches in delivering broadband infrastructure and services to schools. More so, there are no specific, formal and standardized guidelines on how broadband connectivity in schools should be achieved. Everyone seems to be at liberty to provide any connectivity solution to schools. This leads to lack of uniform provision of connectivity solution.

The research findings also revealed that stakeholders such as teachers, parent, labor and unions are important stakeholders that need to be involved in effecting change in the way education is delivered through the implementation of ICT technology. The study also highlighted the need to have a transition or migration structure from the traditional way of delivery education to the modern and technology-oriented way as key. This therefore calls for the country to initiate a national conversation with all affected stakeholders to discuss the implications and expectations of this transition in education.

### ***5.8.3 The educational value of broadband connectivity in schools has not been established***

The research findings revealed that, apart from the ICT sector related challenges such as availability of broadband infrastructure and ineffective regulation, the educational value of broadband connectivity in schools has not been established. The White Paper in e-education (2004) does not adequately articulate the rationale for providing Internet or broadband connectivity in schools. The national broadband policy also fails to articulate the need for providing broadband in schools. This policy highlights the required speed (and bandwidth) for schools but it does not indicate what is informing this bandwidth, that is, what the broadband connectivity will be used for. The DBE has not defined the education user requirements for broadband connectivity. It has not measured the impact of integrating technology in schools on the quality of education or even on administrative processes, yet. The need for broadband connectivity in schools has therefore not been established yet and this has adverse effects on the uptake of broadband connectivity in schools.

## **5.9 CHAPTER CONCLUSION**

It has been more than a decade since the White Paper in e-Education (2004) came into force but not much has been achieved, particularly in regard to the provision of Internet connectivity in schools. The research has revealed that the challenges pertaining to schools connectivity goes beyond the education sector. The research has also revealed that it is critical to address the fundamentals of delivering education and only use technology as an enabler, as opposed to relying on technology to solve education problems. Technology is not a panacea for education but it is one of the many methods of improving the access to and the delivery of education. As indicated in the conceptual framework, the rollout of broadband connectivity and its uptake is a shared responsibility between the education and the ICT sectors. The supply of broadband infrastructure is led by the ICT sector but the broadband uptake is driven by the educator sector.

### 6.1 INTRODUCTION

This research was aimed at identifying the key challenges that poses as barriers towards the provisioning of broadband connectivity in schools. The objective was to establish measures that need to be implemented to address such barriers, so as to improve broadband penetration in South African public ordinary schools, and ultimately contribute positively towards improving the quality of school education in the country.

This section therefore outlines the proposed interventions (recommendations) made on how to address the challenges highlighted in the research findings and in the analysis of the challenges. It assesses whether the research questions were adequately addressed. The recommendations were largely informed by the understanding derived from studying and analysing these challenges. The Chapter proposes possible measures required to address the existing challenges. It also outlines the areas that require further research (given the research limitations) and provide conclusion of this research.

The key proposed interventions highlighted in this chapter includes addressing challenges of broadband infrastructure provision, policy implementation and enforcement of compliance on regulatory environment, coordination of the rollout of schools connectivity initiatives.

### 6.2 THE PROPOSED INTERVENTIONS

#### ***6.2.1 How to improve the policy implementation and increase uptake of broadband connectivity in schools***

The effective implementation of broadband connectivity in schools requires proper planning, setting up of appropriate coordination mechanisms and consultation

structures, as well as clear monitoring and evaluation tools. The roles and responsibilities of key stakeholders involved in each segments of the entire value chain of rolling out broadband connectivity to schools have to be defined. The following recommendations seek to provide solutions to how effective implementation of broadband connectivity in schools can be achieved.

a) Develop the national e-education strategy to support policy implementation

The research findings revealed that the existing policies and legislations that supports and advocates for the use of ICTs in education, and for the provision of Internet and broadband connectivity in the main, are adequate but that implementation of these policies remains a challenge. The research further established that the implementation of these policies is not only uncoordinated but also that there are areas that requires clarity on how these policies should be implemented. Such areas include funding for both connectivity (Internet service) and access devices in schools, administration, governance and accountability in providing ICTs in schools and the role definition of various stakeholders involved in facilitating ICTs in schools. This depicts the gap in the planning of the effective rollout of broadband connectivity in schools.

There are many elements in the value chain of providing ICTs in schools such as the availability of broadband infrastructure and ICT devices, funding, the governance structure, the development of e-education content, capacity building, ICT integration into curriculum and the provision of support and maintenance of ICTs in schools. These elements needs to be effectively aligned and harmonised through the development of an integrated and uniform approach towards delivering ICTs, particularly broadband connectivity in schools. This can only be achieved through the development of an integrated national e-education strategy that will facilitate the effective implementation, and usage thereof, of ICTs in schools and the integration of technology in the core business of teaching, learning and the administration of schools and the education system as a whole.

Even though this study focuses mainly on the supply-side factors affecting broadband penetration in schools, it is recommended that the e-education strategy should focus on both supply and demand factors influencing broadband provision and adoption in schools.

The Ministry of Basic Education should lead the development (and implementation) of the national e-education strategy and the implementation of the national broadband strategy should support the implementation of such a strategy. The implementation of this strategy should be realized through the development of an Implementation Plan with clear objectives, measurable and realistic deliverables and time frame.

b) Promote aggregated procurement of ICT end-user devices: bulk purchasing of devices

There are about 25 000 public ordinary schools in South Africa, which means that if each school should have one or two computer labs, which should have a minimum of 30 computers/tablets as per the DBE hardware guidelines, then government will spend millions in purchasing these devices. It is therefore recommended that government should consider more cost-effective measures of securing these devices such as bulk purchase so as to reduce the expenditure on these devices, investing in the development of local manufacturing capacity of entry-level devices and removal of taxes for Internet-enabled devices.

The government expenditure on these devices would escalate drastically if each learner is to have his or her own device, which should be a consideration if South African learners and teachers are to fully realize the digital educational opportunities. One device per learner would give learners an advantage of convenience as the learner will be able to use the device anytime. It should be noted that devices (computers and tablets) also includes the devices for teachers and administrators in schools, as well as other end-user devices such as multi-function printers, scanners, servers, and etc.

The consideration for aggregated procurement of ICT end-user devices should be for all sectors where government has facilities. This will include the health sector (health facilities – clinics and hospitals), arts and culture sector (libraries), post offices, and etc. This should form part of the aggregated demand for public sector, that is, the aggregated demand should go beyond the infrastructure provision and it should also include the services and devices.

The education system does not have sufficient resources to ensure a device for every child and every administrator. In the long term a realistic policy will rely on other strategies like subsidies for the indigent and an expectation that those who can afford to buy their own devices will be required to do and such devices integrated through Bring Your Own strategies. The indigent policies should be implemented in order to assist and ensure that those who cannot afford the devices will be enabled.

c) Establish an Implementing Agency to rollout ICTs in schools

It has been 10 years since the adoption of the White Paper in e-Education (2004) by Cabinet and the Department of Basic Education has not been able to effectively coordinate the rollout of ICTs in schools. The main reason that is cited for this shortfall is lack of capacity within the Department. Other factors that hinders effective coordination and monitoring of schools connectivity initiatives is the high number of public ordinary schools (about 25 000) in South Africa and the level of autonomy in provinces with regard to funding and the degree of their administrative role in schools. There is a need for a central coordinating body to be established to plan, implement and coordinate all ICT related activities in schools. This should be an Implementing Agency for e-Education.

The functions of this Implementing Agency should include, but not limited to, the following:

- Develop and implement the National e-Education Strategy to rollout broadband in schools in line with the targets sets in the National Broadband Policy.
- Coordinate overall programme of schools connectivity implementation by government (all three spheres) and private sector;
- Facilitate the monitoring and measurement (audit) of broadband penetration in schools;
- Support the implementation of regulatory interventions on schools connectivity, e.g. USO and e-Rate implementation for educational institutions;
- Promote awareness on the benefits of broadband in schools.

The composition of this Agency should include members from public and private sectors, especially those in the ICTs and Education sectors.

d) Establish an audit mechanism to measure broadband penetration in schools

The research revealed the lack of an existing audit mechanism to measure broadband penetration in schools. The DBE and the DTPS do not have records of how many schools have Internet and broadband connectivity to date, neither does ICASA. Information on schools connectivity, including related attribute information such as the type of connectivity (access technology), connectivity speeds, cost of connectivity, usage patterns, etc is in the hands of the ECNS and ECS licensees. This information needs to be collated by either ICASA or USAASA so as to measure the actual broadband penetration in schools connectivity. When collated and integrated, this information will also assist in the development of the business case to secure funding for the provision of broadband connectivity to all schools. For example, it will inform the business case on the user and the technical requirements (bandwidth, speed, etc) for schools connectivity.

e) Create the demand in the usage of ICT in schools

The main challenge seems to be in creating the demand for ICT usage in schools, that is, providing evidence to (or demonstrating) the potential and benefits of ICT integration in schools and this has not been achieved yet. ICT integration into the curriculum should include new innovative ways in which ICTs can be used to deliver the teaching instruction in the classroom. This requires the development of new software programmes, new interactive educational material and new educational applications that will contribute towards the improvement of delivering education in schools. This requirement goes beyond the provision of connectivity and end-user ICT equipments in schools. It introduces a new paradigm towards the delivery of education and therefore requires serious conversation with all stakeholders involved in the provision of education in the country. Government should provide a vision and a strategy to transform education using ICTs and private sector should support and drive the implementation of that vision and strategy through developing innovative educational solutions to improve the education system in the country. Everyone should play a role.

f) Build Teacher confidence in the use of ICTs

Teachers need to have confidence in the use of ICTs in education so as to embrace the integration of ICTs into education and such confidence can only be built through training the teachers on *how to use ICTs* and on *how to integrate it into teaching and learning* environment.

A formal ICT curriculum policy needs to be established, to promote the adoption of ICT in schools. This policy fosters the integration of ICT in teaching and learning processes, but builds on the professional attitude and willingness of the individual teacher and school principal.

**6.2.2 How to improve regulatory effectiveness on schools connectivity (USAOs, e-Rate, USAF)**

The research has revealed that the regulatory instruments for schools connectivity have been characterized by challenges of implementation. The nature of these challenges ranges from the ineffective implementation frameworks of these regulatory instruments, some of which are highly informed by the current institutional arrangements, to the ineffective regulatory enforcement on compliance. The following recommendations are made to provide solutions to the challenges revealed by the research findings.

a) Remove the USAO for schools connectivity and replace with increased contribution to the USAF

The enforcement of the universal service and access obligations on schools connectivity has proved to be ineffective for years. The current revised USAO framework also proves to have challenges with implementation. In particular, the long standing challenges of funding for both monthly Internet services and for ICT end-user devices in schools still remains. Moreover, not all the schools are ready for broadband connectivity, that is, research has revealed that there is still some significant number of schools that are located outside the last mile infrastructure coverage particularly with fixed infrastructure.

This lack of availability of adequate infrastructure therefore highlights a need to attract more infrastructure investments to areas that are poorly served. In order to attain the universal service and access goals in schools connectivity, broadband connectivity should be provided to all schools.

The research has also revealed that the current USAO framework is a partial solution to attaining the universal service and access goals as it does not make provision to connect all schools. This therefore defeats the purpose of imposing the USAO to provide Internet connectivity to schools (about 30% of schools). An increased contribution to the USAF for all licensees to replace the USAOs is therefore seen as a better policy approach as it will make funding available for (and subsidies) the deployment of broadband infrastructure, monthly Internet services and end-user devices to all public ordinary schools. The regulator should conduct research to determine this percentage of increased contribution.

b) Appoint an e-Rate administrator

As indicated in Chapter 5, there is currently lack of coordination in the administration of e-Rate, there is no central point of contact with regards to the administration of e-Rate. Most schools are also not aware of this provision, there is no clarity in terms of the responsible entity to facilitate this, and there is also no role definition (who does what) in the value chain of stakeholders involved in the implementation of e-Rate legislative provision. As a result, schools do not know who to apply to, there is no governance structure or coordination mechanism in place. There is also lack of clarity in funding provisions to supplement e-Rate discount. The Regulator does not monitor the implementation of e-Rate, as a result there is no audit that has been conducted on schools that have benefited from this provision to assess the progress on this implementation.

These existing challenges pertaining to e-Rate implementation requires an administrative body to ensure full compliance to, and to promote uptake of this legislative provision. In addition, the ECA amendment (2014) has made provisions for the increased scope of e-Rate beneficiaries to also include institutions such as independent schools, public and private colleges, private further educations and training institutions, public and private higher education institutions. This increased scope will put additional pressure on ICASA to monitor compliance.

This therefore necessitate for an appointment of an e-Rate administrator to execute the following functions:

- Monitor and conduct audit on e-Rate implementation;
- Promote awareness with all the e-Rate beneficiaries;
- Liaise with them to ensure uptake of this provision; and
- Liaise with the licensees (ECS and ECNS) to attend to any administrative matters and queries relating to e-Rate.

This e-Rate administrator could be a division within ICASA working closely with USAASA and other primary stakeholders such as DBE, DTPS and DoC. A governance structure such as a steering committee with key stakeholders should be established with clear definition of roles and responsibilities for each entity. USAASA could also be appointed as an e-Rate administrator.

Effective regulation is required on this front, ICASA has to rigidly enforce e-Rate implementation on licensees. It has to keep an eye on the rate they charge the beneficiaries for these services and determine whether these are 'market based' rates, i.e. whether the rates are not inflated to compensate for e-Rate. Some controls needs to be exercised on how this rate is determined to ensure that government isn't subsidizing private sector business. ICASA should also manage the dispute between ECS and ECNS on the provision of the discount on the wholesale rate, as per the ECA amendment

The e-Rate regulations also need to be revised to make e-Rate more enforceable. The review of these regulations should focus on addressing challenges such as the relationship between the upstream and downstream providers, funding provision, monitoring and evaluation mechanisms, and etc.

c) Establish a funding model for broadband connectivity in schools

The research has revealed that there are currently no funding models to ensure the sustainable connectivity in schools. As indicated, the Departments of Education (both national and provincial) do not make specific budgetary allocation for ICTs. As a result,

schools connectivity is mostly funded in an uncoordinated manner and through various initiatives, most of which are unsustainable. The funding model for schools connectivity should therefore be clearly determined and this should be incorporated in the proposed national e-education strategy. This funding model should include the provision of funding for infrastructure rollout (in under-served areas), end-user devices and monthly Internet services.

Other considerations on the funding models could include the entrepreneurial funding where the broadband-connected schools act as community ICT centers for the local community to provide services to the community after working hours and on weekends. These school-based ICT centers can offer ICT services such as computer literacy, Internet connectivity and video and audio communications software. This could be a financial sustainability model that will assist the school to afford the running Internet cost.

The Departments of Education should be encouraged to secure funding for ICTs in schools, as a separate budget item. Every Province should follow the lead of Gauteng and Western Cape provinces in driving the rollout of ICTs in their schools and this should be supported by budget allocation. The National Department of Basic Education should focus on developing national policies and strategies to promote the use of ICTs in schools, and set national standards and guidelines for the provision of connectivity and the development of education content for schools. The DBE should also provide an oversight role and coordination of schools connectivity initiatives and monitor the progress of broadband penetration and usage in schools and develop audit reports on this. The DBE should also aggregate funding requirements for ICTs in schools in provinces and develop a sustainable and comprehensive funding plan for all schools.

The research has also revealed that the private sector should also play a role in funding the broadband connectivity in schools, given the magnitude of the task and the cost implications of relying on only one funding model thereof. Investment from the private sector such as the corporate social responsibilities and other funding resources, including the donor funding, is critical to supplement Government contributions.

### **6.2.3 How to improve the broadband infrastructure coverage and connectivity for schools**

The broadband infrastructure coverage for public ordinary schools largely depends on the broadband infrastructure coverage in the country. As research has revealed, most areas that are served in terms of broadband infrastructure provision are urban areas, as they are deemed to be more commercially viable by the private sector. This approach by the private sector has unfortunately left most rural areas un-served or poorly served, thereby affecting the infrastructure availability of more public ordinary schools as most of these schools are geographically located in these rural areas. This therefore necessitate for a need to resolve the general broadband infrastructure provision in the country so as to positively advance the broadband infrastructure rollout in schools. The proposed interventions to address this are outlined as follows:

a) Establish a central coordinating agency for broadband rollout

Establish a central coordinating agency for broadband, this agency will be responsible for coordinating all the broadband initiatives at various spheres of government. This will include the rollout of broadband infrastructure, aggregation of the broadband demand in government (across various government institutions such as schools, health facilities, community centres, libraries and etc), etc. This agency can either report to the Minister of the DTSP or to Presidency. This will give the Agency some of independence it needs from the Department of Telecommunications and Postal Services.

b) Promote effective regulation in the ICT sector (strengthen ICASA)

The research has revealed that the lack of effective regulation affects the broadband penetration and usage in schools. The regulator could not (and still does not) effectively leverage the existing regulatory resources (e-Rate, USO, USAF) to advance the broadband penetration in schools. Lack of or poor enforcement on compliance to regulations emerged as a key challenge to the ICT sector, and this proved to have detrimental effects to the education sector.

The regulator has to be adequately capacitated and there needs to be proper accountability and governance structure in place that will assist in monitoring and evaluating the effectiveness of ICASA particularly in meeting the socio-objective goals.

About 20 000 schools were supposed to have been connected to the Internet to date through the license obligations initiative, had ICASA enforced compliance on the schools connectivity obligations of the licensees. E-Rate was another potential driver of connectivity in schools but was unfortunately not effectively implemented.

ICASA is also expected to vigorously regulate the sector so as to attain effective competition amongst licensees and ensure that licensees expand the broadband infrastructure to areas that are under-served or not served. The Green Paper (DTPS, 2014) and the Discussion Paper (DTPS, 2014b) have clearly highlighted that Chapter 10 of the ECA that seeks to address competition issue has not been fully implemented by ICASA. ICASA also has to mandate open access to the incumbent's networks so as to enable other small licensees to gain access to the incumbents' infrastructure on a fair, reasonable and non-discriminatory terms. This will allow licensees to compete at a service provision level and this could consequently drop the cost of communication services.

c) Priorities investments in the last mile provision of broadband infrastructure

In order to address the existing enormous infrastructure gap in the provisioning of the last mile, as revealed by the research findings, it is recommended that investments in this layer of broadband provision be prioritised. This would mean that more private sector investment should be directed to this area, and that government should intervene where necessary to ensure that immediate measures are implemented to provide network links to the existing backbone infrastructure. The government can either do this by providing incentives to private sector, where necessary, or alternatively by direct investment in infrastructure deployment through the state owned companies or through public outsourcing funding model. This would see more schools being connected through various access technology platforms including the fixed network (fiber) which is more reliable and wireless connectivity (satellite and 3G or future 4G networks).

## **6.3 AREAS IDENTIFIED FOR FURTHER RESEARCH**

The areas identified for consideration in future research are as follows:

### ***6.3.1 The demand-side broadband strategies in education***

This study has highlighted the key research areas that need further investigation as: the demand side strategies. Such strategies should include the development of e-education content, the integration of broadband opportunities into the curriculum and the appropriate funding models to ensure sustainability of broadband connectivity in schools. By its nature in focusing largely on broadband supply-side factors, this study could not sufficiently investigate all the demand-side measures required to improve broadband penetration in schools. The study acknowledges a need to strike a balance between the supply-side and the demand-side measures when approaching the issues of broadband penetration. This integrated approach will provide a more comprehensive and a balanced understanding of the entire value chain of broadband connectivity and usage in schools.

### ***6.3.2 Measuring the impact of broadband uptake in education***

The broadband “dividends” in education are still not realized. Not much has been document on the direct impact of broadband connectivity in schools, even in developed economies where broadband penetration in schools is high. This research revealed challenges around the prevailing mindsets towards the adoption of technology in general. It seems as if the intricate and implicit nature of technology makes it less appealing and less amenable for most people to understand its impact in our lives in general, and in education in particular. This is notwithstanding the existence of the several studies that proved its potential to improve productivity, create jobs and increase economy in the country. Broadband, as a fairly new concept has not yet been fully integrated as an economy driver and as a basic need. In fact, to some people broadband seems to still be an elusive phenomenon. There is therefore a need for more studies to be conducted on the impact of broadband on our lives and in education.

#### **6.4 CONCLUSION – THE FINAL NOTE**

The value of the benefit of introducing Internet and broadband connectivity in schools can only be attained when the digital educational opportunities of these technologies are fully realized and the impact is measured. This would require that the potential of broadband connectivity in schools be understood and be fully embraced. This can be made possible by understanding the fundamental challenges that affect the rollout of broadband services to schools and the uptake of these services thereof. This study has demonstrated that such investigation into the challenges has led to the development of the proposed key interventions that will address the current failures in advancing broadband connectivity in schools in South Africa.

This study has revealed that schools connectivity is in the main, an integral part of the broadband connectivity in the country. It has proved to be impractical to talk about the provision of broadband connectivity to schools without discussing the broader challenges of the broadband provision in the country. The research has also revealed that although funding is typically cited as the main reason for poor broadband penetration in South African public ordinary schools, there are a range of other bottlenecks that negatively affect broadband uptake in these schools. Such bottlenecks include inexistent e-education strategy or school connectivity plan, lack of coordination between various stakeholders, inadequate availability of infrastructure, ineffective regulation of the ICT sector for broadband provision and lack of or poor enforcement of compliance to regulatory instruments that seeks to drive broadband connectivity in schools.

The research has also affirmed that South Africa indisputably needs broadband connectivity in schools to transform the current education system and to expand digital educational opportunities to all learners in the country. The decision that South Africa needs to take is whether it is going to be proactive to the uptake of this technology or whether it will continue to use the challenges highlighted in this study as reasons for its sluggish adoption of this technology. The government needs to make a bold decision that is accompanied by the proposed actions on this issue.

The integration of ICTs into the curriculum also emerged as a critical component in the value chain of providing broadband connectivity to schools. The research highlighted that broadband connectivity should be used to improve the education system through

transforming teaching and learning processes for it to be seen as an effective educational technology. The research in the main acknowledges that there are still socio-economic challenges with the integration of ICTs, particularly broadband into the education system in the country. These challenges include adopting an appropriate approach to deal with the competing priorities such as providing basic services such as water, electricity, security and food in schools, instead of broadband connectivity. This is a reality that the government needs to face.

It is critical to realize that providing broadband connectivity to schools is a multi-sectoral project. That is, the delivery of this kind of a project cuts across various sectors, i.e. education sector, ICT sector, public service and administration sector, science and technology sector, etc. This is largely because ICT on its own cut across various sectors. The planning and implementation of this project should therefore involve all these critical stakeholders to ensure a more uniform, integrated and well-coordinated approach.

As most interview respondents have indicated, broadband connectivity is not a panacea to the education challenge but an enabler to the provision of access to digital educational opportunities. It therefore cannot replace the delivery of education but can only improve the existing education system. This therefore means that for broadband to make a more positive impact in schools, the fundamental challenges of education that includes a need to strengthen the teaching and learning processes, teacher training, learner ratio in classrooms should be addressed. This should run parallel to the integration of broadband in schools.

In addition to the supply-side factors affecting broadband connectivity in schools, this study has managed to also uncover some demand-side factors and it has most importantly, managed to respond to the key research question. The factors affecting broadband connectivity in ordinary schools have been highlighted, their challenges have been outlined and recommendations on how to address these challenges have been made. In this digital era, broadband connectivity in schools should be made a right for every learners and every teacher to use to access and create online educational resources.

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## ANNEXURE A

### SEMI-STRUCTURED INTERVIEW GUIDE:

#### Policies and Strategies for schools connectivity

**Objective:** To investigate the challenges of implementing existing policies and strategies for the provision of broadband connectivity in schools (White Paper in e-Education,)

**Questions:**

- 1. Do you think that South Africa has adequate policies and strategies to address the broadband provision in schools?*
- 2. If yes, what then are the challenges in implementing the existing policies and strategies?*
- 3. If no, what policies are required to drive the provision of broadband connectivity in schools?*
- 4. What would you say are policy gaps in providing broadband connectivity to schools?*

**Recommendations:**

#### Regulatory Interventions: USO/USAO's & e-Rate

**Objective:** To explore the challenges with the implementation of USO/USAO's & e-Rate

**USO/USAO's**

**Questions:**

- 1. What is your view on implementing these USOs for Internet connectivity in schools?*

2. *What are the challenges with implementing USOs/USAOs to provide Internet connectivity to schools?*

**PROMPTS:** *do you think they're still relevant? How should they be implemented? Should they be applicable to all licensees? What exactly should the licensees be implementing in schools?*

### **e-Rate**

3. *What is your view on implementing e-Rate for Internet connectivity in schools?*

4. *What are the challenges with implementing e-Rate?*

**PROMPTS:** *is e-Rate still relevant? How should it be implemented?*

### **Recommendations:**

<b>Funding</b>
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**Objective:** To determine the extent to which the current funding mechanisms address funding requirements for Internet connectivity in schools?

### **Questions:**

1. *What funding mechanisms are available for the provision of connectivity to schools?*

2. *Do the current funding mechanisms sufficiently address the funding requirements for Internet connectivity in schools?*

3. *How should schools connectivity be funded?*

4. *What should government subsidize? CAPEX or OPEX or both?*

5. *Would you say funding is a barrier in providing connectivity to schools? Why?*

**Recommendations:**

**Broadband Infrastructure Coverage**

**Objective:** To determine why schools that fall within the broadband coverage do not have connectivity

**Questions:**

6. *According to the RIA (2012) study, only 25% of SA ordinary schools have Internet connectivity. The BMI-T (2013) study showed that only 27% of these schools were located outside the broadband coverage area. What do you think is the reason why schools that fall within the broadband coverage are not connected to broadband?*

**PROMPTS:** *what are the causes for poor penetration of Internet in schools?*

7. *What are the drivers for schools connectivity?*

**PROMPTS:** *what needs to be done to improve the Internet penetration in schools?*

**Recommendations:**

**Implementation & Coordination of schools connectivity initiatives**

**Objective:** To understand the proper coordination structure for implementing broadband in schools and to understand roles of various stakeholders.

**Questions:**

1. *What do you think should be the role of public sector in providing broadband connectivity to schools?*

**PROMPTS:**

- *The role of DBE?*
  - *The role of PDE's?*
  - *The role of schools?*
  - *The role of DTPS?*
  - *The role of ICASA?*
  - *The role of USAASA?*
2. *What role should the private sector play in providing broadband connectivity to schools?*
  
  3. *How should government coordinate the schools connectivity initiatives?*

**PROMPTS:** *Who should coordinate? Are there any policy interventions required?*

**Recommendations:**

<b>General</b>
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**Objective:** To solicit general inputs that is not covered by the research questions but that is critical to the exercise.

**Questions:**

1. *What are the general challenges in providing broadband connectivity to schools?*
  
2. *If you are to be given an opportunity to propose a solution for providing connectivity to all SA schools what would you recommend?*
  
3. *What are the factors affecting the implementation of broadband connectivity in schools?*

**PROMPTS:** *What do you think are the critical pillars of developing an e-education strategy?*

**Recommendations:**