Demand side stimulation strategies to boost broadband access in South Africa: A Case Study of the Western Cape

Abstract

The growing awareness of broadband as a driver of economic growth and development has placed it at the centre of global reform agendas, such as the Millennium Development Goals, and ICT specific forums such as the UN Broadband Commission and World Summit on the Information Society +10. At the same time, national states have been implementing broadband policy to support the deployment of infrastructure. For instance, the South African national 'Connect' broadband policy provides a framework for localised strategies. At the local level, the Western Cape government in South Africa, in line with the national policy, implemented the 'Connected leadership' broadband roll-out for purposes of provincial development and growth. Drawing from these experiences, this paper provides a supply and demand side assessment of the national, and local conditions necessary for effective and optimal use of broadband.

Despite the obstacles presented by the national policy and regulatory environment, the Western Cape province has made progress in putting in place the necessary infrastructure to connect its communities and citizens. Realising the full benefits of broadband will however depend on the extent to which end users make use of the technology and the services it provides. Evidence shows that the use of internet at the individual level is still below 60 per cent and less that 45 per cent at the household level. The use of the internet among informal businesses in conducting their business activities is also low. The use of available e-government services as well as how individuals use the internet remains sub-optimal.

Apart from the high cost and low speed of broadband, the lack of relevant content and language barriers limit internet users from exploring the internet fully. The lack of awareness of what the internet is, the lack of knowledge and skills to use the internet are also some of the factors that prevent non-users from making use of the internet. The low level of education of individuals also contributes to the low and sub-optimal use of broadband among citizens in the Western Cape.

This indicates the need to digitally prepare citizens so they can optimally use the services available through broadband. Designing relevant content in a sufficient number of local languages and making services available through mobile platforms would go a long way in enhancing broadband access and use.

Having a wider pool of the right skills and techniques, can enhance the innovative capacity of companies allowing for effective demand side use of broadband and can contribute positively to business efficiency in the Western Cape.

KEYWORDS: Broadband, connectivity, demand, ICT indicators

Introduction

The main contribution to economic development of the information and communication technology (ICT) sector is to enhance communication and information flows that improve productivity and efficiency (NDP 2014). For this reason, any State seeking to meet the information and communication needs of a modern citizenry must create conditions for access to affordable, high speed broadband[1]. Under such conditions, research suggests that an increase of 10% in broadband penetration can result in a 1% increase in GDP output and arguably more in developing countries (Kim, Kelly, and Raja, 2010).

With increasing evidence of links between investment in electronic communications infrastructure and improvements in the economy, broadband has become crucial to broad economic stimulus packages, economic growth strategies, and the rationale for projects such as the Western Cape Broadband Initiative[2] throughout the world.

The concept of broadband now goes beyond the purely technical notion of a network operating at a minimum transmission speed as determined by the ITU in the past. It is currently viewed as an ecosystem, which includes in it networks, the services that the networks carry, the applications delivered, and the users. The more functional definitions that have emerged in the last few years allow not only for more specific points of policy and regulation along the broadband value chain, but with the critical inclusion of users, both as consumers and producers, also compels a range of demand side interventions to ensure optimal exploitation of broadband potential. The conceptual framework used as a lens through which to analyse the empirical evidence draws from Research ICT Africa (RIA)'s definition of ICT ecosystem, which includes global and national governance and regulation, operations, and users, that needs to be transformed into a dynamic and flexible yet robust ecosystem if it is to be both sustainable and innovative (Gillwald, Moyo, and Stork, 2012).

The ICT ecosystem places users - citizens and consumers - at the centre of the system. Their access to and the affordability of the networks, services, applications, and content - now conceptualised as the broadband ecosystem (Kim, Kelly, and Raja, 2010) - determines the degree of their inclusion in the ecosystem; or their exclusion from it. The factors that link these elements and affect access and affordability are those of pricing and quality of service. These, in turn, are an outcome of the market structure and the effectiveness of the regulation, which are themselves determined by the policy and legal framework. The levels of efficiency and innovation that enable the evolution of the ecosystem depend on the availability of the skills and competencies of the people and institutions at each node within the ecosystem in order to harness the benefits associated with integrated networks for economic development, as well as social and political engagement (Gillwald, 2012).

With the main objective of improving broadband networks roll-out through linking different elements of an ICT ecosystem, this research paper presents a case study of the Western Cape province by way of an assessment of the localised digital readiness of the environment and it's citizens and consumers that will allow the province's broadband initiatives to achieve the ultimate goal - keeping it's citizens connected and transforming the province into a digital hub.

Problem Statement

Global, national and local policies aimed at ensuring high broadband penetration address different bottlenecks according to the context of intervention (such as infrastructure investment, physical access to the infrastructure or Over-The-Top (OTT)/content regulation). All of these policies aim to maximize access and use of the broadband networks, two factors critical in capturing the gains of broadband roll-out.

The demand gap in broadband use is a critical policy issue that goes beyond network deployment (World Bank, 2013). Governments and ICT regulators often play the traditional role of regulating the supply-side and setting up of networks in broadband initiatives. Yet there is a need to move beyond this (Mugeni et al, 2012). Successful uptake and use of broadband in countries with high penetration rates is characterised by policies focusing not only on supply side issues of network infrastructure but also on demand side issues of enhancing

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[1] This research paper defines broadband as an ecosystem of interlinked networks, services, applications, and content that provides the backbone to a modern economy and its connections to the global market (SA Connect 2013).
[2] This includes the roll out of broadband services to under-served communities with the aim of connecting communities, households, businesses and governments throughout the province.

awareness and adoption so that people are capable of using the service and benefitting from it (World Bank, 2011).

Whilst the high cost of communication continues to be a barrier to a wider use of the services that broadband provides, the lack of awareness and skills sets have also been contributing factors in this regard. Despite efforts of the Western Cape government to connect the province through improved internet access at schools, clinics and government offices, use remains suboptimal. This points to the fact that there are other underlying factors that are not related to supply-side issues.

Research questions

The main research question the research paper seeks to answer is why, despite a global and national effort to improve broadband roll-out is there still a need for a localised broadband initiative?

The research questions formulated to answer the main question were as follows:

1) How extended is the broadband network in the Western Cape Province?

2) To what extent do citizens make use of broadband?

3) What are the factors preventing widespread and optimal use of broadband in the Western Cape Province?

4) What policy and regulatory interventions can be devised from a digital readiness assessment?

Methodology

The study analyses both the supply-side and demand-side issues that affect broadband access and use in the Western Cape Province. To answer the research questions, quantitative analysis based on the RIA 2014 surveys at the provincial level were used to gather supply and demand side indicators. RIA undertook a demand-side survey of access and use at the individual and household level in order to obtain accurate sub-national data. In addition, RIA piggybacked on the nationally representative demand-side survey and carried out an informal sector ICT access and use survey. An e-government assessment was also carried out, through the use of administrative data, demand-side data and a web survey on provincial and local government web presence in order to understand the state of connectivity of the public sector and the development and availability of government services via online platforms.

This study uses RIA's pricing database for mobile broadband data to obtain pricing and affordability indicators. Affordability is determined by assessing average individual expenditure on communications (voice and data) in relation to income measurements from the 2014 individual and household surveys conducted for the Western Cape. Analysis of the demand-side data are presented in the form of descriptive statistics showing how the province performs in each of the areas discussed.

Literature Review

Extensive and efficient broadband infrastructure is an essential driver of competitiveness (World Economic Forum, 2014). In addition, the quality and extensiveness of infrastructure networks significantly impact economic growth and reduce income inequalities and poverty in a variety of ways (World Economic Forum, 2014). In this regard, a reliable communications infrastructure is considered a prerequisite for low-income communities to connect to core economic activities and basic services.

Broadband internet is considered a strategic resource for the improvement of the lives of people in developing nations as it facilitates access to economic opportunities and social welfare that were previously inaccessible to the poor (Stork, Calandro, and Gamage, 2014). For instance, mobile broadband has been driving financial inclusion through mobile banking and mobile money in Africa as well as supporting new ways of delivering healthcare (Lucas, 2008). Economic growth, job creation and productivity have been three of the indicators most focused on in the research on the effects of broadband. However, most of the research has been on developed and high-income nations. Several studies demonstrated that broadband penetration and broadband quality are important factors for economic growth (Koutroumpis, 2009; Katz and Avila, 2010; Rohman and Bohlin, 2012).

Koutroumpis (2009), through econometric modeling, demonstrates the existence of several levels of return from broadband infrastructure, based on the level of penetration. He asserts that there is evidence of a critical mass phenomenon in broadband infrastructure investments, and the penetration level that he identifies is a critical mass of 20 percent of the population connected to the network. His study refers to OECD countries, but it can

be extended to the African context since he uses standard parameters to calculate it, such as GPD, level of education, broadband penetration and prices, etc. According to him, this percentage creates a vision for countries to capitalise the beneficial effects that the network can provide and it also implies a 0.89% aggregate growth rate due to broadband externalities. Moreover, the World Bank asserts that in low- and middle - income countries, every 10 percentage point increase in broadband penetration accelerates economic growth by 1.38 percentage points. The economic growth associated with the increase in broadband penetration is even higher when compared with the penetration of other telecommunications services, such as fixed or mobile phone (Kim, Kelly & Raja, 2010).

Accessing broadband improves businesses' productivity as it supports the creation of new products and services and accelerates innovation. Broadband deployment has both a direct and indirect economic impact (Katz, 2012): directly, broadband development creates jobs by deploying broadband infrastructure; indirectly, as a result of "spill-over" externalities, it increases productivity and the creation of new products and services.

Job creation through deployment of broadband directly arises from construction of networks and indirectly through empowering the retail and manufacturing sectors. Research has shown that a USD 10 billion investment in broadband deployment will result in a total of 180,000 jobs yearly, including 64,000 direct and 116,000 indirect and induced jobs (Atkinson et al. 2009). However, the positive effect of broadband on employment is said to be strongest in the sectors that rely on information and communication technology more. Contrary to this positive impact, job creation does not guarantee a reduction in the unemployment rate. Skilled labour may only be shifted and local sales and jobs might even be lost as access to broadband increases.

Broadband enables business productivity by making use of e-process that will increase their efficiency. Having access to telecommunications devices and infrastructure allows workers to become more productive. Whilst Waverman (2009) found in his study that a 1 per cent increase in broadband penetration raises productivity by 0.13% in high and medium income countries, in countries with low ICT penetration, impact on productivity was non existent due to high adoption cost and critical mass thresholds, indicating that the ICT ecosystem must be sufficiently developed for the impact on productivity to be realised.

The growing awareness of broadband as a contributor to economic growth and development has placed it on, and more recently at the centre of, global reform agendas, such as the Millennium Development Goals and ICT-specific forums such as the UN Broadband Commission and World Summit on the Information Society +10.

Recognising the development impact of broadband in terms of economic growth and social development (Waverman, Meschi, and Fuss, 2005; Kim, Kelly, and Raja, 2010), the UN Broadband Commission for digital development, an initiative by the ITU and UNESCO, set some ambitious broadband targets for 2015, including "making broadband policy universal" (Target 1), "making broadband affordable" amounting to less than 5% of average monthly income (Target 2); connecting homes to broadband, so that by 2015, 40% of households in developing countries should have internet access; "getting people online", with the goal of reaching 50% or internet user penetration in developing countries and 15% in LDCs (Broadband Commission, 2014).

Broadband in Africa

While the benefits of broadband are globally agreed upon, the evolution has been different for the global South than from the more mature markets in the North. This difference in evolution presents quite different public policy and regulatory challenges for developing countries. Assumptions about the primary means of broadband access as well as the cost and quality of fixed versus mobile broadband services underpinning 'best practice' broadband policies are challenged in the African context. With far lower GDPs per capita and generally higher costs associated with the extension of networks (the building out of primary infrastructure such as roads and power) in the global South, issues of affordable access to these critical high cost digital infrastructures, are seen as the central challenge for African policy-makers. In recent years, with recognition of broadband's positive effect on national goals, government, policy makers and regulators have made broadband a policy priority.

Unlike in developed markets where fixed services are the dominant broadband platform, in Africa, mobile networks have provided the main means of broadband access. Demand for internet by those unable to access the limited ADSL services available on the continent has been met through mobile service providers. Mobile broadband access, in just over four years, has steadily increased within the continent from 1.8% in 2010 to 19% in 2014 (ITU, 2014). Internet enabled phones have become the main access point for internet. Prices of internet enabled phones have consistently dropped and there is an influx of affordable devices targeted for the lower end of the market. Mobile broadband is now not only the primary means of access to the internet in Africa, it is also generally cheaper and faster than fixed (RIA Policy Brief no.2. 2013). Differently from the established telecommunications markets in the North, where access and ADSL-upgradable copper networks or upgradable

cable networks were almost universal at the advent of broadband; in Africa, most fixed-line networks reached less than 1% of the population and fibre remains negligible (Gillwald and Calandro, 2014).

South Africa's National broadband policy

South Africa is one of the 140 countries reported by the broadband commission to have a broadband plan in place (Broadband Commission, 2014). South Africa Connect, aims to develop an information structure that by 2030 will result in universal access to meet the needs of citizens and businesses and public sector and "provide access to the creation and consumption of a wide range of converged applications and services required for effective economic and social participation" (National Development Plan, 2013).

Although a strategy for infrastructure extension is central to the policy, unlike the previous policy, it is also cognisant of the need to create an enabling environment for the roll-out of broadband infrastructure and the creation of associated content, applications, and services. It does this by illustrating the intended structure of the industry and the institutional framework necessary for effective regulation of an open and fair competitive environment. Furthermore, it encourages public and private investment in the broadband network extension. The arising regulatory framework is informed by the principles of openness, inclusivity, universality, and technological and service neutrality. It also acknowledges the need for greater co-ordination between national, regional, and local government in meeting these needs.

Globally, South Africa Connect is considered as an excellent example of a policy focused on both supply and demand side considerations (Broadband Commission, 2014). In spite of this global recognition, ineffective policy implementation has undermined reform processes in the telecommunications sector. South Africa has lost its status as continental leader in voice and data connectivity. Its ranking on the ITU ICT Development Index has slipped from 72nd in 2002 to 90 in 2010 (ITU, 2002, 2012), and has also fallen steadily down other global indices (WEF, 2013).

Many policy and regulatory bottlenecks stifle effective competition in the sector. The RIA Telecommunications Regulatory Environment assessment of 2011 highlights the negative perception of market entry where a second fixed line operator has not been able to compete against the entrenched incumbent operator. The incumbent fixed line operator has been tasked to lead the broadband roll-out in provinces with no initiative in this regard. Spectrum allocation is a critical regulatory bottleneck where the regulator ICASA, has a Draft Frequency Migration Plan[3]. Comment on the Draft Frequency Migration Plan was due in February 2013 but nothing had yet been made public regarding the inputs received (Gillwald, Moyo, and Stork 2012). The result is an uncompetitive market structure, weak institutional arrangements and compromised regulatory effectiveness (Gillwald, Moyo and Stork 2012).

Western Cape broadband strategies

The Western Cape, like the rest of South Africa, is characterised by a bifurcated economy - one advanced and the other developing. Parts of the economy and society have access to cutting edge technology, sophisticated institutions including research bodies and universities, an active private and public sector, and fiscal resources. At the same time, in 2010, it was estimated that 20.1% of the population in the Western Cape were living in poverty (Western Cape Government Provincial Treasury, 2012), and a large proportion of South Africans have weak educational qualifications.[4]

The provincial government has several sub-governments under it and each has it's own systems and networks in place. Many of these fall below business requirements and are often not well integrated resulting in high cost for the provincial government and sub-optimal use of public funds (WCG, 2012). Processes at the provincial level remain mostly paper based, which hinders the effective delivery of services. This has spurred the Western Cape government to devise ways of connecting its government offices across the province.

In an attempt to connect communities within the province, the government put in place Smart Cape through which they can connect and have access to public ICT facilities via libraries. However, of the 110 wards in the Metro, 44 do not have libraries making it impossible for their communities to have access to public ICT facilities (WCG, 2012). A gap in the relative household internet distribution in the City of Cape Town was also detected.

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[3] The frequency migration plan includes an assignment framework for bands earmarked for migration and those identified in the future national Radio Frequency Plan.

[4] The poverty income used is based on the Bureau of Market Research's Minimum Living Level (BMR report no. 235 and later edition, Minimum and Supplemented Living Levels in the main and other selected urban areas of the RSA, August 1996). However, the City of Cape Town uses a different poverty measure: households with a monthly income of less than R3 500 are said to be living in poverty. In 2009, this percentage was 34.9%.

The highest internet distribution at the household level was recorded in the Southern Suburbs at 11% (WCG, 2012) and this promoted the government to also focus on connecting households in the province. According to the Western Cape government, businesses in the province experience lower broadband speeds and higher broadband costs in comparison than their international competitors. This has negative outcomes on their overall competitiveness, making it a priority for the provincial government to ensure that businesses are better connected. International bandwidth costs remain high in the province and it is the aim of the government to bring these costs down "by using government as a demand aggregator and anchor client" (WCG, 2012).

In light of the national bottlenecks, coupled with the province's own challenges and its aim to becoming a leader in broadband access in an attempt to expand its economy, create jobs and become globally competitive, the Western Cape government launched it's broadband strategy. This strategy was put in place in order to determine the needs of the public and private sectors and to devise strategies to meet them. These strategies have been instituted through a range of interventions addressing household, business and government needs. One project to connect under-serviced communities is the provision of broadband connectivity through an open-access network (including last-mile infrastructure) based on Wi-Fi mesh enabling broadband services to be delivered to households (citizens) and businesses in Khayelitsha, Mitchell's Plain and Saldanha Bay (WCG Provincial Treasury, 2013). To further drive this initiative, the WCG, the State Information Technology Agency (SITA) and Neotel signed a strategic agreement in 2014 to provide broadband services. These services are expected to reach about 2 000 government sites, including schools, libraries and health facilities over the next two to three years.

Other communities in the Western Cape are also expected to benefit from this project. Neotel will fund the infrastructure roll-out of 384 Wi-Fi hotspots that will cover most of the wards in the province, with the WCG subsidising Internet access for citizens. The hotspots will give individuals the opportunity to access 'limited free' Internet, helping to bridge the digital divide.

Although there is a strong local software development industry in the Western Cape, and commitment to broadband development at the provincial government level, the national government has jurisdiction over telecommunications policy. However, in order to promote software development, innovation and entrepreneurship in disadvantaged communities within the province, the Western Cape Department of Economic Development and Tourism (DEDAT) plans to establish a new business incubator.

The Western Cape government, through its broadband initiatives, hopes to achieve cost efficiency, increased effectiveness, improved government service delivery as well as economic and social development. It is the provincial government's aim that by 2020, every citizen in every town and village will have access to affordable broadband infrastructure and that citizens in the metropolitan area will have access to affordable broadband infrastructure at network speeds in excess of 100Mbps (WCG, 2012).

Analysis
Overview of supply-side

This section provides an overview of the supply of broadband by assessing market structure, pricing issues and quality of services. The broadband market structure and pricing issues are assessed from a national level as the province has little influence over them.

Broadband market structure

Despite the problems with developing a standard definition of a subscriber in a mobile pre-paid environment and the difficulty in tracking numbers in absolute terms, the South African mobile market is concentrated among a few prominent players. The Herfindahl-Hirschman Index (HHI)[5] based on August 2013 market share data is 3,504.86. The mobile market is dominated by MTN and Vodacom, which in August 2013 had 36.8% and 43% of market share respectively. Cell C, the third operator that was introduced in 2002, captures a small 17.2% market share. Telkom predominantly dominates the fixed market, with the new entrant Neotel making very small in-roads.

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[5] The HHI number can range from zero to 10,000. The HHI is expressed as: HHI = s1^2 + s2^2 + s3^2 + ... + sn^2 (where sn is the market share of the ith firm).
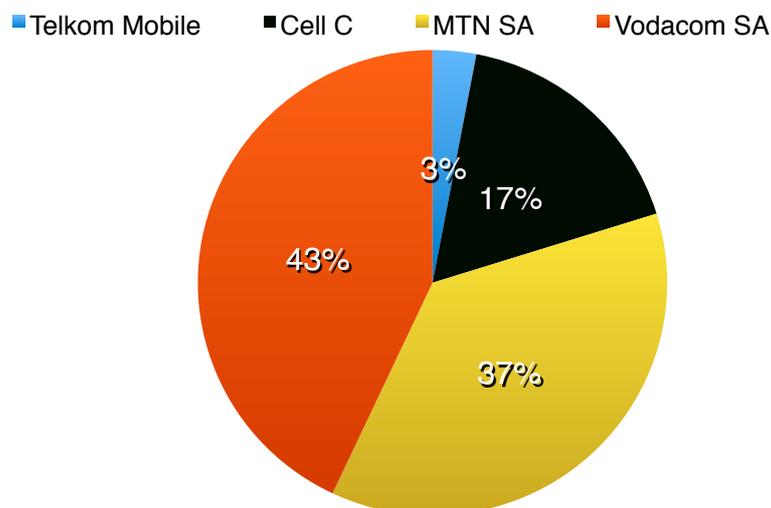
Figure 1: South African mobile operators market share

Broadband affordability

Concentrated markets usually result in high prices. Broadband prices were calculated using 1GB baskets that reflect users' demand for both prepaid mobile data and ADSL services. In the mobile broadband prepaid 1GB basket, at the end of 2014 Cell C, MTN SA and Vodacom SA have the same matched price of ZAR149. Although mobile broadband prices are still very expensive, they are cheaper than ADSL prices. ADSL 1GB baskets are more expensive than mobile broadband due to the cost of copper line installations, monthly line (telephone and ADSL) rentals, and connection devices. The cheapest ADSL 1GB basket with an advertised speed up to 4Mbps in Q32014 costs ZAR338.99 (USD31.98) and the ADSL 1GB basket with an advertised speed up to 10Mbps costs ZAR518.99 (USD48.96). Both baskets are from the ISP MWeb.

From an affordability point of view, South African retail prices of telecommunications services (i.e. voice and broadband mobile) are still very expensive for the majority of the population. By using supply-side data[6] and applying a modified version of ITU ICT basket methodology[7], the monthly ICT basket as a percentage of GNI per capita[8] is 3.1%. At a provincial level, the monthly ICT basket as a percentage of monthly earnings[9] is 7.6%.

However, using the GNI per capita or the median of monthly earnings is highly problematic as it does not take into account inequalities in the South African society, which is characterised as amongst the highest Gini coefficient in the world. Therefore, a better indicator to assess affordability of ICT services is total expenditure on mobile services as a percentage of individual income from ICT access and use survey data.

By using ICT survey demand side data, affordability of mobile services becomes a big concern in the Western Cape Province. The share of household income devoted to mobile services is rising which may reduce the budget for food, health or education. On average, citizens in the Western Cape province spend 20.1% of their individual income for mobile services (voice and data). Although this percentage is very high, with global ITU indicating that anything above 5% of household income is not affordable, it does demonstrate the value that users attach to communication services.

Broadband quality of service

According to the latest report by Ookla, an international broadband testing company, South Africans are on average getting 87% of the broadband speeds they sign up for, which is only slightly lower than the global

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[6] Mobile prepaid voice and mobile prepaid broadband supply side data are based on Q1 2014 prices. Source: RIA Africa Price Transparency Index, available at http://www.researchictafrica.net/prices/Fair_Mobile.php.

[7] The ITU ICT Price Basket includes three price sets: the fixed-telephone, mobile-cellular and fixed-broadband sub-baskets. The basket is the value calculated from the sum of the price of each sub-basket (in USD) as a percentage of a country's monthly GNI per capita, divided by three (ITU, 2014). In order to compare this result with mobile expenditure as a percentage of individual income (based on demand-side data) RIA has calculated the ITU ICT Price Basket taking into account only mobile voice (OECD 40 calls/60SMS) and mobile broadband prices (1GB) from Q1 2014.

[8] The annual GNI per capita in South Africa in 2013 is USD7,190 (World Development Indicators, The World Bank).

[9] The calculation is based on StatsSA Monthly earnings of South Africans, 2010 and on Q12014 OECD 40calls/60SMS mobile prepaid voice and 1GB mobile prepaid broadband baskets. In the Western Cape Province, 2010 monthly earnings is USD243 (ZAR2,700)

average of 87.2%. Ookla's Net Index ranks South Africa number 125th out of 194 countries surveyed on the broadband index. The country is performing better on the mobile index, where it ranks 56th of 114 countries. The Ookla findings are supported by a broadband performance study conducted by RIA in all nine provinces in South Africa. The main finding of the study was that consumers in South Africa are not getting advertised speeds. The study also demonstrated that mobile 3G and LTE services outperformed fixed broadband. The study shows that the median broadband speed for mobile users is around 10 Mbps, whereas for fixed-line users, the median throughput is closer to about 1 Mbps. In South Africa, mobile technologies (particularly LTE) yield higher speed than the fixed-line service plans. Unlike in more developed nations, in South Africa mobile broadband is both cheaper and faster than fixed broadband. However, because of its variability, mobile is unlikely to replace fixed-line connectivity, particularly for consumers needing a stable and reliable internet connection.

Overview of demand-side

This section looks at access and use of broadband by citizens and consumers and the factors that limit or prevent their use of available broadband services. It draws on survey findings to assess how the Western Cape performs in terms of citizen access and use of broadband and to identify the barriers and constraints to access and use. Lack of awareness of the internet and its capabilities, as well as the low levels of education and skills are found to be barriers and limitations to the use of broadband services.

The availability of skills is an important indicator in determining the human capital available for business development and for e-consumption, particularly in an information society and knowledge economy. Literacy, as a whole, allows individuals to have the skills, understanding and knowledge required to experience the full benefits and make optimal use of the internet. Primary schooling is frequently used as an indicator of e-literacy in human development indices, on the basis of the assumption that children get exposed to digital devices at an early age in the Northern hemisphere. However, Schmidt and Stork's (2009) study across 17 African countries revealed that computer skills were widely attained only at the tertiary level. In a study of Internet skills (using both observed capacity and self-reported skills) among US users, Hargittai (2002) finds that education is correlated with Internet skills, with higher levels of education implying more exposure to technology. Deen-Swarray, Gillwald and Morrell (2013) also find that the greater the number of years of education an individual has, the more likely it is for that individual to access and make use of the internet. Higher educational levels increase the ability to adapt more quickly to new technologies and, in many countries, educational institutions are the first point of affordable access for many users (Kiiski & Pohjola, 2002).

Broadband access and use

Broadband access and use is analysed at the household and individual as well as informal business levels for the Western Cape. Whilst the household and individual data provides a provincially representative figure, the informal business data is only indicative of the use of broadband by the businesses interviewed across the province. The table below presents some key indicators used in assessing the access and use of broadband in the Western Cape.

Table 1: Broadband access and use indicators	
Indicator	**Provincial data**
Share of households with internet access	43.7%
Share of household that use ADSL to access the internet	38.9%
Share of individuals who own a mobile phone	81.9%

Table 1: Broadband access and use indicators	
Indicator	**Provincial data**
Share of individuals with an internet enabled phone	75.4%
Share of individuals who use the internet	57.0%
Share who access the internet via a mobile phone	93.8%
Share who access the internet via a computer at a place of education	14.6%
Share who access the internet via a computer in a public space (fixed)	26.8%
Share who access the internet via a mobile device in a public space (WiFi)	35.3%
Share of individuals using the internet that are signed up for online social network	93.5%

Source: RIA 2014 Household and Individual ICT Access and Use Survey

Internet access at home

The share of households with internet access in the Western Cape was recorded at below half the sample population (table1). Further analysis to assess the medium used by households that access the internet, shows that mobile phones was the most predominant medium used to access the internet, while the use of ADSL is comparatively lower (figure 2).
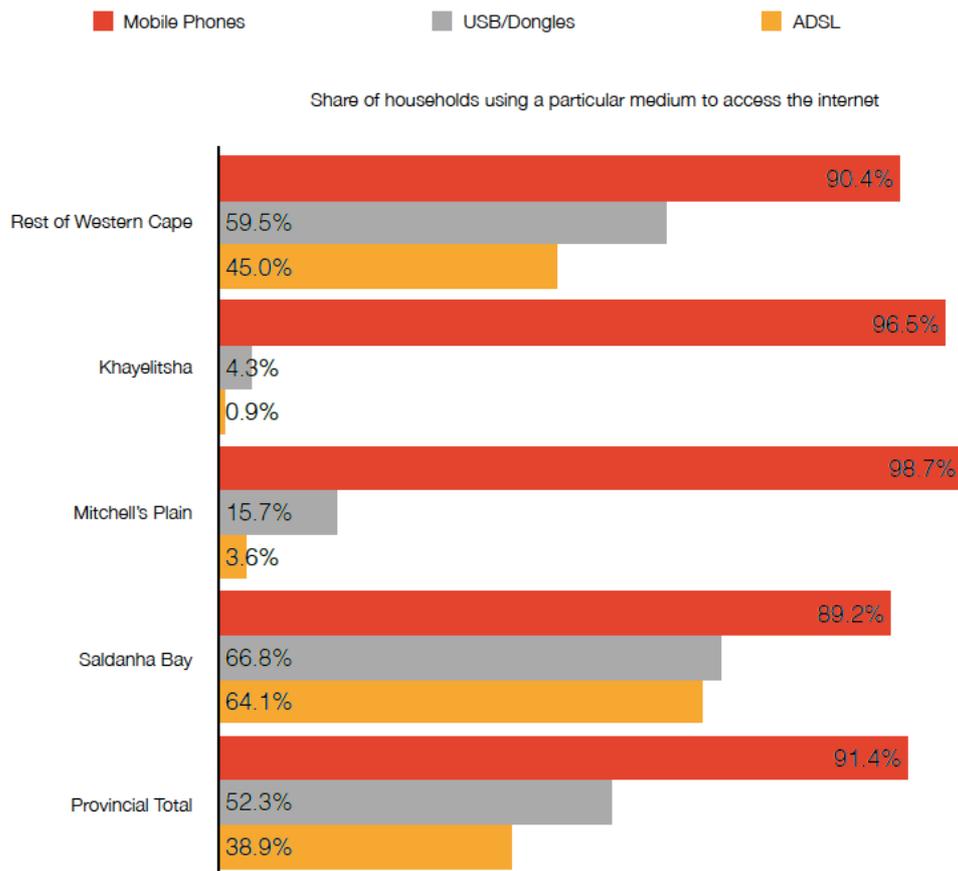
Share of households using a particular medium to access the internet

	Mobile Phones	USB/Dongles	ADSL
Rest of Western Cape	90.4%	59.5%	45.0%
Khayelitsha	96.5%	4.3%	0.9%
Mitchell's Plain	98.7%	15.7%	3.6%
Saldanha Bay	89.2%	66.8%	64.1%
Provincial Total	91.4%	52.3%	38.9%

Figure 2: medium used to access the internet at home

Source: RIA 2014 Household Survey

In contrast to the high ownership of mobile phones among citizens, ownership of devices such as laptops or desktops are very low. These are the medium through which dongles can be used and may therefore be the contributing factor to its low use (Figure 2). The widespread use of the mobile phone to access the internet points to the important role this device can play in increasing access to broadband and the need for employing mobile broadband technology in the attempt to get the province connected. According to a quality of service survey, mobile broadband speeds were relatively faster (Gillwald et al. 2012).

Individual internet access

The share of individuals in the Western Cape that have used the internet was recorded at about 57 per cent. This figure is not only higher than the national level but is also above the global average of 32.8 per cent (ITU, 2013). The majority of individuals in all the different areas first used the internet on their mobile phones (Figure 3). The study also shows that about three-quarters of individuals in the Western Cape have mobile phones that are capable of browsing the internet.
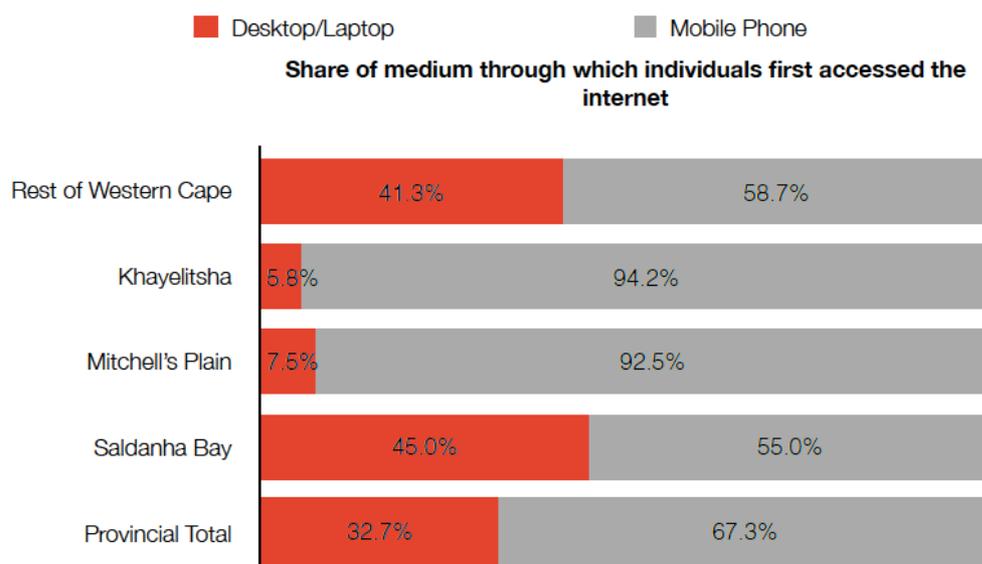
Figure 3: where individuals first accessed the internet

Source: Household Survey, 2014.

Similar to results of households' means of accessing the internet, the majority of individuals who make use of the internet also do so via their mobile phones. The statistics showing those who access the internet via a mobile device in a public place through WiFi is a third of the population in the Western Cape, which is an encouraging figure for the province as this is a major target area for their broadband roll-out.

However, the share of individuals who access the internet at a place of education is very low, illustrating the necessity of the WCG's plan to have Internet access in schools and institutions of learning.

Table 2: Where individuals access the internet (multiple responses) Source: RIA Household Survey 2014					
Mode of internet access	Rest of Western Cape	Khayelitsha	Mitchell's Plain	Saldanha Bay	Provincial Total
Mobile phone	92.5%	96.9%	98.6%	85.1%	93.8%
Desktop/Laptop at home	58.0%	7.0%	16.1%	25.9%	46.2%
Desktop/Laptop at work	45.3%	17.5%	15.3%	42.1%	37.9%
Desktop/Laptop at a place of education	15.7%	16.9%	6.8%	32.3%	14.6%
Desktop/Laptop at an internet cafe	32.9%	24.4%	5.2%	52.5%	28.0%
Desktop/Laptop at a public space	31.5%	19.0%	7.3%	51.9%	26.8%
Mobile device at a public space	39.6%	27.4%	18.6%	46.8%	35.3%

Involvement in social media

The emergence of online social networks such as Facebook, Twitter, LinkedIn, Skype, and Mxit have created a platform for people around the world to connect and engage. These networks are increasingly becoming an

important aspect of the internet and the ICT industry. The survey results show that online social networking is a driving force behind internet use among Western Cape residents. What citizens do on social network sites was not investigated, but this could serve as a platform through which government can reach its citizens in many aspects.

Social networking is cited as the main reason for starting to use the internet by about 48.5% of individuals in the Western Cape and also across the focus study areas. In the province as a whole, only 20.6% started using the internet due to work related purposes and 16% for educational purposes. This once again indicates how social networking has contributed to internet use and that this could be used as a channel to increase the possibilities of how individuals can benefit from broadband.
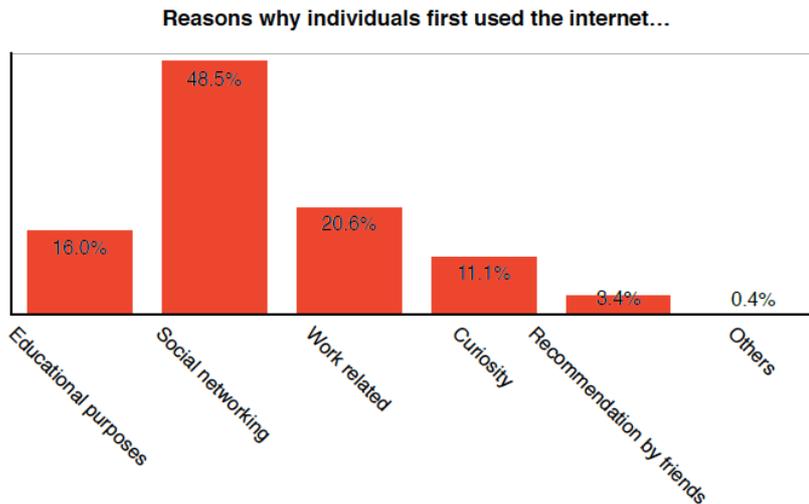

Reasons why individuals first used the internet...

Figure 4: reasons for first using the internet

Source: RIA, 2014 Household Survey

Limitations and barriers to the use of internet

Though about 57 per cent of individuals in the Western Cape claim that they use the internet, they also expressed that they do face challenges that limits their use of the internet. The factors mostly cited as a limitation for internet users include the low speed they encounter when accessing the internet and the fact that internet services are still considered expensive. This indicates that affordability and speed of internet services continues to be a concern even among internet users. A new and emerging issue that users indicated limited how they use the internet is that of their concern about privacy invasion (figure 5).
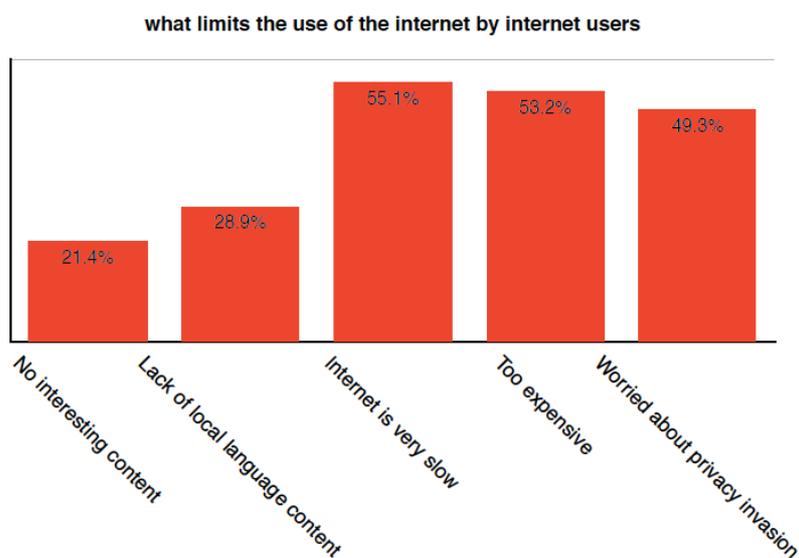
what limits the use of the internet by internet users

Figure 5: Factors limiting the use of the internet - Source: RIA 2014 Household Survey

The number of individuals who have never used the internet is still high at 43 per cent. The study was able to find out what some of the main reasons are why some individuals are still not using the internet. Connectivity and the lack of a device through which to access the internet is the main reason recorded by non-users for not using the internet. The issue of cost is also expressed as a major barrier. Interestingly, there are still about 58.3% of non-internet users who claim they do not know what the internet it and about 56.8% who lack the know-how to use the internet.
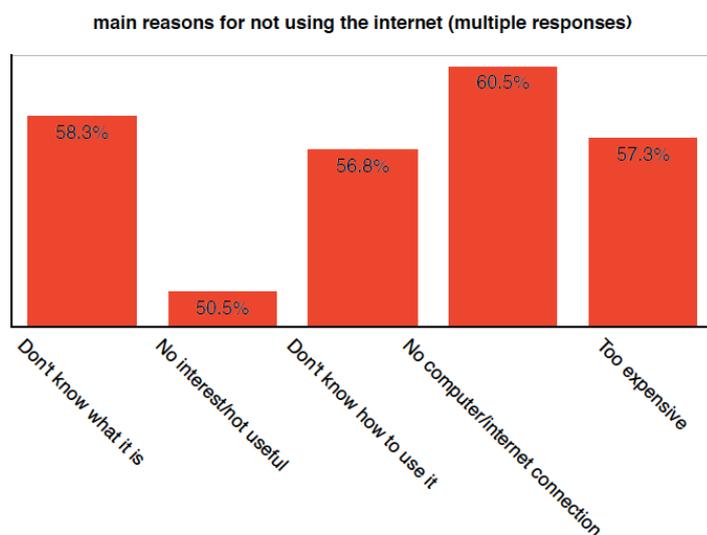
main reasons for not using the internet (multiple responses)

Figure 6: reasons for not using the internet

Source: RIA 2014 Household Survey

Education and Skills

Education and skills have been identified as indicators that can play a role in the endeavour to build a knowledge based economy through the widespread use of broadband.

While there has been a decline in the gap between those who have voice services and those who do not, the divide in access to the Internet has widened. This limits access to the range of enhanced services available online, which have become necessary for effective citizenry and consumer participation. Using the internet effectively requires strategic skills, which here refers to the ability to use computer and network sources as a means for attaining particular goals and for the general goal of improving one's position in society (Van Dijk, 2005). Strategic skills relate to the gap in the use of the internet between those who use them primarily for

professional and educational development, those who use them mainly for entertainment and those who use them for basic communication (Bonfadelli, 2002).

Table 3 below assesses the skills sets of citizens in the Western Cape province.

Table 3: Skills indicators			
Category	**Indicator**	**Source**	**Data**
	Share of individuals who have completed primary education as highest level		19.3%
Enrolment & educational attainment rate	Secondary school enrolment rate	StatsSA/Western Cape Department of Education/RIA Survey	72.0%
	Share of individuals who have completed secondary education as highest level		60.4%
	Pass rate for matric		85.1%
	University graduates as percentage of enrolment		24.4%
	Share of individuals who have completed tertiary education as highest level		17.6%
Literacy levels	Proportion who can easily read	RIA Survey	90.6%
	Proportion who can easily write	RIA Survey	90.2%

The literacy level for individuals 15 years and above in terms of their reading and writing abilities as specified in the 2014 provincial household and individual use survey was recorded at 90.6 per cent and 90.2 per cent respectively (RIA, 2014). The number of individuals who never went to school is low across the province and this could be because of the free basic education in place, meaning individuals have access to primary education.

Secondary level as the highest attained remains the highest in the province. The secondary school enrolment in the Western Cape is recorded at 72 per cent, while the pass rate for matric students in 2013 was 85.1 per cent in the province (DBE, 2013). According to the RIA 2014 survey, 19.3 per cent of those interviewed in the Western Cape had attained primary education as their highest level completed and 60.4% had completed secondary education.

Table 4: Highest level of education attained by individuals				
Level	Khayelitsha	Mitchell's Plain	Saldanha Bay	Rest of Western Cape	Provincial Total
None	1.3%	1.3%	3.6%	3.1%	2.6%
Primary	4.3%	12.6%	17.1%	23.2%	19.3%

Secondary	90.3%	84.0%	71.0%	50.5%	60.4%
Tertiary: Diploma or certificate	3.3%	1.1%	6.1%	11.5%	8.9%
Tertiary: BSc or BA	0.7%	0.3%	1.0%	6.6%	4.9%
Tertiary: Masters	0.0%	0.1%	0.6%	4.9%	3.6%
Tertiary: PhD	0.0%	0.0%	0.0%	0.2%	0.1%

Tertiary schooling is predominantly low in all the areas (Table 4 above). Those who have a tertiary education in the Western Cape (which includes a diploma, a bachelor's, a master's and a PhD degree) as the highest level attained is recorded at17.6 per cent, with only 4.9 per cent claiming they have completed a Bachelor's degree and 3.6 per cent a Master's (RIA, 2014). Yet, research has shown that there is a positive correlation between education and the way in which individuals use the internet. Developing the education level and intellectual capacity of citizens is therefore essential to allow for the optimal outcome of the introduction of broadband services in the communities.

Citizen use of e-government services

The Western Cape broadband strategy includes a focus on e-government services as it aims to improve government efficiency and transform provincial government for the benefit of citizens, businesses and those charged with delivering services (DEDAT, 2013). Internal government ICT use was commendable given that at a local level all municipalities had working internet connected at 4Mbps or more (Department of Local Government, 2014). As the UNDESA e-government survey pointed out that by government having working websites this was indicative "both of evolving expectations on the part of increasingly connected citizens and the enhanced capacity of governments to utilise ICT in addressing public service needs" (UNDESA, 2014: 48). The RIA 2014 Western Cape Government Web survey found that all government departments had functioning websites that could be searched for through any search engine and were updated regularly with links to forms and documents that could be downloaded. However the sites are not mobile friendly and the main language of delivery of the content is in English and this is a concern given the multi-lingual nature of the Western Cape community.

While from a supply side perspective government does provide some online services to citizens, a demand side assessment showed that currently there is minimal use of these services.

Table 5: Provincial Individual use of e-government services	
Share using a mobile phone/internet	**Provincial**
Use of mobile phones to access government services	30.0%
Use the internet for getting information from government organisations	40.9%
Use the internet for interacting with government organisations	29.9%
Use the internet for downloading/uploading forms from/to a government	42.6%
Use the internet to transact financially with government organisations	19.5%

In-spite of government launching e-services, the provincial survey shows that uptake is low. The highest figures of use were recorded for getting information from government organisations online and downloading or uploading forms on government websites (Table 5). Although the informal business sample is not a subset of a

statistical population and therefore does not accurately reflect the entire population, it gives an idea of the value that businesses at the micro-level have for the internet. Only 10.5 per cent of the businesses interviewed indicated they have access to the internet with the majority of these accessing it through their mobile phones. Of those with access to the internet, less than a quarter made use of e-government services (Table 6).

Table 6: Informal business use of e-government services	
Indicator	**Provincial**
Use of Internet to transact financially with government	7.1%
Use of internet to download or upload documents or forms or applications from or to government	21.4%
Use the Internet for: Interacting with government organisations	7.1%
Use the Internet for: Getting information from Government Organisations	14.3%

Conclusions & Recommendations

The Western Cape government, through its broadband initiative is in the process of connecting its citizens to broadband for the purpose of furthering economic development and growth and building a knowledge based economy. The digital readiness assessment of the province showed that ICT policy outcomes are a result of national policy on the market structure and institutional arrangements, and resulting licensing and regulatory regime which go beyond the jurisdiction of the Western Cape Government, therefore, putting constraints on provincial development.

As indicated in the literature reviewed and findings from the RIA survey, infrastructural interventions are not enough on their own to enable the growth and development associated with broadband extension in developing economies. Issues such as prices of the services affect the end user, impacting negatively on investment in ICT given it is a service that wider service sectors and businesses depend on. As one of the objectives of the Western Cape is to become the ICT hub for South Africa, critical areas from the supply side still need to be addressed, including but not limited to the provision of affordable and ultrahigh speed broadband. There is significant evidence that it is not technology on its own that drives efficiency, productivity and innovation, whether in the private or public sector, but rather that ICT can act as an enabler of, and even catalyst to, other economic and social interventions, beyond the availability of low cost and high speed bandwidth.

However given these supply side issues that stem mainly from national bottlenecks, the Western cape government has been seen overall to be seeking to ensure that they supply infrastructure, providing public Wi-Fi and government online services to ensure that citizens may benefit optimally from access to broadband.

In spite of this, realising the full benefits from broadband is greatly dependent on end user making use of the services. Considering the importance that has been placed on broadband as an economic driver by the province, internet access both at the household and at the individual levels, which stand at less than 45% and below 60% respectively, could be greatly improved. The informal business study, although not representative, provides some indication of the limited use of the internet in conducting business activities. Very little use is made of online banking and mobile money transfers to carry out financial transactions with suppliers and customers.

Apart from the limited access to the internet, there is extremely low use of available e-government services mainly as a result of a lack of awareness of these services or the platform through which they can be accessed. This indicates the need to digitally prepare citizens so they can optimally use the services available through broadband. The absence of relevant content in a sufficient number of local languages on websites, contribute to the low use of government online services and the preference to interact with government face-to-face.

The level of education of individuals is also factors that contribute to the low and sub-optimal use of broadband among citizens in the Western Cape. Although adult literacy level in the Western Cape is higher than they are for the rest of the country, basic literacy is not sufficient to allow citizens to participate fully and constructively in a digital economy. While the province performs well, in comparison to other provinces, in matriculants and university graduates, there is a low share of individuals with secondary and even more so tertiary education. This requires interventions at the provincial level through the Department of Education to ensure that this is improved, in order to align the Western Cape's available skills set with the demand for skills in a knowledge economy.

Having a wider pool of the right skills and techniques, should the number of graduates increase within the province, can enhance the capacity of companies to innovate and potentially to exceed current levels of innovation. This can allow for effective demand side use of broadband and can contribute positively to business efficiency in the Western Cape. Services that would stimulate demand side use of broadband need to be devised on a mobile platform that citizens have access to as well as actively designing relevant content.

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