ADVANTAGES AND DISADVANTAGES OF ICASA'S 2011 SPECTRUM LICENSING MODELS

Name: Yolisa Kedama

Student Number: 0711642F

A research report submitted to the Faculty of Management, University of Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management (in the field of ICT Policy and Regulation)

March 2014

ABSTRACT

The challenges of the broadband divide between rural and urban areas, and the demand for access spectrum exceeding the available supply, require regulators to rethink their approaches to spectrum regulation. Traditional spectrum management mechanisms resulted in artificial spectrum scarcity and hoarding whilst operators ignored their universal service obligations. This research report uses the regulatory impact assessment methodology to investigate what the proposed market-based spectrum licensing models of wholesale open access and managed spectrum park mean and the impact such regulatory approaches would have on the communications industry and technology progression.

The findings of this research indicate that the wholesale open access and managed park are new concepts and were not well defined thus as a result are not well understood within the industry. The different stakeholders have different interpretations that suit and benefit their own organisations. The regulator does not have spectrum strategy that acts as a guide in achieving a digital country. There is no guiding document that promotes compliance for the relevant stakeholders to roll out broadband networks for next generation e-services.

The ‘artificial’ interdependence between policy-maker and regulator’s mandates has created a vacuum where all the industry players manipulate both institutions in order to advance their commercial business interests. Yet, regulatory failure has negative consequences for technology progression. ICASA’s lack of regulatory impact assessment (RIA) studies worsens the situation as the 2011 proposed spectrum licensing models were never investigated before being introduced.

The conclusions of this research indicate that for greater broadband inclusivity, a hybrid of traditional spectrum management approaches with market-based models should be employed. The regulator needs to make RIA a permanent process in decision making to minimise possibilities of

litigation and regulatory capture. This will make it easier to implement new regulations and make decisions from an informed position. Incumbents have existing infrastructure, capital and technical expertise and it is up to the regulator to decide whether they can be used as enablers or considered obstacles for faster broadband rollout.

DECLARATION

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

Signature:.....

Date: 13/10/2014

Mrs Yolisa Kedama

DEDICATION

To my loving husband Pumzile, thank you for your support, understanding and patience during this period. Thank you for taking care of the kids, I owe you big time.

To my babies, Aviwe and Buhle, thank you for cheering me up.

To my mother and the whole family: thank you for your understanding and unconditional support.

ACKNOWLEDGEMENTS

A big thank you and sincere appreciation goes to my supervisor, Lucienne Abrahams for her patience and valued guidance throughout this research process. Thank you for your encouragement and instilling confidence in me. All your sacrifices and commitment are finally paying off.

I would also like to thank all the interviewees who made time to engage on the topic, without whom this study would not have materialised.

To Eugenia, thank you for being a good committed study mate, Ncedisa for your words of encouragement during the last phases of this research process.

Table of Contents

ACRONYMS

3G	Third Generation
4G	Fourth generation
5G	Fifth Generation
AIP	Administrative Incentive Pricing
ADSL	Asymmetric Digital Subscriber Line
APT	Asia-Pacific Telecommunity
ANC	African National Congress
ATU	African Telecommunications Union
BCA	Benefit Cost Analysis
BEE	Black Economic Empowerment
BIPT	Belgian Institute for Postal Services and Telecommunication
CDMA	Code Division Multiple Access
DOC	Department of Communications
DTT	Digital Terrestrial Television
ECA/EC Act	Electronic Communications Act
ECNS	Electronic Communications Network Service
ECS	Electronic Communications Service
EDGE	Enhanced Data for Global Evolution
E-GSM	Extended Global System for Mobile
GDP	Gross Domestic Product
GSM	Global System for Mobile
GSMA	Global System for Mobile Association

IBA	Independent Broadcasting Authority
ICASA	Independent Communications Authority of South Africa
ICT	Information and Communications Technology
IECS/I-ECS	Individual Electronic Communications Service
IECNS/I-ECNS	Individual Electronic Communications Network Service
IMT	International Mobile Telecommunication
ITA	Invitation To Apply
ITU	International Telecommunication Union
LLU	Local Loop Unbundling
LTE	Long Term Evolution
MVNO	Mobile Virtual Network Operator
NDP	National Development Plan
NGA	Next Generation Access
OECD	Organisation for Economic Co-operation and Development
OFCOM	Office of Communications
PECN	Private Electronic Communications Network
PPP	Public Private Partnership
RIA	Regulatory Impact Assessment/Analysis
SA	South Africa
SATRA	South African Telecommunications Regulatory Authority
SMME	Small Medium Micro-sized Enterprises
SOE	State Owned Entities
US	United States of America

USA	Universal service and access
USO	Universal Service Obligations
USAL	Universal Service Area Licensee
VANS	Value Added Network Services
WP5D	Working Party 5D
WRC	World Radio-communication Conference

List of tables

List of figures

CHAPTER 1: The strengths and weaknesses of spectrum regulation for broadband in South Africa

This chapter introduces the research topic and the place where the study will take place. It will give general information on the environment being studied; introduce the research problem, the purpose statement and the research questions.

1.1 ICASA's 2011 spectrum licensing models for broadband

This report seeks to conduct research about advantages and disadvantages of the spectrum licensing models (wholesale open access and managed spectrum parks) proposed by ICASA in the published draft spectrum assignment plan (draft regulations) in 2011, (ICASA, 2011b). It strives to find out what would be the best way for licensing spectrum where demand exceeds supply whilst encouraging competition and at the same time introducing new markets, giving access to new entrants, allowing technology progress and ensuring broadband rural connectivity for all. It also attempts to understand the definition and the broader meaning of the proposed spectrum licensing models and what impact they will have on the communications industry as a whole. By so doing, it would be possible to critically and analytically comment on ICASA's proposed spectrum regulation.

There are a number of other issues raised in the proposed draft regulation, new concepts, principles and obligations introduced but which are not thoroughly explained for example, "successful applicants are expected to provide broadband services in line with IMT framework as defined by the ITU" and how some incumbent operators got additional assignments without following any process. This makes room for regulatory impact assessment to be done on the entire regulation. This research report, however, will only focus on the spectrum licensing models proposed. The IMT spectrum (spectrum earmarked for broadband) will be referred to as high demand, last mile or access spectrum.

1.2 Population and broadband access

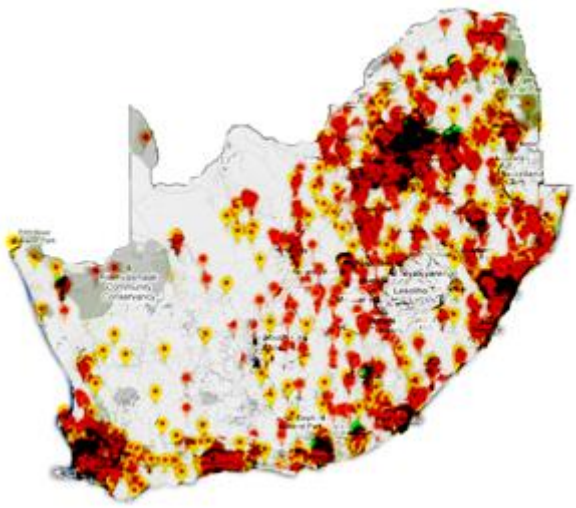
South Africa has a population of 52.98 million, (mid-year estimate) (StatsSA, 2013). According to the World Bank (2012), “South Africa is an upper middle income economy”. It has the largest economy in Africa and is ranked 41st overall in terms of ease of doing business in the world (World Bank, 2013) with a nominal GDP of $384.3 billion (World Bank, 2012). Just less than a quarter of the population is unemployed, 24.1% (StatsSA, 2013). One of the objectives of the proposed spectrum licensing models is to address lack of broadband connectivity because broadband is believed to contribute positively in job creation not only within the communications sector but has positive ripple effect that overspills into other sectors as well. Qiang, Rossotto & Kimura (2009, p45) claim and confirms that “growth benefit that broadband provides for developing countries was of similar magnitude as …[in] developed economies - about a 1.38 percentage increase for each 10 per cent increase in [broadband] penetration. Such investments in broadband infrastructure have spill-over effects and increases payoffs in other sectors”. From a broader economic, efficiency and governmental point of view, broadband will assist government in delivering critical services faster and more efficiently to the people. Being able to place an order for agricultural services, provide traditional clothing online from a rural area (e-commerce), request assistance for municipal/government services (e-government services) and appoint an expert teacher from the urban area to give a lecture on a particular subject to a rural school (e-education) all become possible when broadband connectivity is a reality for all.

It has been more than 18 years since democracy but the state of communications in South Africa still reflects its history of apartheid to a larger extent, (Limpitlaw, 2009). For example, the communications sector and infrastructure in South Africa is highly developed in certain parts of the country e.g. the major metropolitan areas (Johannesburg, Cape Town and Durban, the golden triangle) yet almost non-existent in some areas such

as the villages in Limpopo and Eastern Cape, resulting in a digital divide and in particular a broadband divide between urban and rural areas. The sad reality is that even in those major metropolitan areas, the state of 3G in some suburbs leaves much to be desired as it becomes a struggle to get continuous connection let alone reasonable speeds. It is unfortunate that in recent years the number of fixed lines also started declining. TechCentral (2013) reported that there are currently approximately "3.8 million fixed lines after slumping to 4 million fixed lines a year ago", with the majority in urban areas contributing negatively to fixed broadband penetration growth especially in rural areas. "The number of broadband digital subscriber lines in service has increased by only 5.2 % to 870 000 lines", (TechCentral, 2013).

Figure 1 below depicts the level of ADSL penetration with darker colours showing areas with more telephone lines and therefore some level of ADSL.

Figure 1: The level of fixed broadband in South Africa



Source: www.broadbandstats.co.za

Considering the limited number of existing fixed lines, and taking into consideration the geographic mobile coverage which is believed to be closer to 100%, it can be concluded that the vision of 'broadband connectivity for all' will be achieved mainly through wireless and mobile

technologies. There are limitations though to mobile broadband in South Africa due to limited bandwidth availability and the number of licensed IECNS and IECS operators 'qualifying' to apply for the available high demand spectrum. In terms of the standard terms and conditions for IECNS licences' regulations of 2010, the IECNS licence gives right to the licensee to "construct, operate and maintain an ECN as well as provide an ECNS in the licence area", (ICASA, 2010b). Also the standard terms and conditions for IECS licences' regulations of 2010 gives right to IECS licensee to "provide ECS by means of an ECN operated by ECNS licensee or a licence-exempt PECN operator. This suggests that all the licensed IECNS and IECS licensees can apply ('qualify' to apply) for the available high demand spectrum. What this means is that government might have to consider including a mix of fixed (fibre) and wireless with mobile technologies or even satellite as part of its broadband strategy. ICASA spectrum licensing models are proposed to assist the new smaller operators to gain access to high demand spectrum introducing more competition and changing the market whilst also introducing obligations to connect certain percentages of the population and geography (excluding the big metropolitan areas) to address the digital and broadband divides.

The migration to digital technologies and the convergence of technologies required countries to reconsider and align themselves with a converged regime in order to be able to regulate accordingly. In 2002 a converged regulator was formed by the merger between the then telecommunications regulator, SATRA and the broadcasting regulator, IBA. Convergence legislation repealed the Telecommunications Act of 1996, the Independent Broadcasting Act of 1993 and certain sections of the Broadcasting Act of 1999 through the introduction of the Electronic Communications Act (ECA or EC Act) promulgated in 2005. The objective was to create a licensing regime that encourages horizontally integrated networks which makes it easier for all operators to provide converged services or even share networks wherever possible. The promulgation of the Electronic Communications Act however, did more than that, disrupting the Minister's

managed liberalisation policy of waiting for the invitation to apply from the Minister before any new Individual Electronic Communications Network licensee could be licensed. The then VANS operator Altech took ICASA and the Minister of Communications to court and the so-called *Altech-Autopage v ICASA, Minister court ruling* resulted in approximately 400+ operators being converted to either Individual or Class Electronic Communications Network Service (ECNS) and Electronic Communications Service (ECS) licensees. These operators need access to high demand spectrum for them to be competitive and to be able to provide efficient services. Given this dilemma faced by ICASA in fulfilling its mandate where there are more operators than the available high demand spectrum, the proposed spectrum licensing models are 'considered mechanisms to encourage spectrum and network sharing, ensuring efficient use of spectrum which in effect ensures sharing of spectrum and network costs'. It is yet to be seen whether ICASA will be able to achieve some of its goals and government objectives and bring about positive change to the communications industry by introducing these models.

1.3 ICASA's mandate regarding spectrum regulation

In terms of section 4(3)(c) and (e) of the ICASA Act of 2000, ICASA "must manage the radio frequency spectrum in accordance with bilateral agreements or international treaties entered into by the Republic", and "must grant, amend, renew, transfer and revoke licences" including spectrum licences. The EC Act of 2005 gives ICASA authority to make regulations regarding the different licences and the use of radio frequency spectrum. Some of ICASA's objects are to "ensure efficient [and effective] use of the radio frequency spectrum", regulate the markets, promote competition, encourage innovation, and promote universal provision of electronic communications networks and services and hereby ensuring connectivity for all. ICASA's aims by introducing the 2011 spectrum licensing models were to address the need for spectrum efficiency, spectrum markets, competition and broadband connectivity for all. It is in

the interest of South Africa to discourage network duplication at all levels especially in rural areas to ensure that communications' costs are kept at a minimum. Section 31(3) of the EC Act mandates ICASA to "prescribe procedures and criteria for awarding radio frequency spectrum licences for competing applications or [in] instances where there is insufficient spectrum available to accommodate demand". However, it is not clear whether the wholesale open access and managed spectrum park approaches to spectrum regulation are the most appropriate means to achieve these aims.

1.4 The industry's reaction on the proposed spectrum licensing models

The major operators objected to the introduction of the 2011 spectrum licensing models especially the wholesale open access citing various concerns. ICASA also did not assist the situation and gave the operators more reasons to object as they published the plan only a day after the draft policy directive on high demand spectrum was published. Some of the concerns raised include exactly that the timing of the publication of the spectrum assignment plan and the ITA notwithstanding the fact that ICASA does not have to act as per the policy directive but 'must consider the policy directive'. Other concerns raised are the limitations in bandwidth in the midst of technology evolution e.g. 4G technologies if the incumbents are excluded, the cost of building a network from scratch for new operators, the viability of introducing additional operators to the market, the viability of the business model of operators operating and competing at wholesale level only. Other concerns relate to ICASA using regulatory mechanisms to introduce competition instead of allowing market forces to dictate and the delays that could be experienced in relying on new entrants to build broadband networks especially in rural areas. Furthermore, the draft spectrum assignment plan does not make it clear how this regulatory approach would contribute to addressing the digital and broadband divide.

1.5 The status quo in terms of current high demand spectrum distribution

Currently in 2014, there are four mobile operators and two MVNO's, two fixed-line operators and 400+ IECN/ECS licensees.

Due to the old traditional spectrum regulatory models e.g. command and control, beauty contests, first come first served that gave exclusivity to a limited number of operators, the spectrum that has economic value (high demand, IMT or access spectrum) is in the hands of few operators i.e. MTN, Vodacom, Telkom, Cell C, Neotel and WBS. The bands referred to are 800MHz, 900 MHz, 1800 MHz, 2100 MHz, 2.6 GHz (2600 MHz) and 3.5 GHz bands. Within the broadcasting sector, Sentech, a state-owned signal distributor, was a holder of spectrum licences to some of the high demand bands i.e. 2.6 and 3.5 GHz bands and has recently (2013) returned this spectrum back to the regulator after the introduction of administrative incentive pricing (AIP) model which resulted in high spectrum fees. Despite the amount of bandwidth already assigned to the operators, the existing level of competition still has failed to reduce prices and to address broadband divide hence the proposed alternative spectrum licensing models. The challenge is to show how those models will assist in achieving the desired objectives. The rest of the spectrum has not yet been identified for IMT and hence is not referred to as high demand as is available for assignment to a larger extent, e.g. for point to point links and other shared services i.e. alarm systems.

1.5.1 High demand spectrum that could potentially be available for licensing

The remaining high demand spectrum includes the unassigned portions in the 2.6 and 3.5 GHz bands and the spectrum that will be released after the analogue broadcasting services have switched over to digital technologies, 'the digital dividend', I and II. The 450-470 MHz band is not yet available for broadband in South Africa even though it has been

identified by ITU for IMT services. WRC 2007 identified the 450-470 MHz band for IMT services, (Resolution 224, WRC07). The 2.3 GHz band on the other hand was used mainly for fixed links by the then 'bulk users', i.e. Telkom and Transnet amongst others and is one of the frequency bands identified for IMT services. The regulator still has to undertake a migration process where necessary for all the services occupying IMT identified bands which will take years to complete. A frequency migration plan has since been finalised and ICASA is proposing to do a feasibility study especially in the 450-470 MHz band given the current occupation and usage by government and operators like Transnet. The 450-470 MHz band is one of the bands of interest due to its propagation characteristics which are suitable for rural areas but is unfortunately not yet available for assignment as is assumed to be 'congested'. Spectrum monitoring conducted by ICASA in the 450-470 MHz band shows that the band is underutilised confirming the concept of 'artificial' spectrum scarcity', (ICASA, 2010a). This will still have to be further investigated by ICASA before any decision is taken.

1.5.2 Exploring other means to address demand-supply asymmetry

As part of ensuring spectrum efficiency and managing 'artificial spectrum scarcity', ICASA has started investigating technologies that use white spaces to provide broadband services starting with TV white spaces. White spaces are those spectrum channels that sit idle in certain areas at certain times due to the design of certain networks that can be used by other services when not in use without causing interference, e.g. broadcasting networks. These use intelligent technologies, the dynamic spectrum access or cognitive radios, which hop and detect unused channels avoiding occupied channels. "Cognitive radio along with software [defined] radio,…, and other emerging technologies can facilitate new forms of spectrum sharing that would greatly improve spectral efficiency and alleviate scarcity, **if** spectrum policies are in place that support these forms of sharing" (Peha, 2008, p2). The ITU WP5D is further investigating

more spectrum bands where IMT technologies could be implemented and the findings will be discussed and endorsed (if at all) during the next ITU World Radio Conference (WRC) in 2015.

1.6 The key events in regulating the 'high demand' spectrum

Vodacom and MTN were assigned spectrum in the 900 MHz band as far back as 1993 together with their service licences. At the time this happened, during a transition period, apartheid-democracy negotiations, telecommunications was in a way overlooked, the focus being more on broadcasting, such that Vodacom and MTN were licenced in the middle of the negotiation period and the ANC "threatened to revoke the licences when it came to power", (Limpitlaw, 2009, p2) which almost collapsed the negotiations, probably due to the fact that the process was seen to be either flawed or unfair by the new party. When the third mobile operator was licenced in 2001, there was not enough bandwidth in the 900 MHz band (GSM band) and was assigned spectrum in the 1800 MHz band first. The extended GSM (E-GSM) was later cleared for Cell C to utilise as the 1800 MHz band was dubbed as 'not economically viable for rural deployment'. The Telecommunications Act of 1996 gave exclusivity to Telkom for five years in exchange for rural connectivity amongst other things. During Telkom's exclusivity period, 100 MHz of bandwidth in the 3.5 GHz band was assigned to Telkom and when the exclusivity expired, Telkom relinquished some of the spectrum in the 3.5 GHz band and remained with 2X14 MHz of bandwidth. The minister issued a policy directive under the amended old Telecommunications Act in 2002 giving 'deemed access' for mobile operators to apply for spectrum in the 1800 MHz and third generation spectrum i.e. 2100 MHz band. Telkom and the second network operator (Neotel) also enjoyed the same privilege of being beneficiaries to the policy directive for both 1800 MHz and 2100 MHz bands. All these operators were to be assigned spectrum in the 1800 MHz and 2100 MHz bands on application. Some spectrum was assigned and licenced to WBS in the 1800 MHz and 2600 MHz bands. Unfortunately the

way the 2100 MHz band was segmented resulted in there not having enough spectrum to accommodate all the operators in the 2100 MHz band as pronounced in the amended Telecommunications Act and as a result Neotel being the last entrant was assigned spectrum in the 1800 MHz band only and in the 3.5 GHz band. The amended Telecommunications Act gave rights of access to the 3G band to 5 operators at the time as alluded to above. It was stated as follows:

> *Within six months after the date the second national operator is granted a public switched telecommunications service licence, or such longer period as the Minister may determine, Telkom may apply to the Authority for a third generation telecommunication radio frequency spectrum licence to provide public switched telecommunication services, and such other services as Telkom, from time-to-time, is licensed to provide,* (Telecommunications Act, 2002).

The responsibility for the regulator was to ensure that all these operators have equal assignments in the 3G band by slicing the band in a way that guarantees access to all those 'deemed' to be the licence holders and by also reserving some spectrum for those who apply at a later stage. The 3G band has 2X60 MHz of bandwidth and unfortunately ICASA assigned 2X15 MHz bandwidth to each operator 'deemed' to be the holder depleting all the assignable spectrum in the band hence Neotel could not be assigned. For an operator to build a high-speed, high-capacity 3G network, how much bandwidth makes business sense for consumers to obtain the benefits? The researcher has not come across any document that explained the criteria used by ICASA to choose 2X15 MHz.

In 2002, Sentech was issued with carrier of carrier's and multimedia licences. These licences were issued together with spectrum in the 2.6 GHz and 3.5 GHz bands, thanks to the same policy directive.

1.6.1 Regulation of spectrum fees

The introduction of the administrative incentive pricing (AIP) model for spectrum fees in 2010 and its implementation in 2012 started forcing a number of operators to return some of the spectrum they were either not using or using inefficiently e.g. Telkom, Sentech and others which drastically reduced their spectrum fees. Interestingly though even after the introduction of the AIP, most operators who had access to the high demand spectrum decided to hold on to their assignments reflecting how much they value their asset (spectrum) with the exception of Sentech who gave back 50 MHz of bandwidth in the 2.6 GHz band and 2x14 MHz of bandwidth in the 3.5 GHz bands.

1.7 Policy and regulatory landscape regarding high demand spectrum

Between 2003 and 2006, a huge hype and interest on the WiMax technology erupted and ICASA started a process of assigning and licensing the remaining high demand spectrum both in the 2.6 GHz and 3.5 GHz bands using market-based assignment model proposing to auction the spectrum.

The draft regulations on high demand spectrum and Invitation to Apply (ITA) were published in 2009 but the ITA was later withdrawn. The regulations have since been finalised and incorporated in the final Radio Regulations document that was published on 31 March 2011. The licensing process was later put in abeyance and was resurrected in 2011 with a different approach. The proposed approach is combining the licensing of the 800 MHz and 2600 MHz bands using wholesale open access and managed spectrum park for 20 MHz portion in the 2600 MHz band. The licensing of the 3.5 GHz band thereof has been put on hold though no clear reason has been given for this decision. However, according to agenda item 1.1 for WRC 15, “initial frequency bands are under consideration by WP 5D members, within the following ranges

(MHz): 470-694; 694-790; 1000-1700; 2025-2110; 2200-2290; 2700-3400; 3400-5000; 5350-5470; 5850-6425". The identification of the 3400-3600 MHz band for IMT was not globally agreed meaning some countries wanted to keep the band for satellite use. The 3.5 GHz band forms part of the C-band for satellite services hence sharing studies had to be conducted as per report ITU-R M.2109 (i.e. "sharing International Mobile Telecommunications-Advanced (IMT-Advanced) systems and geostationary-satellite networks in the fixed-satellite service in the 3 400-4 200 MHz…frequency band", (Resolution 154, WRC12) though in South Africa the mobile allocation and licensing for mobile broadband has already been done specifically in the 3400-3600 MHz band.

A draft policy directive on the licensing of high demand spectrum specifically the 800 MHz and 2.6 GHz bands was published by the DoC on the 14 December 2011. One day later ICASA published a draft spectrum assignment plan and the draft ITA on combined licensing of the 800 MHz and 2.6 GHz bands. ICASA's draft plan and ITA were put on hold pending the finalisation of the policy directive by the Minister. More than two years have passed and the policy directive has still not been finalised. This has delayed the finalisation of ICASA's spectrum assignment plan and the ITA resulting in delays in licensing the most sought after spectrum which would have assisted in increasing broadband connectivity and realising the government's goal of broadband connectivity for all by 2020. One of the reason's cited to be contributing to the delay is the outcome of WRC 2012 which officially made an allocation of the 700 MHz band, the second digital dividend (694-790 MHz) or (700 MHz band) to mobile services in Region 1, giving an opportunity to assign and licence the 700 MHZ and 800 MHz at the same time or even combined. This increases the bandwidth available for assignment to accommodate more operators than the initial plan. This also gives an opportunity to choose a channel arrangement that will harmonise the country's plan with the APT plan i.e. in region 3. As this guarantees more bandwidth for assignment, it also guarantees economies

of scale and therefore lower costs for handsets. Whether this will yield positive results remains to be seen.

1.7.1 The ITU and ATU in regulating high demand spectrum and digital dividend

The ITU divides the world into three regions, region 1 includes Africa and Europe, region 2 refers to North and South America, and region 3 as already explained. Region 3 is the Asia-Pacific region of the ITU including Australia.

The ITU is a United Nations agent responsible for radio communication (ITU-R), telecommunication (ITU-T) and development (ITU-D). It holds world radio communication conferences (WRC's) every three to four years discussing and deciding on new radio frequency spectrum allocations as the technologies evolve.

The sharing studies are still underway within the ITU regarding the lower band edge of the 700 MHz and interference protection values for broadcasting services. In fact South Africa hosted a simulation workshop on behalf of ATU to carry out the ITU studies in order to ensure that Africa does not miss out on the 700 MHz opportunity since the consideration for allocating the 700 MHz band to mobile services was mainly motivated for and by African countries. The issue to be considered is how much socio-economic benefits the country is missing out on whilst delaying the licensing of the 800 MHz spectrum. "The effect of time on money makes a dollar received or spent today worth more than a dollar received (or spent) in the future" and "people place a higher value on a benefit that they obtain today than one they will obtain in the future", (OECD, 2008, p13). What becomes a challenge for the country (SA) and Africa as a whole is deciding whether the benefits from delaying the licensing process (having more spectrum to accommodate more operators) outweigh the benefits of immediate release and licensing of the 800 MHz band i.e. economic benefits from broadband networks or vice versa.

1.7.2 Wholesale open access and managed spectrum park in a South African context.

The draft spectrum assignment plan is proposing two spectrum licensing models, the wholesale open access and managed spectrum parks. These are new concepts in the South African regulatory environment and not much research has been done to get a detailed understanding of what these mean and what their impact is for both the new entrants and the incumbent operators, i.e. on the market and competition and whether they will address broadband connectivity for all.

1.7.2.1 Wholesale open access

In the South African proposal, wholesale open access means “no locking i.e. encouraging interoperability, no blocking which refers to no restrictions on ‘legal’ content and applications, and no retail referring to no service provision to end user”, (ICASA, 2011b). According to OECD (2013), “open access refers to some type of effective wholesale access to broadband services, with a certain degree of “openness” – such as transparency and non-discrimination – in the access policy established for these services, either on a voluntary basis or resulting from some obligations”, (OECD, 2013, p9). Berec (2011, p8) defines open access as “a form of wholesale access whereby operators are offered transparent and non-discriminatory wholesale access, thereby enhancing competition at the retail level”. It seems as if the idea with wholesale open access in this context is infrastructure or spectrum sharing or both and open access is used loosely to refer to ‘wholesale access’. To avoid ambiguity and confusion, this distinction will be given throughout the document.

In the draft plan, two combined licences in the 800 and 2600 MHz bands were earmarked for wholesale open access, one for Sentech and one for an I-ECNS licensee who has no spectrum assigned in any of the high demand bands. It appears that this approach was intended to either get one operator to build a network or operators to form consortiums and build

a network with a view to resell to others on a national wholesale basis and use Sentech's advantage of national presence to expand its network in order to eventually resell to retail operators. Two other licences in the 2600 MHz band only are allocated for any I-ECNS licensee who has no "spectrum assigned in any of the designated IMT bands". It is not clear what the intention is with these two licences whether they will be assigned on a national basis or will address 'hotspots' given the characteristics of the 2600 MHz band.

1.7.2.2 Managed spectrum park

The Managed Spectrum Park model in ICASA's proposal refers to a "sharing model where a number of entities apply to participate in sharing a block of common spectrum on self- managed basis and according to some regulations and/ or agreed procedures. The model encourages efficient use of spectrum, innovation and flexibility and provides for low-cost compliance and administration over time", (ICASA, 2011b). In the regulations only one block of spectrum in the 2600 MHz band is allocated for managed spectrum park. It appears that this approach was intended to cover 'hotspots', university campuses, smaller dense towns etc., on a managed basis. The only other available definition of managed spectrum parks is based on the New Zealand model which defines the concept as follows: "Managed spectrum parks (MSPs) are intended to allow access to a number of users in a common band of spectrum on a shared and, as far as possible, self-managed basis. Ideally, they encourage efficient use of spectrum, innovation and flexibility and provide for low-cost compliance and administration over time", (Ohanga, 2008, p4). The closest other authors came to defining a concept closer to managed spectrum parks is open access commons, for example Brito (2007) defines a commons as "a resource that is owned or controlled jointly by a group of individuals". It "is characterized by restrictions on who uses the resource, and when and how", (Brito, 2007, p4) whilst open access, on the other hand is defined as "a regime under which anyone has access to an un-owned resource

without limitation; no one controls access to the resource under open access", (open access referred to here has the same meaning as licence-exempt) or "open access" [Internet Exchange Points] IXPs [which] provide an example of self-regulation where the actors using these facilities establish their own rules and practices", (OECD, 2013, p9). The managed spectrum park model introduces some form of control and management to general 'commons' or 'open access' regime. For the sake of completeness and to avoid further confusion from the definitions above, spectrum commons and open access will be used in reference to licence-exempt unless a clear distinction is given.

1.7.2.3 The impact of the introduction of the 2011 spectrum licensing models and the incumbents' reactions

The introduction of the draft spectrum licensing models and the exclusion of the incumbent operators has had unintended positive and negative externalities and consequences, for example the incumbent operators started re-farming some of their high demand spectrum which they were using for GSM, EDGE technologies (1st and 2nd generation mobile technologies) and introduced LTE technology (4th generation). The negative consequence though is that this could create gaps in the GSM networks as operators would need a number of contiguous 200 kHz voice channels to make 5 MHz data channel for LTE technology. This has a potential to increase the number of drop calls on the GSM networks affecting the very same poor communities that the regulator is trying to connect unless the incumbent operators are prepared to re-engineer the networks and build more base stations. The concerns therefore raised by the incumbent operators and proposals made by ICASA should take into consideration the negative unintended effects.

Both models encourage sharing in an 'open access' environment with variations in access be it wholesale open access, private commons (for managed spectrum parks) etc., but the proposals are meant to indirectly exclude incumbent operators with the exception of Neotel, Sentech and

WBS who is benefiting by getting 5 MHz additional bandwidth and 5 MHz of guard-bands on each side without having to undergo a competitive process with other operators. The assumption is that the proposed additional 5 MHz bandwidth will be used as an 'incentive' for having to do an in-band migration in the 2.6 GHz band.

1.8 A case for more competition and broadband in South Africa and regulatory interventions

The country is faced with a number of challenges well past its apartheid years, that of providing basic needs for its citizens e.g. health, education, electricity, water, housing etc. amongst the priorities. Like the world in general it has experienced economic decline in the past few years and unfortunately the economy is now struggling to recover with the unemployment rate not improving at all. According to Qiang, Rossotto, & Kimura, (2009), "[In Korea], the rapid deployment of broadband provided important opportunities for [their] ICT industry. Some 300,000 jobs have been created in ICT, and the sector is growing three times faster than the rest of the economy". They further assert that "broadband is not just an infrastructure. It is a general purpose technology that can fundamentally restructure an economy", (Qiang, Rossotto, & Kimura, 2009, p41). The statement above demonstrates the importance and the critical role played by broadband in different economies. The developed countries have made a case for broadband for example,

> *governments around the world that had given up a direct stake in the telecommunications industry by privatising their incumbent operators and separating the functions of regulation from those of policy-making have also been active in creating and implementing policies aimed at realising the benefits of the information economy* (Firth & Mellor, 2005, p232) e.g. Australia, Korea, USA and others.

1.8.1 The introduction of regional licensees in expanding communications and broadband coverage

As already mentioned, there are competing operators in SA who have access to high demand spectrum nonetheless without assisting the country in meeting its objectives of broadband for all and lower communications costs. The high demand spectrum licences were issued with obligations to connect a certain number of schools, clinics and community centres and yet this did not yield any positive results for the country. The process of licensing Universal Service Area Licensees (USALs) started in 2001 with the intention of addressing rural connectivity as these licensees were only focused on certain district municipalities, i.e. regional licensees. This still did not yield the expected results either even though the USALs were given 'special treatment' in terms of high demand spectrum access, e.g. most USALs were assigned spectrum in the 3.5 GHz band (e.g. Metsweding, Amathole Telecommunications) and one or two allowed to share with the incumbents, the 800 MHz band, e.g. Thinta-thinta was issued with a licence in the 800 MHz band and Karabotel's licence was never issued, even though they did apply, (ICASA source). They still failed to compete or make a noticeable impact in those communities where they were licenced. Most of them remain dormant after all these years and some never paid the licence fees in the following years and were therefore never renewed, (ICASA source). Convergence legislation, i.e. the EC Act of 2005 instead converted all the USAL's to class ECNS's (C-ECNS's). This makes a strong case for intervention from the regulator, a strong case for the introduction of some form of competition or is it a case of encouraging competitiveness amongst the existing operators? It remains however to be seen how and whether the proposed spectrum licensing will introduce efficient competition that will eventually reduce communications costs.

1.9 Summary of the research problem

South Africa, like most ITU member states, has in the past used the old traditional spectrum management models of command and control. The regulator/s assigned and licenced the radio frequency spectrum in an exclusive manner and on a first come first served basis. This mainly protected Telkom monopoly and state-owned enterprises Eskom, Transnet, Police and Defence, which were previously given priority in terms of spectrum assignments and were referred to as 'the bulk users'. The traditional spectrum assignment and licensing models resulted in operators getting spectrum which they ended up not using or using inefficiently. This created 'artificial' spectrum scarcity and hoarding. A good example of this is the 50 MHz of spectrum in the 2.6 GHz band that was assigned and licenced to Sentech in 2002 but has never been used until returned back to the regulator in 2013.

The reform period, politically and within telecoms created an environment conducive enough for the regulator to start introducing obligations as part of the licence terms and conditions of the licensees to address universal service and access. With all these interventions, SA is still sitting at less than 10% broadband penetration and the rural areas are affected the most. Through the process of conversion encouraged by the EC Act, ICASA licenced 400+ network and service licensees which could not gain access and compete in the wireless and mobile space due to demand exceeding supply for the remaining 'lucrative' high demand frequency bands. ICASA has been attempting to address the issues of imbalance between frequency demand/supply, effective competition and lack of broadband connectivity by introducing wholesale open access and managed spectrum park licensing models but unfortunately to date has not succeeded. This has only given the incumbent operators ammunition against potential new entrants, for example, the incumbent operators have started re-farming their 900 and 1800 MHz spectrum introducing Long

Term Evolution (LTE) technology (3.9G-4G technology) whilst keeping telecommunications prices unreasonably high.

The potential benefits for wholesale open access is cost-saving in infrastructure for network rollout especially in rural areas if operators form consortiums to build networks which in turn will reduce consumer prices and sharing exorbitant spectrum licence fees. It also gives potential to introduce competition at service level. It might however be a challenge for government to impose obligations on new smaller operators to start or focus the broadband network rollout in underserved or un-served areas without any incentive to do so e.g. through government subsidy or funding. These models may encourage innovation, technology neutrality and efficient spectrum use. The disadvantages could be discrimination by the operators who gain access as wholesale open access operators against some of the retail operators. Other disadvantages are non-cooperation from the operators who get the spectrum licences and difficulty in reaching consensus for the rules of managing the spectrum parks which could result in uncontrollable interference defeating the main objectives of the models.

1.10 Problem statement

The spectrum licensing models used in the past i.e. command and control, first come first served resulted in economically inefficient use of spectrum. This was due to vertically integrated networks and managed liberalisation which protected the incumbent's exclusivity period amongst others. This created artificial spectrum scarcity and hoarding and resulted in some spectrum neither being used nor used efficiently, thereby contributing to a lack of connectivity, lack of e-services' delivery, and economic value not realised.

In South Africa the government has never adopted a spectrum licensing policy with the exception of the draft policy for high demand spectrum which was published on 14 December 2011. The only other document that

attempts to address spectrum policy issues is a national radio frequency spectrum policy document published in 2010 by the Department of Communications (DoC), though this does not address spectrum licensing models. The regulator is proposing wholesale open access and managed spectrum park as the new spectrum licensing models, though without having conducted a regulatory impact assessment (RIA). Conducting RIA before introducing a regulation assists in determining the impact/effect as one proposed solution is not always the only solution in addressing and achieving the regulatory objectives.

The majority of the high demand spectrum is already assigned and licenced to mainly the big operators i.e. the mobile and fixed operators and yet have not managed to rollout 3G and ADSL networks in most rural communities. The country is sitting at less than 10% broadband penetration and one of the objectives of the proposed spectrum licensing models is to change this and ensure effective competition and access to broadband for all. Operators allegedly attribute the lack of rural connectivity to various factors e.g. high costs of rolling out 3G networks and copper cables due to geographic location and distances between the poor rural communities and population sizes in those communities which does not make business sense for operators to provide services, and also unavailability and lack of access to spectrum in lower frequency bands that are appropriate for rural coverage.

It is not clear what will be the advantages and disadvantages of the proposed spectrum licensing models, how they will encourage rural broadband connectivity and whether they will address the issues of competition or infrastructure sharing and how, hence the study.

1.11 Purpose statement

The purpose of this research is to understand the applicable spectrum regulation concepts i.e. exclusive licensing, secondary markets, spectrum commons amongst others, in order to analyse the advantages and

disadvantages of ICASA's 2011 proposed spectrum licensing models and its limitations.

The study will investigate the perspectives of the regulator, operators and experts in further adding to an understanding of the advantages and disadvantages of these spectrum licensing models.

These analytical approaches will enable the researcher to draw conclusions about the impact these spectrum licensing models will have in addressing the regulator's strategic goals of introducing competition and broadband connectivity for all.

1.12 The research questions

With the understanding that ICASA's 2011 spectrum licensing models were still in a draft format and not yet finalised, an *ex-ante* RIA will be conducted to investigate whether the benefits of these models outweigh the costs and justify the action by ICASA.

The main question and the sub-questions therefore are crafted with that kind of background.

1.12.1 Main question

To what extent do ICASA's 2011 spectrum licensing models reflect an appropriate regulatory approach to achieving ubiquitous and high speed connectivity for South Africa?

1.12.2 Sub-questions

(1) To what extent are the proposed spectrum licensing models expected to encourage competition in electronic communications markets?
(2) To what extent would this regulatory approach address issues of low broadband connectivity in both urban and rural areas?
(3) What other effects could this regulatory approach have on services offered by the broader electronic communications market?

(4) In which ways do the anticipated benefits justify the costs associated with implementing the proposed spectrum assignment plan/regulations?

1.13 Conclusion

The main objective with this chapter was to introduce the country on which this study takes place. Also the history and key events in as far as regulation of high demand spectrum were highlighted. Interventions introduced by the regulator to achieve the main objectives as highlighted in ICASA's 2011 proposal are briefly mentioned. The proposed spectrum licensing models are introduced though not discussed in detail. The problem statement and the main research question are also indicated in this chapter. In the next chapter, literature on spectrum licensing models will be reviewed.

CHAPTER 2: Traditional vs modern spectrum management models

All the literature reviewed on the spectrum licensing models with relevance to the current environment and to the study being conducted will be discussed.

2.1 Introducing spectrum management

This section explores and reviews literature on spectrum assignment and spectrum licensing models proposed by different authors and taking into consideration future spectrum requirements. In essence it looks at basic spectrum management principles and how those relate back to the study. In South Africa, there has been limited investigation into spectrum policies and their licensing models and the impact these have on the communications industry and the public in general. The international experiences, debates and proposals would therefore be explored to increase the level of understanding on spectrum regulation and specifically the issues being investigated.

The literature review is intended to gain an in-depth understanding of the problem. As Rocco points out, “the purpose of the literature review is to determine if the topic is researchable, to report the results of closely related studies” (Rocco, 2009, p125). There are lots of theories and studies on ‘exclusive’ spectrum licencing and ‘licence-exempt but not much research has been done on a concept of ‘wholesale open access’ especially wireless or mobile and managed spectrum parks. The concept of licence-exempt is generally referred to as ‘open access’ though in some instances authors use the term ‘open access’ loosely to refer to access provided at wholesale level, e.g. in OECD (2013, p4), ‘open access arrangements’ “refer to wholesale access to network infrastructure or services that is provided effectively on fair and reasonable terms, for which there is some degree of transparency and non-discrimination”. As already pointed out, for the sake of completeness and to avoid confusion ‘open access’ will be used to refer to licence-exempt unless otherwise specified

and in those instances such distinction will be qualified to reflect the difference. A number of countries have recently published their broadband policies where this concept of wholesale open access is proposed e.g. Australia. On the concept of managed spectrum parks, the New Zealand approach will be studied. Regulatory Impact Assessment/Analysis (RIA) will be used to conduct the study.

2.2 Defining regulation, economic regulation and why we regulate in general

Baldwin, Cave and Lodge (2012, p18) suggest using the following to define regulation in general “as a specific set of commands …”, as a deliberate state influence”, and “ as all forms of social or economic influence …”. Regulation according to the OECD work is defined as a “diverse set of instruments by which governments impose requirements on enterprises and citizens. [These] include constitutions, laws, formal and informal orders, …, joint opinions, declarations, resolutions, recommendations, proposals, guidelines, codes of conduct [etc.]”, (Cordova-Novion, 2007, p1). A summarised way to define regulation is that it is a rule or set of rules meant to direct, instruct or give guidance to its citizens by a superior body within a particular industry or government for various reasons e.g. to address issues of competition, consumer protection (safety, health) etc. “Regulation … was generally advocated on two main grounds: natural monopoly and externalities” and so was and still is the case in telecommunications, (Sutherland, 2012, p22). Regulations can be introduced at any stage of the process but preferably *ex-ante* especially in markets where competition is adversely affected and the economy is suffering.

> *The effects of regulation, whether it is "economic regulation" or "social regulation," are likely to depend on a variety of factors: the motivation for regulation, the nature of regulatory instruments and structure of the regulatory process, the industry's economic*

characteristics, and the legal and political environment in which regulation takes place, (Joskow & Rose, 1989, p1451).

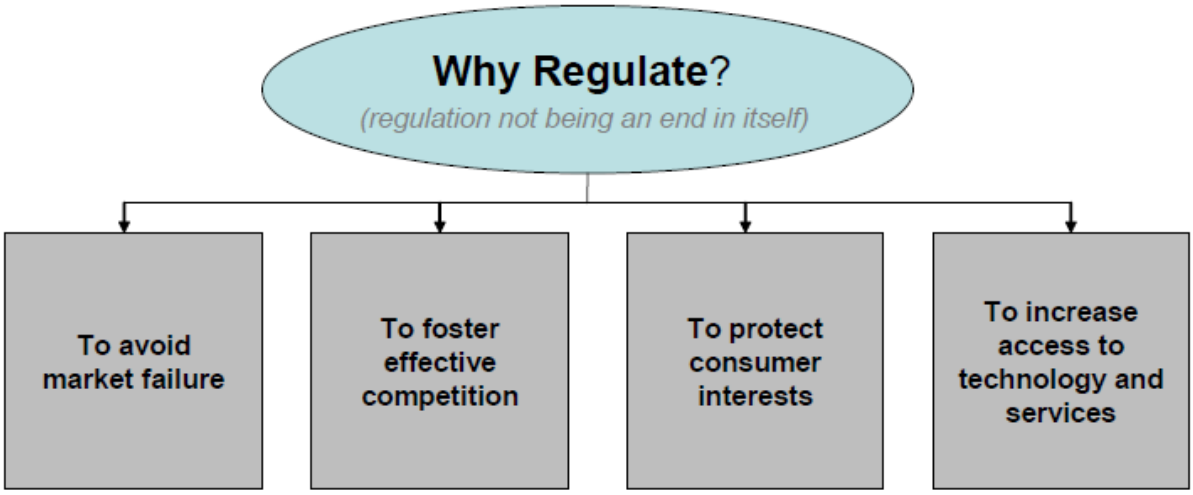
Baldwin, Cave and Lodge (2012, p258) indicate that "regulators can intervene [with regulations] in economic or social activity not merely by different methods but at different stages in the processes that lead to harms". Regulations may be used to control certain conduct or behaviour of those it regulates to avoid or prevent those harmful consequences. According to Cordova-Novion (2007, p1-2), "regulations fall in three categories, economic, social and administrative". "In general, deregulation strategies are applied to economic regulation, while various means of improving regulatory quality and reducing burdens are used for social and administrative regulation", (OECD, 1997, p8). "Economic regulations intervene directly in market decisions such as pricing, competition, market entry, or exit"; (OECD, 1997, p6). Whilst economic regulation is deemed necessary for competitive markets and in turn, assumed to be driving down costs; "markets do not [always] properly value some public interests that citizens deem important", (OECD, 1997, p8), so governments will always have a role to play through social regulations in making sure that public interests are taken care of. In some instances markets fail dismally when left to dictate, unregulated or to self-regulate.

2.3 Regulating frequency spectrum for broadband

Spectrum regulation was introduced to maintain order and avoid chaos of the airwaves. "Historically, access to and use of radio spectrum has been highly regulated in order to prevent interference among users of adjacent frequencies or from neighbouring geographic areas, particularly for reasons of defence and security", (Foster, 2011, p6). Spectrum is regulated for economic and social benefits, to avoid interference, encourage competition, to protect consumers and to assist in addressing the digital divide for developing countries. In the digital era, spectrum is also regulated to encourage 100% broadband connectivity in different countries.

Figure 2 below (borrowed from Blackman & Srivastava, 2011, p20) illustrates basic objectives why regulation, and spectrum regulation in particular is critical.

Figure 2: Objectives for regulation



Source: ICT Regulation Toolkit

2.4 Spectrum regulation in a converged environment

Spectrum management is a process of regulating frequency spectrum and it includes planning, assignment, equipment registration, licensing, monitoring and compliance, amongst other functions. It is defined as "the planning, coordinating, and managing the use of the electromagnetic spectrum through operational, engineering, and administrative procedures", (AESMO, 2006, p6). Prince (2004, p1) on the other hand defines Frequency Spectrum Management as "the regulatory and perhaps co-operative process of allocating specific frequency bands for specific uses and users". The different operators are given usage rights of spectrum through different licencing methods. In some instances, spectrum licensing and spectrum assignment are used interchangeably although the ITU gives the basic distinction between the two terms. The spectrum licensing is the authorisation or approval element within spectrum management; authorisation is given through a licence. "Authorisations can be used to identify the source of any transmissions

causing a problem and to take measures to eliminate it". Spectrum assignment on the other hand involves the engineering aspect of the process, the specific lot to be assigned power output etc., including coordination i.e. consultation with other users of the band", ITU-R SM.2093. Even though spectrum licensing is a subset of spectrum management but "their policies have an important distinction" with management policy concerned about long-term planning for all the technologies that might require spectrum and licensing policy being short-term procedure in assigning access rights to applicants, (Carp, Dunogué & Murakami, 2002, p2).

Spectrum management policies, regulations including its authorisations have always been defined using the traditional historic ways where the regulator used to dictate to the market. Technological development is taking place at such a fast pace that the spectrum management policies and regulations are lacking behind whereby the market is dictating to the policy-makers. "Regulatory policies are now being challenged by a convergent world, whereby new technologies blur the existing distinction between fixed/mobile/broadcast services", (Bondelind, Brito, & Tan, 2007, p1). Television and internet on the mobile handsets are proof of the real convergent world. "There is a need to define new spectrum management rules that accommodate [both] former and newer technologies…", (Bondelind, Brito, & Tan, 2007, p1), instead of using outdated regulations with latest technologies. "Regulations that are outdated or poorly designed to achieve policy goals can impose unnecessary costs", (Cordova-Novion, 2007, p2). This defeats the purpose of regulation in the first place as one of the objectives why regulation is critical is aimed at reducing costs.

2.5 Approaches to spectrum regulation

The traditional spectrum management methods created artificial spectrum scarcity resulting in exclusion of new entrants to competition which created monopolies and duopolies. The new bandwidth-hungry technologies and the opening up in the market with more operators coming into the market

cause the demand to exceed the supply calling for market-based assignment methods e.g. spectrum auctions, spectrum trading and spectrum leasing amongst others. “Fundamental to the efficiency of markets is scarcity. If resources are not scarce,…, then there is simply no need to have markets, which have costs to organize, administer and maintain” (Faulhaber & Faber, 2002, p8). Developing countries are faced with challenges of balancing the ‘two worlds’; embracing technology advancements whilst addressing socio-economic factors including the broadband divide hence the constant need to review and update the current policies and regulations, and introduce forward thinking models. “Flexible regulatory regimes and technologies that make spectrum use more accessible to start-ups and other small innovative operators offer significant potential to reduce lead times from innovation to market for communication products and lend a competitive edge to domestic producers in new product markets”, (Freyens, 2009, p6). “Promotion of competition should also be a principal consideration motivating the establishment of rules for assigning spectrum to individual users”, (Rosston & Steinberg, n.d., p5). This would explain why *ex-ante* regulation is still very critical in developing countries to prevent uncompetitive unwarranted behavioural patterns before they actually happen and to ensure a level playing field for all especially new smaller entrants. For meaningful competition to be enhanced and markets developed, regulators in developing countries need to play a crucial role by introducing market-based assignment and licensing models with an aim of fulfilling government’s objective of broadband connectivity for all. It is however crucial to note that market-based mechanisms alone may not address social interests.

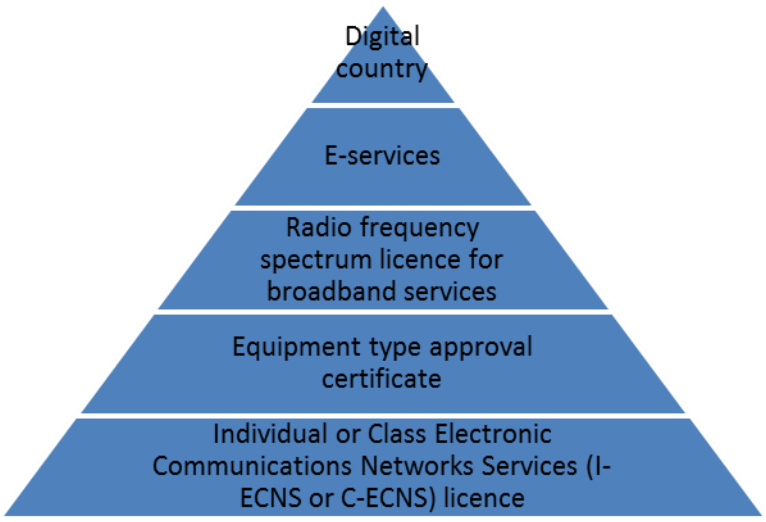
2.6 Convergence and vertical vs horizontal licensing structures in creating a digital country

Former technologies and licensing models required separation of services and licences. Service or network licences and spectrum licences were

specific to either fixed, mobile or broadcast services. The convergence mandates a flat licensing structure instead of vertical integrated licensing. “In terms of [service or network] licences, there are various types, including individual licences, system licences, class licences, general authorizations” (Miedema, 2011, p33). In South Africa since the promulgation of the EC Act, spectrum licences are only assigned and licenced if an operator is in possession of an individual, class licence or licence-exempt. The objective of the EC Act was to move away from service specific licences to more horizontally integrated, technology neutral licences introducing a more converged licencing regime. The converged regulator and converged licensing framework with the converged technologies facilitated the possibility to consider re-assigning spectrum previously used purely for broadcasting to wireless mobile broadband services i.e. the digital dividend or 800 MHz band. With broadband connectivity sitting at 7% (DoC, 2012) in South Africa, the 800 MHz band and others e.g. 450 MHz band, with wider geographic coverage provide key roles in fostering the digital country and therefore a digital economy where connectivity for all becomes a reality. The licensing of access spectrum facilitates the deployment of broadband networks. The challenges to be addressed are how to licence the limited available spectrum be it a digital dividend or any other whilst ensuring the introduction of competition through licensing new entrants and also addressing the broadband divide.

The researcher presents a hierarchy below showing different compliance levels for operators towards achieving the digital economy.

Figure 3: Steps contributing to digital country



Source: Researcher's own

The base layer is the access to network licence which gives rights to build a communications network and a service licence which gives rights to provide a service. Equipment that forms part of the network must conform to certain standards and therefore must have certification by reputable labs. The radio frequency spectrum has become the most contested and highly "congested" and the licensing methodology is therefore highly debated; that is the basis for this research study. Access to the right spectrum unlocks the possibility of broadband networks' and it is the availability of such spectrum that eventually builds a digital country. "IP-enabled services and applications delivered by broadband networks will propel the digital economy in the next decade", (Miedema, 2011, p89). The immediate licensing and release of the remaining access spectrum especially lower frequency bands e.g. the digital dividend will assist in making broadband connectivity for all a reality as the band is ideal for rural coverage due to its propagation characteristics. The delays are depriving the country from realising economic value from this spectrum. Policy and regulation must therefore evolve and not stifle technology development ensuring and 'promoting an open, fair and non-discriminatory' regulatory environment.

2.7 The historical spectrum assignment and licensing - command and control

It may seem as if many authors such as Buddhikot (2007) and Lehr (2005) share a view that the notion of 'spectrum scarcity' is artificial and is "made worse" by the old traditional spectrum management models, for example Buddhikot's (2007, p1) observation was that "spectrum scarcity was the by-product of antiquated spectrum management, even though a large part of prime spectrum was assigned, it remained highly underutilized". "Command and control provide[d] exclusive license rights, assigned in administrative fashion, with rigid rules about transmission standards (use, power, area, etc.) and regulatory constraints on equipment standards, frequency use and interference management", (Freyens, 2009, p20). Spectrum in South Africa was also assigned and licensed on a command and control basis and of course on a first come first served 'administrative' basis. This has resulted in governments deciding how much spectrum gets assigned to who and this also resulted in lucrative spectrum being assigned and licenced exclusively to those who first came into the market. This practice has continued until ICASA was faced with more spectrum applications than available spectrum especially in access bands e.g. the 2.6 and 3.5 GHz bands. The advancement of technology and the introduction of new services have placed a strain on bandwidth availability thus forcing ICASA to consider modern market-based spectrum licensing alternatives in order to address demand supply asymmetry, increase competition and broadband penetration.

2.8 Exclusivity vs licence exempt

According to Lehr (2005), the old traditional spectrum models stifle innovation; limit 'the choice of technology', "constrains [the] ability to redeploy the spectrum to higher value uses" which eventually "constrain the business models", (Lehr, 2005, p1). He states the traditional approaches created 'artificial scarcity of spectrum'. He advocates for spectrum management reform models that are market-based, the

introduction of ‘flexible licensing’ and unlicensed models though to a larger extent more for unlicensed model, (Lehr, 2005). In South Africa some frequency bands are licence-exempt’ or unlicensed though this does not refer to the high demand, high valued spectrum, which is what Lehr is advocating for. This was mainly an issue of conformity since South Africa falls under ITU region 1 and the ISM bands which are licence-exempt bands were already identified at an international level.

Banerjee et al (n.d) share the same views as (Lehr, 2005), they argue that “the ‘exclusive’ spectrum licensing approach is static and leads to under-utilisation. On the other hand, the commons or unlicensed spectrum *is believed* to encourage innovation leading to new technologies being introduced and efficient spectrum utilisation”. According to Banerjee et. al. (n.d), ‘spectrum occupancy rarely exceeded 25% in the US and the FCC eventually had to legalise secondary markets to take care of the under-utilisation. These secondary users sub-lease spectrum from the primary owners’. Peha (2007, p7) takes the debate further and suggests that “with either coexistence or cooperation, a “spectrum commons” could be created by a license-holder instead of the regulator”, he explains: Rather than using unlicensed spectrum, a private entity might obtain a license, establish its own operating rules, and allow devices to operate in its spectrum” but accepts that “such a band may never emerge without deliberate assistance from the regulator”. This is another approach which requires one entity to build the network and let others use their devices to either receive a service or provide a service, similar to what ICASA proposes with wholesale open access or other entities sublease spectrum building networks in areas where they are non-existent or limited. Either way this minimises infrastructure duplication or limitations whilst increasing competition or taking services where they are needed, e.g. broadband services. The OECD (2013, p6) concurs and asserts that “the use of an open access policy is often highlighted as a facilitator of objectives, such as promoting greater choice for consumers or addressing infrastructure bottlenecks, especially in the context of regulated access”. ‘Open access’

in this context refers to “access … provided at wholesale level”, access “provided on transparent and non-discriminatory terms”, (OECD, 2013, p5) which is how ICASA defined their ‘wholesale open access’ model.

2.9 Spectrum ownership rights

The economists and mobile operators are advocating for market-based spectrum licensing models as this protects the huge investments made in setting up the commercial mobile networks, e.g. Buddhikot (2007). This is so because even if spectrum is assigned through auctions, operators can still have exclusive access to a particular block of frequencies. Engineers on the other hand believe that moving from the traditional spectrum assignment and licensing models and increasing more bandwidth to unlicensed model encourages innovation forcing interoperability, e.g. Lehr (2005). Faulhaber & Faber (2002) are taking a different approach in addressing ‘artificial scarcity’ and the sharing models to be introduced. Their view is that “both economists and engineers got this all wrong and that the best way to deal with this spectrum scarcity is to introduce a legal regime through property rights for spectrum. They believe that this will support both markets and commons. The model being proposed is a “market-based ownership with non-interfering easement regime”, (Faulhaber & Faber, 2002, p19). In brief this is more like introducing secondary markets with protection just as proposed by Banerjee et al. (n.d) just like with Neotel in the South African case. The difference is just the issue of ownership. In South Africa, the second network operator Neotel was assigned and licenced using in the 800 MHz band which is traditionally a broadcasting band. WRC 2007 identified the 800 MHz band as one of the bands for IMT services to be available immediately after digital switch-over of broadcasters from analogue to digital technologies. The assignment was made on a secondary coordinated basis with the broadcasters and was possible because there was ‘underutilisation’ of some broadcasting channels which made it possible for Neotel to co-exist

with the broadcasters. Basically Neotel is using ‘broadcasting white spaces’ for their CDMA network.

Most regulators have always licensed spectrum to an operator giving rights to its use but not ownership. Faulhaber & Faber (2002) are suggesting a move from this regime and the regulators actually relinquishing spectrum ownership to licensees. “The full property rights approach differs by higher degree of flexibility with regard to technological standards and license use, and is assigned by auctions or similar competitive mechanisms rather than administrative rule”, (Freyens, 2009, p22). This might be all well and good for mature economies and industries but not for developing countries such as South Africa where social differences between the haves and have-nots still need to be addressed. Ownership of spectrum might still be better off left in the hands of the country so as to address the issues of competition and broadband digital divide no matter how the spectrum is assigned and licenced. It has been proven that even with obligations attached to the lucrative spectrum; it has been difficult for the regulator to enforce compliance on the operators. Operators would rather pay penalty fees than rollout networks in some rural areas hence the experiment with wholesale open access and managed spectrum parks even though it is not clear how they will be implemented.

2.10 Wholesale open access as a licensing model

“Through human history, demand increase caused by population growth, new technologies, and economic growth have led to adjustments in the governance regimes of many resources which were once available freely to the public into private properties”, (Bauer, Kwon & Wildman, 2006, p1). This resulted in exclusive assignments and licensing which in turn created ‘artificial spectrum scarcity’ as operators had indirect ownership of spectrum for a number of years denying access to others. The debate between exclusive spectrum assignments and spectrum commons or licence-exempt became relevant as the industry was opening the market

to more competition, licensing more new operators and access spectrum supply becoming reduced. In order to accommodate the supply shortage versus the demand, countries are experimenting with a concept of wholesale open access e.g. US with the licencing of its digital dividend, the 700 MHz band, (Goodman, 2009). Both the US and Australia have already experimented with the concept of wholesale open access but more on fixed last mile, (Lehr, Sirbu & Gillett, 2006) The key would be clear guidelines on the format of access, be it network sharing, how, or any other to ensure practical implementation. “There is little evidence to date of wholesale-only mobile operators enjoying commercial success. Infrastructure sharing agreements appear to be gaining importance and this may be the trend in many countries for the deployment of LTE networks”, (OECD, 2013, p12).

2.10.1 Introducing infrastructure or spectrum sharing or both

Mobile operators have realised in the recent years starting with the introduction of 3G networks, that building new networks or even upgrading their current networks is very expensive. This was mainly due to the expenses incurred for licence fees through spectrum auctions especially during the licensing of 3G spectrum, (Frisanco, Tafertshofer, Lurrin, & Ang, 2008). “One scheme for reducing capital requirements and operating costs is network sharing”, (Bauer, Westerveld & Maitland, 2001, p13). This statement was therefore more relevant to assist operators reduce costs for 3G infrastructure rollout, and still is relevant today if one considers the objective for introducing wholesale open access. “Infrastructure sharing agreements are playing an increasingly important role in mobile markets, more markedly in the context of the deployment of LTE technology. Wholesale-only models have emerged at different levels of the network and are usually based on purely commercial arrangements”, (OECD, 2013, p32). One of the policy objectives according to ICASA is to ensure “affordable, accessible and universal access to infrastructure for businesses, communities…”, (ICASA, 2011b), i.e. increasing competition

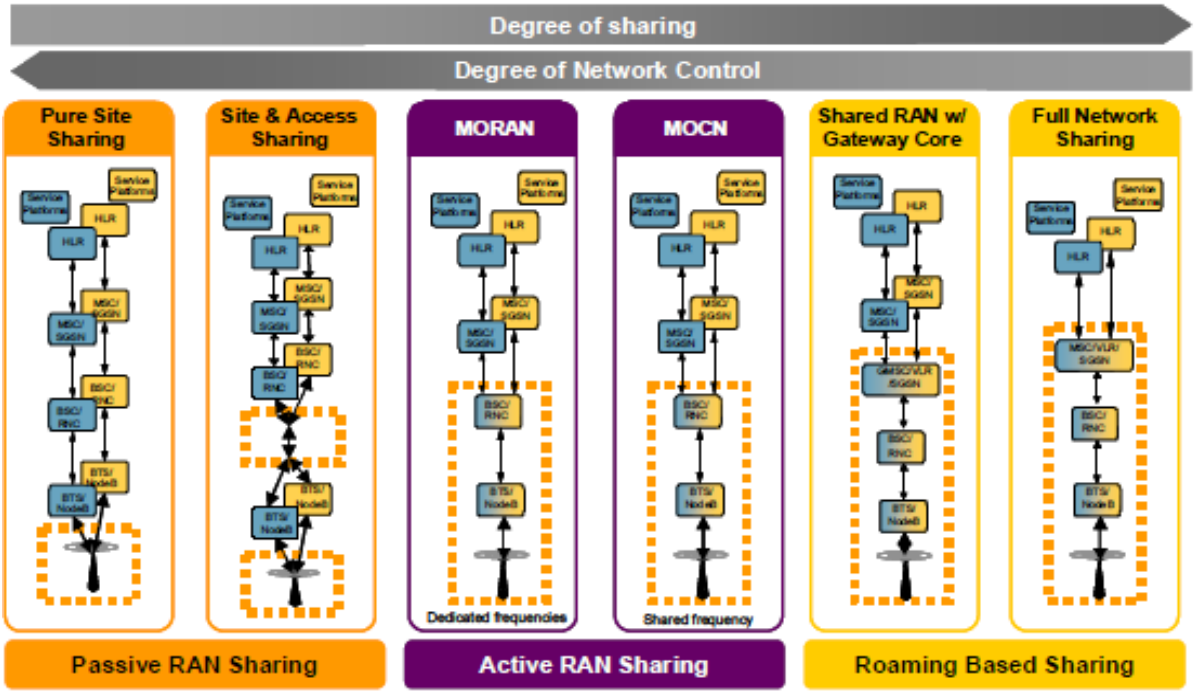
by licensing more operators within limited available spectrum which will assist in ensuring broadband for all especially rural connectivity.

> *Open access arrangements will [] play a major role in shaping the level of competition in next generation access (NGA) networks [broadband networks], …, regardless of historic challenges or interventions e.g. local loop unbundling, MVNO's or even lack of cable and fibre networks as it is unclear whether there will be sufficient infrastructure competition, especially outside very densely settled urban areas …* (OECD, 2013, p5).

Again in this scenario, open access' is used loosely to refer to 'access at wholesale level'.

Below are the different scenarios for infrastructure and spectrum sharing: Technicalities on the practical implementation is what ICASA will eventually have to clarify;

Figure 4: Different forms of infrastructure and spectrum sharing



Source: BIPT

Roemer, Zhang, Haardt, & Jorswieck (2010, p1) argue that “equal-priority resource sharing in wireless networks improves the spectral efficiency, enhances coverage, increases user satisfaction, leads to increased revenue for operators, and de-creases capital and operating expenditures”. They further assert that this kind of sharing and cooperation enhances efficiency which “improves the operators’ individual sum data rates” and also “it reduces the operators’ expenditure since the cost of deploying and maintaining the infrastructure as well as licensing the spectrum can be shared as well” (Roemer, Zhang, Haardt, & Jorswieck, 2010, p7). The statements above make an assumption that the benefits derived from the network sharing models outweigh the exclusive spectrum licencing models hence the investigation in this study.

2.11 Exploring Managed Spectrum Park

One other model which has not been fully explored is that of 'controlled open access' which Freyens (2009, p9) refers to as "privately-run commons or commons park". What this entails is "establishing joint spectrum property rights first, and let the co-owners manage spectrum access, interferences and usage rights among themselves", (Freyens, 2009, p7). This model combines the exclusive (exclusive to a group of operators) property rights and the licence-exempt or commons. This can also be through light licensing also. Given the lack of detail so far on the approach proposed by ICASA and analysing the definitions given for the proposed spectrum licensing models, the managed spectrum park model could be defined similarly to the 'commons park'. The "managed spectrum parks are intended to allow access to a number of users in a common band of spectrum on shared, and, as far as possible self-managed basis" (Ohanga, 2009, p2) hence the regulatory impact assessment/analysis (RIA) study to investigate whether the government strategic objectives of increasing competition and broadband for all will be achieved through these proposed spectrum licensing models.

2.12 Global Trends on wholesale open access and Managed Spectrum Parks

Wholesale open access as a concept has been introduced in a number of countries but mainly for fixed and fibre to the home (FTTH) services through the national broadband policies or strategies. These national broadband strategies are implemented differently in different countries. Some countries impose stiffer universal service obligations to those who gain access to the digital dividend whilst others bring government back to partner with private sector in building this wholesale open access network to ensure 100% population coverage. Government involvement is criticized by some who believe markets will eventually take care but acknowledged by some who view rolling out broadband services in deep

uneconomical rural areas as a government obligation. Justifying government involvement Given (2010) states that:

> *The global financial and economic crisis helped spread these policy impulses across the whole economy. By diminishing the private sector's capacity to invest, increasing the demands for governments to spend and undermining faith in the efficacy of free markets [] the crisis provided a rationale for 'nation-building' initiatives. Among them, broadband–'the most important economic infrastructure of the, 21st century'*, (Given, 2010, p543).

The majority of the developed countries introduced some form of open access through local loop unbundling but the introduction of 'wholesale open access' for mobile creates new markets altogether. Few countries (e.g. Australia, US, Germany (to learn of obligations for rural connectivity), some BRICS countries e.g. Brazil and Russia, Kenya as an African country and Korea only because of its broadband success story) who are either attempting to introduce or have some form of 'wholesale open access' introduced in licensing operators for broadband deployment will be analysed. Korea is not an example of wholesale open access but rather a successful 'broadband for all' case study. German is also included to understand how obligations in the licensing of the 800 MHz band were imposed to address rural connectivity. The wholesale open access concept will be explored whether it is applied to fixed or wireless services or both with a view of understanding the practical implementation.

2.12.1 Australia: PPP wholesale open access for 100% population coverage

Australia is a country which is also a continent and encompasses few surrounding islands and is situated in the Southern Hemisphere with New Zealand, Bangladesh and Indonesia amongst others as its neighbours. It has a Population of 22.68 million and is the world's sixth largest country by total area, (World Bank, 2012).

Australia is one of the highly developed and one of the wealthiest countries worldwide. It is one of the high income countries, (World Bank, 2012).

“In April 2009, the Australian Government announced that it would establish a company that will invest up to $43 billion Australian dollars over the next eight years to build and operate a wholesale-only, open access National Broadband Network [NBN]”, (Oliver, 2009, p4) to build and bring high-speed broadband within reach of all Australian premises. Government will be the majority shareholder and will ‘privatise the company once it is up and running. It is expected that the NBN will use mainly fibre, for the majority of the population, about 80 %, but will also use wireless and satellite to cover the remaining 20% of the population. “The product approach involves offering one product construct for fibre, wireless and satellite and one entry level speed across the technologies for the same wholesale price”, (NBNCo, 2013). The Australian government believes that the National Broadband Network has potential to provide economic and social benefits e.g. to health and education sectors, create employment and new business opportunities. According to OECD (2009, p4), broadband networks “serve as a communication and transaction platform for the entire economy and can improve productivity across all sectors. Advanced communication networks are a key component of innovative ecosystems and support economic growth”.

Service providers will seek access from the NBN provider and to qualify to be an ‘access seeker’, whereby a service provider must meet certain requirements and NBN is not allowed to discriminate against any access seeker as long as all requirements are met. The NBN company will make a thorough investigation of the actual product proposed by the access seeker and will test for interoperability of the proposed product with NBN from a technical, operational and organisational capability viewpoint so as to ensure that the service provider will successfully ‘interoperate’. The fixed or fibre wholesale open access model is more of a local loop

unbundling and the wireless portion is a bit complex as it requires that the service provider seeks other parts of the network from other third parties to complete the network, (NBNCo, 2013). The NBN company is given full control on the entire network with the regulator getting involved when there are disputes that cannot be resolved by the affected parties. The incumbent operator in Australia, Telstra was 'threatened' to structurally separate or will be prevented from accessing additional spectrum for advanced wireless broadband if it remained vertically integrated, (Oliver, 2012, p15). This forced Telstra to enter into agreements "to make its infrastructure, including pits, ducts and backhaul fibre, available to NBN Co, and to migrate its fixed line customers progressively from its own copper and HFC networks to NBN Co's wholesale fibre network", (Given, 2010, p545). The NBN Company however builds the whole network infrastructure without providing retail services to any end users which gives the model the same flavour as proposed by ICASA, however, more on the fixed (fibre) side. One of the major concerns though is the financial viability of this arrangement and whether there will be enough rate of return for the private operators and also that it would change the business model of the incumbents in the South African environment.

2.12.2 US: 'Open access' for digital dividend licensing

The United States is a federal republic consisting of 50 states and is the World Bank's largest shareholder. It has a population size of 319.9 million people with the GDP of $16.24 trillion, (World Bank, 2012). Open access explained in this instance and from the direct quotes refers to 'access at wholesale level'.

The US is among the first countries to introduce open access model in one form or the other and mainly in fixed services be it copper or cable networks. "In the United States, open access policies and, specifically, local loop unbundling played a major role in telecommunication policy debates in the 1990s and 2000s", (OECD, 2013, p13). "…Telephone companies have [long] provided open access to competing ISPs and

content providers because they are subject to common-carrier regulation of their services, including broadband services", (Crandall, 2003, p29). In those countries that have cable networks e.g. US, these networks are being upgraded to be able to accommodate broadband services but "unlike copper networks, open access regulation of broadband services provided over cable is relatively rare in OECD countries and, if it exists, it is implemented at a higher layer of the network" (OECD, 2013, p9), open access in this case referring to local loop unbundling even though not on a mandatory basis. This apparently is attributable to complex challenges at the access layers.

Even though the US has always been amongst the leading countries in ICT connectivity but it left the issue of broadband connectivity or broadband for all to the market which unfortunately resulted in the country lagging behind with low broadband speed and high costs. It was only in 2010 that government passed a national broadband strategy which amongst others was to assist in job creation…. One of the aims of the United States National Broadband Plan (2010) is to facilitate and expedite the development and use of high-speed broadband infrastructure by using broadband to create jobs and advance economic growth, (Falch & Henten, 2010). The objective of the US government is that "by 2020, at least 100 million U.S. homes should have affordable access to actual download speeds of at least 100 Mbps and actual upload speeds of at least 50 Mbps", (Kruger, 2013, p2).

In 2007, the US took a chance at licensing the 700 MHz band (the digital dividend) which was referred to as one of the most important auctions of the century, (Goodman, 2009). In licensing the digital dividend, the US imposed conditions that those who get the licences must abide by the "open platform conditions", which meant that network operators must allow consumers to use any devices and applications as long as they did not cause harm to the network, (Freyens, 2009 & Goodman, 2009). The 'open platform conditions' were supported by the new entrants as they promoted

innovation and competition whereas the incumbents objected citing that "the FCC [US regulator] [would find itself] in continual oversight of a competitive industry and would deter investment in wireless broadband. Furthermore, they argued that open platform conditions would depress auction revenue", (Goodman, 2009, p349). The FCC later changed the conditions and added a clause that allows it to re-auction the spectrum and remove the open platform conditions should the reserve price not be met. The regulator went ahead and licensed one block of the 700 MHz spectrum with 'open platform conditions' to much criticism from the 'Congress members', (Goodman, 2009). The open access platform is proving to be complex even for countries like the US whether this is due to competition issues or technical issues remains to be seen.

2.12.3 GERMANY: Obligations imposed on 800 MHz licences

Germany is a federal republic in western-central Europe and has the largest population of any EU country, (EU, 2014). It has a population of 81.89 million, (World Bank, 2012) and a GDP of $3.428 trillion, (EU, 2014). Germany is the World Bank's third largest shareholder and the world's third largest economy (World Bank, 2012 & EU, 2014).

Germany like many other countries launched its National Broadband Strategy in 2009 with objectives to expand coverage to the broader population, to increase speeds in those areas that have access to some basic broadband technology with the hope of generate thousands of jobs. In actual fact one of the stated objectives is to provide

> *75 per cent of German households with access to a broadband connection of at least 50Mbps by 2014. The second scenario (labelled "ultra-broadband" and covering 2015-2020) defines the investment required to provide to 50 per cent of households with at least 100 Mbps, and another 30 per cent with 50 Mbps by 2020* (ITU, 2012, p23).

The strategy combines a mix of technologies to ensure wider coverage and high speed connectivity. In addressing areas that can only be covered by wireless technologies, Germany auctioned and licensed spectrum in the 800 MHz band. These licenses were issued with rural coverage broadband obligations, referred to in this document as the 'German model'. The German model states that "the winners of the spectrum [the 800 MHz spectrum] were required to build-out their networks in listed communities in four stages in areas with no or very low broadband coverage, before deploying in more populated area", (GSMA, 2011, p3) these were divided into different priorities with the less densely populated given the first priority. *The four stages are:*

- *smaller towns and districts with 5000 or fewer inhabitants (priority stage 1)*
- *towns and districts with between 5000 and 20000 inhabitants (priority stage 2)*
- *towns and districts with between 20000 and 50000 inhabitants (priority stage 3)*
- *towns and districts with more than 50000 inhabitants (priority stage 4)*. (GSMA, 2011, p3).

The condition was that 90% of the population in those areas must be covered first before moving to the next second priority stage. The operators were also allowed to share infrastructure and lease spectrum.

2.12.4 BRICS countries

BRICS is a group of emerging economies representing Brazil, Russia, India, China and South Africa. Before the inclusion of South Africa in 2010, this group was referred to as BRIC, (Kelly & Rossotto, 2012). The BRICS members are all developing and newly industrialised countries and are all G20 members, (World Bank, 2012). A brief look at the broadband strategies of Brazil and Russia where the concept of open access is mainly introduced will be carried out with the exception of South Africa

which is the country being studied. China and India will also not be included.

Brazil: Infrastructure sharing as a form of open access

Brazil is the fifth most populated and fifth largest country in the world, with a population of 198.66 million people, (World Bank, 2012). Brazil is classified as an emerging economy but is ranked among the top ten countries worldwide when ranked by total number of broadband users, (Jensen, 2011, Kelly & Rossotto, 2012). “At the end of 2010 Brazil was in 9th position, with about 15m fixed broadband subscribers, as well as 20m mobile broadband (3G) subscribers”, (Jensen, 2011, p7). In fact Brazil is the World’s 7th wealthiest economy, (World Bank, 2012). Brazil has some similarities to South Africa that have been identified e.g. a bigger percentage of population staying in rural areas and a huge disparity between poor and rich communities including a growing middle class. It launched one of the largest projects to triple broadband penetration by 2014 to include mainly low-income households that are either poorly served or under-served, (Jensen, 2011). The kind of open access introduced in Brazil was that of MVNO’s with an aim of improving broadband access in 2008. The official national broadband strategy was however launched in 2010, (Roetter, 2013). The commitment made through the national broadband strategy is that “by [2014, Brazil must] “have 30 million fixed broadband connections, including homes, businesses and co-operatives, plus 100,000 telecasters”, (Roetter, 2013, p31). In Brazil, broadband was found to add up to 1.4 percent to the employment growth rate (Kelly & Rossotto, 2012).

The high demand bands have been licensed to different operators with the 1.9/2.1 GHz band auctioned with mandatory infrastructure sharing with smaller operators as a form of open access model. As evident in the explanation here, open access is used loosely but refers to ‘access at wholesale level’. The SMP operators are compelled to charge the smaller operators lower wholesale prices, (Jensen, 2011). Also “a form of local

loop unbundling is also being considered that would allow any provider to sell services on the last mile if the operator that installed it is not providing services", (Jensen, 2011, p23). This makes for open access at the wholesale level so that competition is only at the retail level.

Russia: Consortium to build wholesale open access network

Russia is a country in northern Eurasia. It is the largest country in the world covering more than one-eighth of the Earth's inhabited land area. It is also the world's ninth most populous nation with 143.5 million people with a GDP of $2.015 trillion, (World Bank, 2012).

In Russia, the Broadband strategy was launched in 2010. The commitment is that "by 2010, [there should be] 15 lines per 100 population; by 2015, to have 35 lines per 100 population", (Roetter, 2013, p31). The way wholesale open access was introduced is that, a mobile operator (Yota) in 2010 "reached an agreement … with four mobile operators in the country, to roll out one single wholesale LTE network that will be utilised by the four operators on a wholesale basis", (OECD, 2013, p32). The challenge with this approach is that these mobile operators had already started making plans of their own e.g. trial of LTE throughout the country, (Northfield, 2011). The issue to consider is the impact of this new arrangement even though the LTE network will be accessed by these mobile operators, the reality is that it changes the business model. One of the issues indicated is "an arrangement for the separation of network ownership and service provision,... to avoid the cost of duplication of infrastructure investment and provide users with faster mobile access at lower prices", (OECD, 2013, p32). There is also an option for these operators to have 20% future stake in Yota, (OECD, 2013). This is another form of wholesale open access highlighted focusing on infrastructure sharing.

2.12.5 Kenya

Within the African continent, the broadband strategy of Kenya will be looked into. Kenya has a population of about 44 million, (World Bank, 2012). The economy of Kenya is the largest by GDP in East and Central Africa.

The government of Kenya launched a broadband strategy, 'a draft national broadband strategy for Kenya' in 2013 with the aim of "transform[ing] Kenya to a knowledge-based society driven by a high capacity nationwide broadband network", and also in order to assist in achieving Kenya's Vision 2030, (Kenya, 2013). Vision 2030 seeks to "provide Kenyan citizens with a lifestyle that is equivalent to the experience that a newly industrialized country provides. The overall objective of [the] strategy is to provide quality broadband services to all citizens", (Kenya, 2013, p3). This sounds like a common theme to most broadband strategies worldwide including South Africa. The difference and the challenge is in the implementation details.

The wireline and mobile broadband penetration rate was estimated at two subscriptions per 100 people in 2010, "90% of Kenyans do not have access to broadband" meaning Kenya like all the developing countries "still has significant progress to make with respect to broadband uptake", (Kenya, 2013). A number of initiatives have been launched to address issues of literacy, education, content and others as a way of increasing the uptake. Kenyan connections to three undersea cables has resulted in an 80 percent decrease in wholesale bandwidth costs", (Kelly & Rosotto, 2012, p323). "The Kenyan government, for example, has supported open access to backbone infrastructure in various ways. It encouraged operators to participate in the TEAMS undersea cable and has also pursued public-private partnerships for national backbone construction", (Kelly & Rosotto, 2012, p314).

The Kenyan government again like many other administrations has [also] proposed a private public initiative to form a consortium that will roll out a wireless network in the context of a single national open access LTE network, with open access referring to 'wholesale access'. The network will be funded and used by a single "consortium". The incumbent operators in Kenya will form part of the consortium. "The ownership structure is based on a public and private partnership (PPP) where the government and telecommunication operators will own stakes equivalent to the capital they will invest in this joint venture" (OECD, 2013, p32). This approach is similar to the Russian proposal mentioned above of one single wholesale LTE network.

2.12.6 Korea

Korea makes an interesting case study even though there is no real lesson on open access to be learned. However the objectives for the wholesale open access and managed spectrum park's models is to promote broadband connectivity for all and Korea achieved 97% percent coverage across the peninsula and a subscriber base of 47 million as of June 2009 for mobile broadband and also more than 90% penetration for fixed broadband and aiming to have 100 % coverage by 2015, (Kim, Kelly & Raja, 2010). Looking at the broadband penetration figures, South Africa could learn positive lessons from the Korean story hence the interest.

Just a quick peek at Korea, Korea is divided into two distinct states, North and South Korea but the focus of the case study will be on South Korea with an estimated population of 50 million residents. It is Asia's fourth largest economy and the world's 15th largest economy, (World Bank, 2012).

Korea has been successful in rolling out broadband networks despite the absence of mandatory local loop unbundling (LLU), "LLU has played a negligible role in broadband development", (Ovum, 2009, p102). It mandated open access through the broadband project and targeting newly

built apartments. The Korean Government played a proactive role in terms of ensuring rollout and penetration of broadband services to the broader geography and population, (Ovum, (2009), Kushida & Oh, (2006)). The advantage for Korea is that it has densely populated residential areas. About 58.6% Koreans stay in apartment buildings making it easier to rollout fibre networks to the buildings but the Korean government had to come up with a strategy for different operators to have access, share infrastructure and bring about choice for consumers, (OECD, 2013). Korea [has] "promoted open access to the inside wiring of apartment buildings, or other connection points for high-rise buildings, that facilitate infrastructure competition", (OECD, 2013, p12). The "in-house wiring belongs to the house owners and is therefore not included in the wholesale market definition", (OECD, 2013, p17). Korea [] also adopted a comprehensive broadband strategy focused on providing operators with financial incentives to invest in their networks", (Kim, Kelly & Raja, 2010, p103).

On the wireless spectrum side, "The Republic of Korea plans to re-allocate spectrum in the 800 MHz and 900 MHz bands with preference given to new operators and latecomers to the market", (Qiang, 2010, p7). Korea is one of the countries that has a "mobile broadband penetration in excess of 100 connections per capita", (ITU, 2013).

The Government's stance in being proactive through enabling policies, awareness campaigns and funding models has assisted in putting the country amongst the leading countries in broadband. The ITU (2013) asserts that "Korea ranks in the top five countries for both fixed and mobile broadband penetration…, and has the highest household penetration in the world" and developing countries could learn valuable lessons on the approach adopted by Korea.

2.13 Using RIA as an investigative approach

"RIA is a process of systematically identifying and assessing the expected effects of regulatory proposals, using a consistent analytical method, such

as benefit/cost analysis" (OECD, 2008, p3). Kirkpatrick and Parker (2004, p2) define RIA as "a term used to describe the process of systematically assessing the benefits and costs of a new regulation or an existing regulation, with the aim of improving the quality of regulatory policy". The process of RIA is assessed in terms of 'good governance principles' and these comprise, "consistency in decision making to avoid uncertainty, accountability for regulatory actions and outcomes, and transparency in decision making to avoid arbitrariness and promote accountability", (Kirkpatrick and Parker, 2003, p3). This is what was not done when proposing the new spectrum licensing models. RIA is introduced in a number of countries to regulate better and to improve on decision-making. "An impact assessment needs to encompass many factors, social, economic and environmental", (Sutherland, 2010, p22). Ladergaard (2005, p2) concurs and describes RIA as "a tool used in most developed countries to improve the understanding of impacts of regulation, be it economic, social or environmental". For government choosing to undertake a RIA study, it is important to understand who will be affected and the depth of the impact. "The preparation of an impact assessment requires a detailed understanding of the economics of specific markets in order to see how the different players will be affected and to measure the overall effects", (Sutherland, 2010, p22). A number of authors e.g. Kirkpatrick & Parker, (2004) agree that the challenges in introducing RIA in developing countries is the lack of understanding what RIA is, limited or no training on RIA and many more others.

The South African government has produced a document on 'guidelines for the implementation of the regulatory impact analysis/assessment (RIA) process in South Africa', (RSA, 2012). In the South African communications industry the process of regulatory impact assessment has unfortunately not really been implemented. The government and regulatory objectives for introducing RIA are to improve governance and to use 'evidence based' policy decisions. "The underlying rationale for RIA is that regulations need to be assessed on a case-by-case basis to see

whether they contribute to strategic policy goals" (Kirkpatrick & Parker, 2004, p3). According to Rodrigo (2005), there is no correct model for RIA, the approach differs from country to country dependent on political, economic and social standing and status. The bottom line is to assess *ex-ante* the impact and level to which the proposed regulation affects the country, its economy and its people. Radaelli (2003) identifies 'benchmarking' and 'lesson drawing' as the two RIA methods. The OECD includes expert, consensus, political, empirical and benchmarking as the different RIA methods. The cost/ benefit analysis, multi-criteria analysis or even simple checklists can then be used to compare the different RIA methods.

The following are some of the questions on the checklist to be answered when conducting RIA:

1. *Is the problem correctly defined?*

2. Is government action justified?

3. Is regulation the best form of government action?

4. Is there a legal basis for regulation?

5. What is the appropriate level (or levels) of government for this action?

6. Do the benefits of regulation justify the costs?

7. Is the distribution of effects across society transparent?

8. Is the regulation clear, consistent, comprehensible and accessible to users?

9. Have all interested parties had the opportunity to present their views?

10. How will compliance be achieved? Source: OECD (1995).

The decision whether to regulate or not arises:

When the benefit to be derived from the regulation cannot justify the cost for the government action and yet the problem will still not be addressed effectively. (OECD, 2008). RIA will assist in arriving at a decision on whether to take action or not in addressing a particular goal. In this instance it will investigate whether or not the intentions and actions by ICASA are justified.

What governments have been struggling to do is to evaluate the usefulness and effectiveness of the regulations being introduced hence RIA was adopted in many developed countries and slowly making in-roads in developing countries. “RIA usually involves the use of economic analysis – in particular cost-benefit analysis or cost-effectiveness analysis – to examine the impact of government regulations”, (Goggin & Lauder, 2008, p15). The challenge would be to turn the results into monetary terms. Quantification of costs and benefits may prove difficult in some cases and that a qualitative measure may prove valuable”, (Hahn, Burnett, Chan, Mader, & Moyle, 2000, p10).

Governments and the regulators have always had a key responsibility from a policy and a regulatory point of view to ensure that frequency spectrum as a scarce resource is used effectively and efficiently. In a country like South Africa spectrum is also a tool that could help government to reduce communication costs by increasing competition and to bridge the digital broadband divide. RIA will investigate if the proposed models achieve the government’s strategic goal of increasing competition and bridging the digital broadband divide. To the communications industry, frequency spectrum is one of the most valued business assets. Government introduced competition in the South African communications industry but has struggled to enforce the licence obligations on those operators to bring broadband to all citizens. Cave (2002, p221) suggests that “regulators should be interested in inserting competition in infrastructure as deeply as possible in the spectrum value-chain in order to sharpen commercial rivalries and promote service differentiation”.

Wholesale open access and managed spectrum parks could be but one of the models of introducing such competition.

2.14 Conceptual framework for spectrum regulation

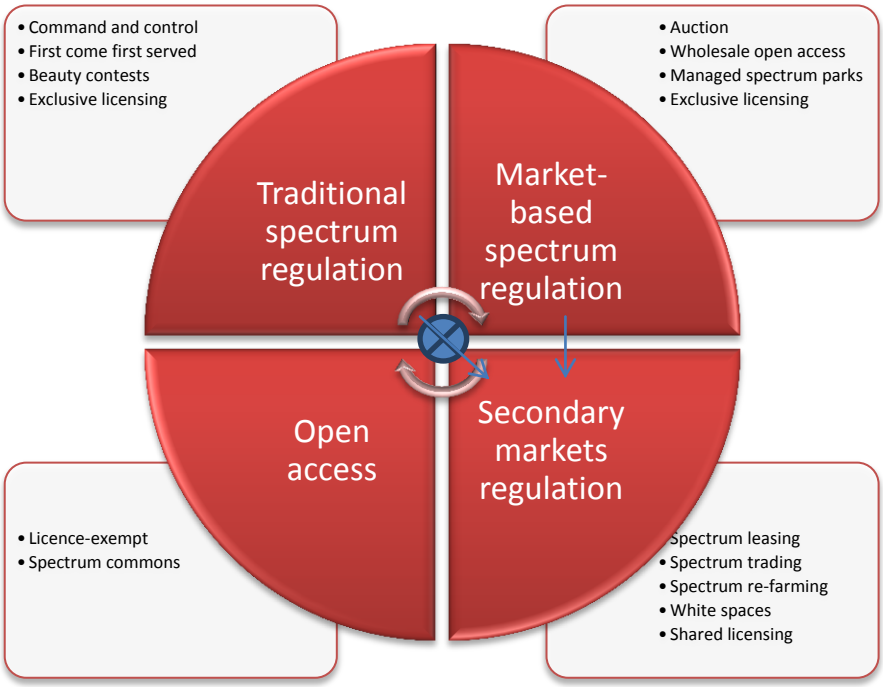
The conceptual framework includes two major perspectives, namely approaches to spectrum regulation and the utilisation of regulatory impact assessment ex-ante.

According to Cave (2002, p5) spectrum is “a finite but non-exhaustive resource which is a vital input into an ever widening range of services”, and is always referred to as a scarce resource. Spectrum licensing is a component of spectrum management process and is a highly regulated subject. First-come first-served and beauty contest licensing approaches are some of the traditional command and control exclusive assignment methods; whereas auction and lotteries are some of the market-based assignment methods. Increasing demand for spectrum to operate mobile and broadband networks required spectrum administrators to introduce alternatives to accommodate the limited supply by introducing secondary markets, for example spectrum leasing, trading and re-farming as reassignment methods. Licence-exempt, open-access or spectrum commons approaches require no licensing as the names suggest, but are open for all users to access as long as certain regulatory limitations are observed. These are the few critical spectrum policy and regulatory concepts that the study utilises to investigate the research problem.

The regulatory impact analysis/assessment (RIA) methodology is an important underlying process to inform good regulatory practice, including understanding the comparative benefits of various spectrum regulation models and is used to investigate the wholesale open access and managed spectrum park models proposed by ICASA. Different spectrum regulation approaches have yielded different results with the traditional approach creating ‘artificial scarcity’ and ‘hoarding’, leading to the creation of secondary markets. Demand-supply asymmetry requires regulators to

introduce flexible market-based spectrum regulatory mechanisms, such as wholesale open access and managed spectrum parks, and other mechanisms.

Figure 5: Generic overview for spectrum regulation



Source: Researcher's own

2.14.1 Traditional spectrum regulation

From the literature discussed in this chapter, the traditional spectrum regulation methods favoured government owned entities and operators that came into the market first which at the time was just a handful hence they ended up with more spectrum which was either underutilised or used inefficiently. Analysing the progress with and the impact of the traditional spectrum regulation methods on the South African market, in particular the exclusivity that was given to operators for high demand spectrum, may assist with understanding ICASA's basis and the objectives for introducing the 2011 spectrum licensing models. The aim is to understand the advantages and disadvantages of the models proposed by ICASA, given the artificial spectrum scarcity and hoarding created by the traditional spectrum regulation models.

2.14.2 Market-based spectrum regulation approaches

From the theory discussed in this chapter, it is evident that traditional spectrum regulation methods with exclusive licensing failed to connect rural areas, hence the introduction of market based spectrum regulation mechanisms. The study investigates the extent to which the particular market-based spectrum regulation models proposed, namely wholesale open access and managed spectrum park, have the potential to address the issues of broadband connectivity, competition and the introduction of new markets. Market-based spectrum regulation mechanisms are preferred as assignment methods for high demand spectrum as they are viewed as objective and transparent. Introducing these new concepts in South Africa, it is critical to consider the readiness of the South African market, hence RIA is employed to analyse the perceived benefit versus the perceived cost.

2.14.3 Secondary markets for spectrum utilisation

The concept of secondary markets emerged from research and the contemplation of traditional spectrum management models and the introduction of market-based models. Secondary markets are a by-product of both traditional and market-based spectrum management mechanisms. The investigation into possible secondary markets for spectrum in South Africa arises as a result of hoarding created by traditional spectrum management methods and the realisation that supply cannot meet the demand for extensive high-speed bandwidth network infrastructure. This aspect of the investigation has the potential to assist in determining whether and how secondary markets may develop under the proposed models to address the demand-supply asymmetry, and to balance technology progress and competition. The issues investigated for broad stakeholder consideration include co-existence and co-operation amongst the licensees to allow for easy implementation of the proposed models. The terms for spectrum sharing are negotiated either amongst the

licensees or with the regulator, hence the study explores where the proposed models saw this responsibility residing.

2.14.4 Open access spectrum

For the sake of clarity in this report, open access and spectrum commons have the same meaning as licence-exempt, unless otherwise specified. These approaches are believed to encourage innovation, spectrum sharing and to address the issue of 'artificial spectrum scarcity'. The study investigates how the proposed models relate to these concepts (open access, spectrum commons or licence-exempt) and any similar elements, in order to expand the understanding of these models. The obvious advantage of open access approach is that no operator has priority over others, and operators must learn to co-exist. The study examines the managed spectrum park approach to see if there are any elements within the definition, which could address those sentiments advocated for by open access and spectrum commons.

2.15. Conclusion

At the beginning of the chapter, it was highlighted that spectrum regulation concepts e.g. exclusive licensing, license-exempt and open access will be investigated to gain better understanding of the proposed wholesale open access and managed spectrum park models. The investigation focused mainly on the approaches that have been employed in South Africa and in particular on ICASA's proposed licensing models. The regulatory impact assessment is highlighted as a methodological approach to carry out the study. The following chapter explains the basic principles of RIA that are considered for the study.

CHAPTER 3 - Research Methodology and Design

The research approach will be discussed in this chapter together with the design and data collection.

3.1. Introducing the qualitative RIA

Research is about asking questions and finding answers to those questions. Goddard & Melville (2001, p1) define research as “a process of expanding the boundaries of our ignorance” and “not just a process of gathering information”. Once a problem is identified and questions are known, the researcher decides on the research methodology as a quest to finding out those answers.

“Research methodology is what makes social science scientific”, (Neuman, 1997, p79). This section describes the methodology to be followed in conducting the research. It identifies the research approach, the research design, the sampling methodology and data analysis. Limitations of the research will also be highlighted.

3.2. Research approach: Qualitative regulatory impact assessment

The approach to be undertaken for this study is qualitative research instead of quantitative methodology. The reason for qualitative is that the researcher’s “primary interest is in understanding a phenomenon”, (Merriam, 2002, p4), in this instance the advantages and disadvantages of ICASA’s 2011 spectrum licensing models i.e. wholesale open access and managed spectrum parks. Merriam (2002, p5) further explains that qualitative research is undertaken “because there is a lack of theory or an existing theory fails to adequately explain a phenomenon” as is the case with wholesale open access and managed spectrum park in a South African context. Investigation of phenomena in qualitative research takes place in their natural settings (Ritchie & Lewis, 2003, p34) hence the interactions with interviewees will be conducted in their natural settings i.e. where people work or any other familiar environment and the interpretation

of the collected data will be done mainly in words as it might be difficult to quantify the responses. Qualitative research is about making sense and interpreting other peoples' worlds or seeing things from their perspectives i.e. putting yourself in their shoes. Hennink, Hutter & Bailey, (2011, p9) assert that "one of the main distinctive features of qualitative research is that the approach allows you to identify issues from the perspective view of your study participants, and understand the meaning and interpretations that they give to behaviour, events or objects". Merriam (2002, p15) observes that "in qualitative research, it is the rich thick descriptions, the words (not numbers) that persuade the reader of the trustworthiness of the findings". This subjective nature of qualitative research requires "the researcher [to be an] instrument for data collection", which allows them to get close enough to social subjects to be able to discover, interpret and understand participants' perspectives of social reality", (Shaw, 1999, p6). In comparison with quantitative approach, the general process for quantitative is to test theory, it is meant to study statistical and numeric environments and therefore it is measurable, (Anderson, 2006). According to Creswell (2003, p18), in a qualitative research, "the researcher collects open-ended, emerging data with the primary intent of developing themes from the data". Anderson (2006) further notes that "… qualitative research generates rich, detailed and valid data that contribute to in-depth understanding of the context whereas quantitative research generates reliable population based and generalizable data and is well suited to establishing cause-and-effect relationships", (Anderson, 2006, p3).. Marshall (1996, p1) agrees that "the aim of the quantitative approach is to test pre-determined hypotheses and produce generalizable results and such studies are useful for answering more mechanistic 'what?' questions". Compared to qualitative studies which he states "aim to provide illumination and understanding of complex psychosocial issues and are most useful for answering humanistic 'why?' and 'how?' questions", (Marshall, 1996, p1). In further exploring on the approach, one looks at Creswell's definitions and descriptions of qualitative versus

quantitative methods. He gives the following definitions for better understanding of the differences between qualitative and quantitative research designs and environments in which they are employed: “A qualitative approach is one in which the inquirer often makes knowledge claims based primarily on constructivist perspectives…. It also uses strategies of inquiry such as narratives, phenomenologies, ethnographies, grounded theory studies, or case studies”, (Creswell, 2003, p18). On the other hand he defines quantitative approach as “one in which the investigator primarily uses post-positivist claims for developing knowledge…, [observing that] it employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data”, (Creswell, 2003, p18). The study being conducted does not look into experiments or predetermined hypotheses and theorems, it aims to investigate and understand views from the different industry participants hence the conclusion to follow a qualitative approach.

Patton quoted in Merriam (2002, p4) refers to qualitative research as “an effort to understand situations in their uniqueness as part of a particular context and the interactions there”. The decision therefore to do qualitative or quantitative depends on a number of factors e.g. the kind of study, the environment or industry and the availability of enabling resources. Marshall (1996) suggests that a decision to undertake qualitative or quantitative should be based on the research question and not as a preference to the researcher. With all the different explanations and definitions from the different authors and taking those factors into consideration, quantitative research is therefore neither practical nor relevant for the study being undertaken as there is no numerical data to be explored, no experiments are to be considered and only a small pre-defined group is targeted.

3.2.1 Describing RIA in line with the qualitative study conducted

The study looks into the advantages and disadvantages of ICASA's 2011 proposed spectrum licensing models and therefore interviews will be conducted with key players to understand their views. Babbie and Mouton (2004, 270) suggests that "the use of the term "qualitative" refers to a collection of methods and techniques which share a certain set of principles and logic", e.g. case studies, ethnographic studies. "The primary aim of such an approach is in-depth descriptions and understandings of actions and events", (Babbie and Mouton, 2004, p270). The concerns and complexities anticipated due to the introduction of these alternative spectrum licensing models will be explored. "Qualitative approaches focus on phenomena that occur in natural settings and involve studying those phenomena in all their complexity", (Leedy and Ormrod, 2005, p133). The approach will follow a regulatory impact assessment (RIA) process. The benefit of following a RIA process is that it "exposes the merits of decisions and the impacts of actions" and for that reason it "is closely linked to processes of public consultation" (Rodrigo, 2005, p7). The interviews that will be conducted are part of the public consultation; the difference being that the questions will only be shared with a chosen target group not with the general public. As part of data collection and stakeholder consultation, a set of questions will be prepared and circulated to a targeted group of operators, organisations and identified individuals. "Consultation with stakeholder groups is one of the most cost-effective ways of obtaining data to support RIA", (OECD, 2008, p19). Responses (through the submitted documents) received from ICASA's public consultation process will also be critically assessed and analysed. As part of the benefit-cost analysis, the stakeholders will be requested to voice their views on alternative spectrum licensing models that are more appropriate for South Africa taking into consideration government objectives and the level of broadband connectivity, amount of available bandwidth versus the demand and the cost of communication in South Africa. According to the OECD (2008, p3), "RIA is a comparative process",

it is about looking at all alternative regulations that could be implemented to achieve the same regulatory objectives, using the same analysis (e.g. benefit/cost analysis) for all and then making an informed decision whether to regulate or not. RIA will therefore assist the decision-maker on an appropriate action as sometimes “you may find that another type of policy tool is likely to achieve the objective more effectively or efficiently”, (OECD, 2008, p5) than the proposed approach. For this research, a benefit-cost analysis process will be done considering the proposed spectrum licensing models versus other alternative models including exclusive licensing, ownership rights etc., because even if it becomes challenging to convert the regulatory impacts into monetary terms, “the benefit-cost approach [still] provides a constructive means for decision-making” (Viscusi, 1997, p182) and a qualitative analysis will be used on the final results. As Merriam (2002, p5) concurs, the product of qualitative is richly descriptive”. Jacobs (2006, 34) further insists that “the economics thrust of RIA has always favored benefit-cost analysis (BCA) as the most inclusive and socially responsible method of public decision-making”. A number of authors emphasize that RIA is about asking the right questions and in that case the sequence of questions is not really important. This fits in well with the nature of the study as the researcher should give operators enough liberty and not be confined by the questions. This assists as the operators might actually come up with more questions to consider as part of the investigation.

3.3. Research Design and data collection

Babbie and Mouton (2004) use an analogy of building a house in explaining research design, and that it is an ‘architectural design or a plan’ to be followed when conducting the research. An Exploratory (Empirical) type of RIA will be used with document analysis and semi-structured interviews for collecting data. This is more like doing an investigation to get an understanding and finding answers. The process of “document analysis is a systematic procedure for reviewing or evaluating documents -

both printed and electronic (computer-based and Internet-transmitted) material", (Bowen, 2009, p27). The analysis of the documents is already done in document analysis and "the analytical procedure entails, finding, selecting, appraising (making sense of), and synthesising data contained in documents", (Bowen 2009, p28). Whereas in semi-structured interview "specific information is desired from all participants, this forms the highly structured part of the interview. The largest part of the interview is guided by a list of questions or issues to be explored, neither the exact wording nor order is determined ahead of time", (Merriam, 2002, p13). A combination of document analysis and semi-structured interviews will assist as "multiple methods enhance the validity of findings", (Merriam, 2002, p12) and some of the relevant smaller players may not be easily accessible for face to face interviews. Data collection in research means taking the design or plan of how to do it and putting it into action.

3.3.1. Checklist as the RIA process to be followed

A RIA approach will be used in all the different steps of the research study. "The usefulness of a RIA depends on the quality of the data used to evaluate the impact of a proposed or existing regulation", (Rodrigo, 2005, p18).

The basic checklist questions (see under RIA) will be added to the interview questions in order to assess *ex-ante* whether the proposed models will achieve government's strategic goals. Basically the checklist will be used as a type of RIA process chosen for the study as the questions touch on all the critical elements of RIA, e.g. cost-benefit and alternatives. All the questions on the checklist will be used including those that investigate costs taking into consideration the expected limitations on the availability of monetary data. These limitations will be explained. Viscusi (1997), stresses that the rationale for benefit-cost test should be to ensure that policymakers and regulators choose and implement regulations that will benefit society. The benefit-cost analysis will be conducted on the proposed models and comparisons will be made with

alternative models that could be employed to achieve same goals. This will be done in order to understand the cost of the proposed regulation on the regulator, operators and the economy versus the benefit to the industry as a whole including the public in general.

In SA telecoms environment, the incumbents usually use similar arguments for or against certain proposed regulations vs the rest of the smaller telecoms players. Ethnographic study (which is a form of qualitative research method) will be used through the RIA methodology. Babbie & Mouton (2004) observe that this approach has openness to multiple sources. Ethnographic study has to present sociocultural interpretation of data and should not be concerned about how it was collected but rather its interpretation, (Merriam, 2002, p8). “Ethnographic designs are procedures for describing, analysing, and interpreting a culture-sharing groups shared patterns of behaviour, beliefs and language that develop over time”, (Creswell, 2002, p436). In this instance “RIA [will assist] furnish empirical data that can be used to make wise regulatory decisions”, and “…[will] be useful in promoting [both] economic and social welfare” (Rodrigo, 2005, p3) which according to ICASA is the basis for the introduction of these spectrum licensing models. Rodrigo (2005, p18) further suggests that “[one] can ensure better data quality by involving expert groups in the consultation process, such as academic and other research bodies that do not have strong sectional interests in the issue”. This will bring the objectivity to the process by getting views outside the sector operators. The idea is to find facts which will contribute towards an informed recommendation hence academics and industry experts form part of the sample to be interviewed. Merriam, (2002) suggest that the way questions are structured and the way data is collected should relate to how it will be analysed and used. Regardless of which method you decide to use, recording should be done concurrent with data collection if possible, or soon thereafter, so that nothing gets lost and ‘memory doesn’t fade’. In conducting RIA there is no ‘one size fits all’ approach and therefore it will be adapted to suit the environment, i.e. the limited time

available, human resources available and costs associated with performing a very detailed regulatory impact assessment on the proposed spectrum licensing models.

3.4. Sampling Methodology

“The cost of studying an entire population to answer a specific question is usually prohibitive in terms of time, money and resources, therefore a subset of subjects representatives of a given population must be selected, this is called sampling”, Lunsford & Lunsford (1995, p105). Neuman (2011, p219) refers to a sample “as a smaller set of cases a researcher selects from a larger pool and generalizes to the population”. What this means is that sampling is about choosing a well-represented sample in order to avoid leaving out some people, objects or items of the group or population being studied. This is an indication that during research, a researcher is dependent on a chosen sample to draw conclusions on a particular topic being studied. Marshall (1996) stresses the importance of not using random sampling for qualitative studies as this generalises the results. “Qualitative researchers are intentionally non-random in their selection of data sources, … they select those individuals or objects that will yield the most information about the topic under investigation”, (Leedy & Ormrod, 2005, p145). The challenge is not about how many people are interviewed but the relevance and the understanding of the topic being investigated. Neuman (2011, p219) agrees that “qualitative researchers focus less on a sample’s representativeness than on how the sample or small collection of cases, units, or activities illuminates social life”. He asserts that “the primary focus is to collect specific cases, even, or actions than can clarify and deepen understanding”, (Neuman, 2011, p219). In deciding on a particular sample, the environment being studied is taken into consideration. The South African population is sitting at just above 50 million but the interest group is very small. Therefore, for this study, purposeful sampling will be chosen because the target market is well defined and as suggested by Leedy and Ormrod (2005), only relevant

stakeholders who will add value to this investigation will be interviewed. For example, all incumbent operators will be interviewed including the representative from the communications forum representing the smaller players. The regulator and the policy maker i.e. the department of communications will be interviewed. Academics and experts also form part of the sample to get objective views. Few equipment vendors will be considered to get a technical understanding of infrastructure sharing on the access level. Given the limited time and human resources, the study will exclude all other government departments and ancillary services' departments like maritime, aeronautical etc. Also because qualitative research method will be used so no random sampling will be done.

3.4.1. Sample of interviewees

As explained, sampling is done because it is impractical to interview the entire population or industry being studied. The goals of sampling are to decrease time and money costs, to increase the amount of data and detail that can be obtained, and to increase accuracy of data collection by preventing errors", (Lunsford &Lunsford, 1995, p111). It might also not be economical to target the entire population and within limited time period hence the quality of the researcher's sample will eventually determine the credibility and reliability of the study results.

The incumbent operators play a very active role in policy and regulation formulation and consider spectrum as key to their business success with good reason given the evolution of technologies. The question is whether the incumbents have enough spectrum to cater for the 4G type technologies or DoC and whether ICASA will actually cripple the communications industry by excluding them in the licensing process. It therefore makes sense that the following participants from the following operators will be interviewed to get their views: incumbent operators, few smaller players, representative from the communications forum on the proposed spectrum licensing models and the best ways to service government goals. To add to the industry interviewees, representatives

from DoC and ICASA will be interviewed to get an understanding behind the thinking when the proposed models were introduced and academics will be consulted to get objective views on practicality. Table 1 below indicates a list of interviewees and they all have more than 10 years' experience in the sector:

Table 1: Sample of interviewees from the industry

Interviewee	Type of institution	Brief profile and experience
1 SO1	Government entity	The interviewee has vast experience in the telecommunications sector and has worked for the regulator before
2 IN2	Incumbent operator	The interviewee has vast experience in the telecommunications sector and has worked for the regulator before
5 PR11	Government policy	The interviewee has vast experience in the communications sector and plays critical role in spectrum policy
6 PR12	Government policy	The interviewee has vast experience in the communications sector and plays a critical role in spectrum policy
7 MA1	Manufacturer	The interviewee has vast experience in the communications sector and plays an active role in regulatory processes
9 PR22	Regulator	The interviewee has vast experience in the communications sector and plays a critical role in spectrum regulation
10 PR21	Regulator	The interviewee has vast

		experience in the communications sector and plays a critical role in spectrum regulation
11 NE1	New entrant	The interviewee has vast experience in the telecommunications sector and has worked for the regulator before but the interview was cancelled
12 CA1	Communications forum	The interviewee has vast experience in the communications sector and plays an active role in regulatory processes
13 IN3	Incumbent operator	The interviewee has vast experience in the communications sector and plays an active role in regulatory processes
14 NE2	New entrant	The interviewee has vast experience in the communications sector and has worked for the regulator before but the interview was cancelled
15 IN1	Incumbent operator	The interviewee has vast experience in the telecommunications sector and has worked for the regulator before
16 AC1	Academic	The interviewee has vast experience in the telecommunications sector and has worked for the regulator before
17 MA3	Manufacturer	The interviewee has vast experience in the communications sector and plays an active role in

		regulatory processes
18 NE3	New entrant	The interviewee has vast experience in the telecommunications sector and has worked for the regulator before
19 SO2	Government entity	The interviewee has vast experience in the communications sector and plays an active role in regulatory processes
20 IN5	Incumbent	The interviewee has vast experience in the communications sector and plays an active role in regulatory processes
21 AC2	Academic	The interviewee has vast experience in the telecommunications sector and has worked for the regulator before
22 IN4	Incumbent	The interviewee has vast experience in the telecommunications sector and has worked for the regulator before

Source: Researcher's own.

The list of interviewees mentioned above is not exhaustive and discussions with other affected and interested parties or beneficiaries might be added during the data collection process. Views from other new entrants will be used as part of the document analysis process.

3.5. Data Analysis

Levine (1996, p1) defines data analysis as “a body of methods that help to describe facts, detect patterns, develop explanations, and test hypotheses”. On the other hand Glass (1976) described data analysis to have three levels:

> *Primary analysis [which] is the original analysis of data in a research study... e.g. application of statistical methods. Secondary analysis is the re-analysis of data for the purpose of answering the original research question with better statistical techniques, or answering new questions with old data. The last level meta-analysis: This one is referred to as ‘the analysis of analyses’. It is used “to refer to the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings*, (Glass 1976, p3).

Data analysis is an analytical process where raw information is administered, packaged, assembled in a way that assists the researcher to make recommendations and reach certain conclusions. The process of data analysis also assists in eliminating information which was not covered whilst identifying patterns of commonality and differences on the collected information. Data can be in different forms, e.g. numerical statistics, written submissions or oral and video submissions. This research study will seek to ensure that the research question is being answered or has been answered in any way.

The data analysis process usually includes the steps of organising the data for analysis and interpreting the data amongst others. Some authors (Merriam, (2002), Ritchie and Spencer (2002)) advise that part of analysing qualitative data is about reading through the interview notes and listening through the interview tapes and going through any other data, develop codes, code the data, and ‘drawing connections between discrete pieces of data’. It is therefore important to organise the data into specific

themes as per the study or different categories which will make it easier to interpret e.g. relevance, effectiveness, efficiency, results/impacts or sustainability (Shaw, 1999, Levine, 2006). The critical themes in this study are broadband connectivity, markets and competition. The following by-products of the study themes will be investigated during the data collection process and will be used to do qualitative assessment and the decision to quantify any of them will be determined by the kind of information received: job creation, economic growth, inflation, sector investment, cost to communicate, business model. “Data analysis is an inductive strategy”, (Merriam, 2002, p6) it begins with a unit of data (phrases, meaningful words) and compared to another unit of data whilst looking out for patterns, common themes, these are then coded, developed and adjusted as the data collection process continues, (Merriam, 2002). The themes from the conceptual framework (e.g. market-based licensing, secondary markets, wholesale open access) all relate to the strategic objectives identified by the regulator and some are used as units for analysis e.g. broadband for all, competition and emerging markets. These will be analysed with the themes that emerge during the data collection process.

3.6 Expected limitations of the research

It is not always practical to quantify the benefit-cost of a regulation in monetary terms as might be the case in this study because of the limitations in time, limited data available to monetise the impact, however, “developing even an incomplete BCA can greatly improve decision-making”, (OECD, 2008, p10). Should the costs not be quantifiable, they will be discussed in qualitative terms, “drawing some conclusions about their relative importance”, (OECD, 2008, p10).

3.6.1. The practical limitations from field work experiences

All the key stakeholders within the electronic communications industry will be interviewed in order to understand whether the proposed spectrum licensing models will have an effect on the communications market (1),

whether they will encourage competition (2) and provide broadband connectivity (3) for all. Permission will be requested from the regulatory body to view and analyse the documents submitted on the spectrum licensing models.

The different individuals to be interviewed and the organisations and companies they represent were chosen because of their vast experience with technical regulations. A pleasant coincidence was that the majority of them have worked for the regulator before either under SATRA, IBA or ICASA. The researcher chose all the big incumbents, government entities that play part in the communications space and only the highly active smaller 'new entrants'. The rest of the 'new entrants' was mainly represented by an industry body. This therefore gave the researcher confidence that those individuals will be in a position to give views from different perspectives to give the researcher a better understanding of the research problem including the research questions. However, with all the individuals and organisations interviewed, the reader should take into consideration that the sample does not represent the whole communications industry in the country.

3.6.2. The following are some of the challenges experienced whilst collecting data:

- Setting up appointments for interviews was not a serious problem but honouring those appointments by some of the smaller operators was a draining experience. Most of the identified smaller new entrants never availed themselves for interviews and were eventually cancelled. Strangely almost all the incumbents were immediately available to be interviewed.
- The longer time it took to secure appointments

During the interviews, it became clear that some of the questions were similar and as a result similar responses from the participants were given. As the interviews progressed, those questions were grouped together and

asked at the same time to avoid repetition and to give a better understanding to the participants. This minimised the sense of intimidation from the interviewees due to the number of questions. The questions were grouped under different themes which address the following: universal service obligations and broadband connectivity, technology and digital era, competition and finally policy and regulatory frameworks which are constituted to form the RIA approach and have been taken as a guide from the OECD RIA checklist. The participants were all given the same questions to answer but others were exempted from answering some of the questions as they were irrelevant to certain interviewees e.g. policy-maker, regulator and academics. The questions are therefore grouped under the themes mentioned and will be analysed as such.

3.7. Conclusion

The research methodology chosen for this study is qualitative research method due to the nature of the problem being investigated. RIA is used throughout the investigative process to understand the impact of the proposed spectrum licensing models. The sampled group and their vast technical regulatory experience are highlighted. The findings from the fieldwork will be reported in the next chapter.

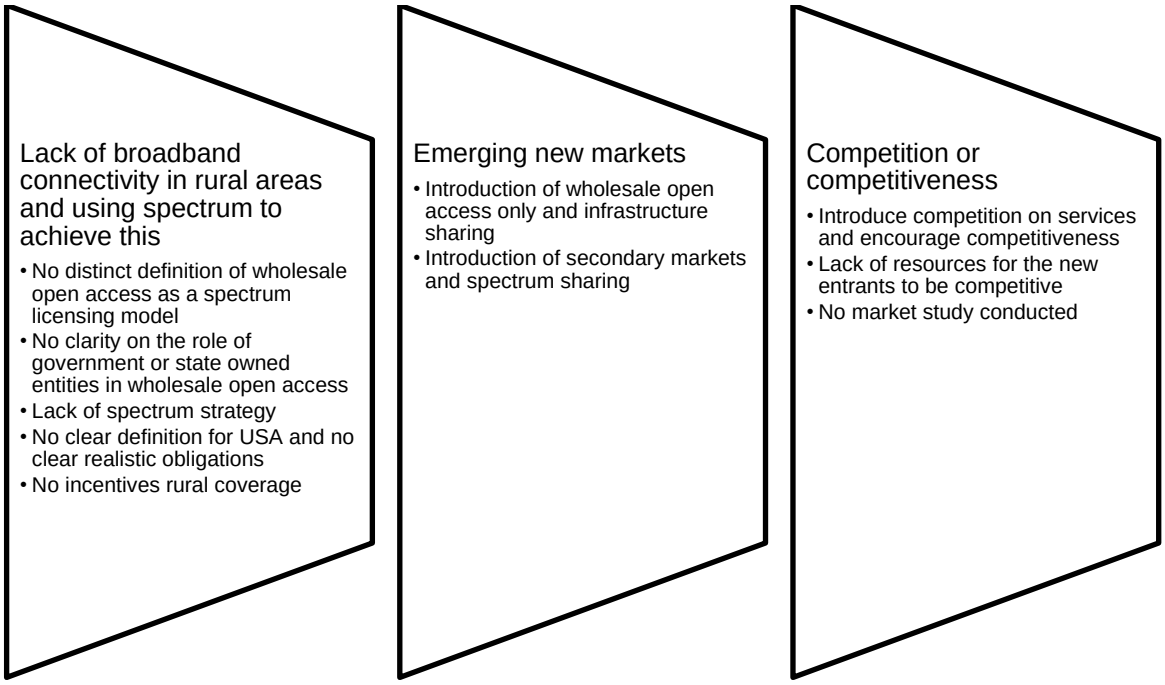
Chapter 4: *Ex-ante* regulatory impact assessment outcomes

The findings from the field interviews integrated with findings from document analysis are presented under this chapter. This chapter describes and presents the outcomes of the qualitative study undertaken by the researcher as highlighted in the previous chapters using three themes which are in line with the regulatory strategic goals. These are universal service and broadband connectivity for all, competition and emerging markets. A look at the regulatory framework is added as the overall umbrella under which all these themes were developed. As indicated, the three themes being analysed are part of the objectives as outlined in the regulations being studied and reasons for introducing the wholesale open access and managed spectrum parks models being analysed.

The theme on broadband seeks views from the interviewees on whether the proposed spectrum licensing models would encourage broadband connectivity for all which would therefore build a digital country. New markets are created by the introduction of wholesale open access and managed spectrum park models hence the theme ‘emerging markets’ which seeks to understand from the interviewees the business models created by these new markets. Lastly, competition as a theme is investigated and analysed versus competitiveness as one of the sub-themes emerging from interviews.

From the responses and findings of the data collection process, sub-themes were established. The findings are thus depicted in a way that reflects the themes and the sub-themes created by the researcher based on the information from the different participants interviewed. Figure 6 below illustrates the three themes and the sub-themes, see the figure below.

Figure 6: Themes and sub-themes from the interviews



Source: Researcher's own

Below is a discussion of major issues raised during the interviews which are based on the themes and sub-themes which were created. A total of 20 interviews were conducted, 16 face to face semi-structured, 2 online and 2 telephonic interviews were also conducted. The participants to these interviews were selected based on their technical regulatory experience with the majority having worked for the regulator or in a regulatory environment.

Whilst interviewing the operators it became clear that it was difficult to analyse ICASA's proposed spectrum licensing models without bringing the broader context under which the models were introduced. Indeed this expectation and view was reasonable and realistic as some of the questions were crafted with the background as captured in the regulations e.g. exclusion of all operators with spectrum assignments in the IMT bands. This necessitated certain critical parts of the regulation being brought to be part of the discussion in order to give meaning to the concepts in a South African environment. The results and views of the

interviewees are displayed in the discussions below. As previously mentioned, the outcomes from the data collection process were incorporated with the results from analysis of the submission documents, i.e. the document analysis process.

One common attitude from the interviewees was to basically brush aside the concept of managed spectrum park because it was never properly explained in the regulations as it was deferred to a later stage hence there will be a very limited discussion around it.

4.1. Lack of broadband connectivity in rural areas and using spectrum to achieve this

The main question all the participants had to respond to was in regard to the extent to which the spectrum licensing models would encourage ubiquitous and high speed connectivity for South Africa. The reasoning behind such a question is to understand the impact and get a view of whether the proposed models would actually address issues of low broadband connectivity especially in rural areas. This investigation is made so as to contrast the views and findings with the regulatory objectives of ICASA as stated in the 2011 draft regulations of “committing to making broadband available to all its citizens”, (ICASA, 2011b), also to check potential benefit against progress achieved through the existing spectrum management and licensing models.

As previously explained, it proved difficult for participants to give straight answers as the view was that there are just too many policy gaps and lack of strategic guidelines to expand on a yes or a no answer hence the sub-themes as discussed below.

4.1.1 No distinct and understandable definition of wholesale open access as a spectrum licensing model

The following are direct quotes from the interviewees highlighting the difficulty in giving straight answers on whether the wholesale open access

and managed spectrum park models would encourage broadband for all without a clear definition of the models themselves:

IN5 stated that *the Wholesale Open Access model was not really defined and the model is very complex though it still has merits and is the way to go in rural areas.*

NE3 alluded to the fact that *there is nowhere where WOA is clearly defined since there are so many different models of wholesale open access, No one understanding on what wholesale open access is and what model government and ICASA are introducing*

SO1 indicated that *there is no definition for wholesale open access and majority of operators came with different views for their own benefit, understandably so.*

MA1 stated that *the regulation is clear but not reliable, it is subjective and is open to different interpretations and will be implemented with different challenges*

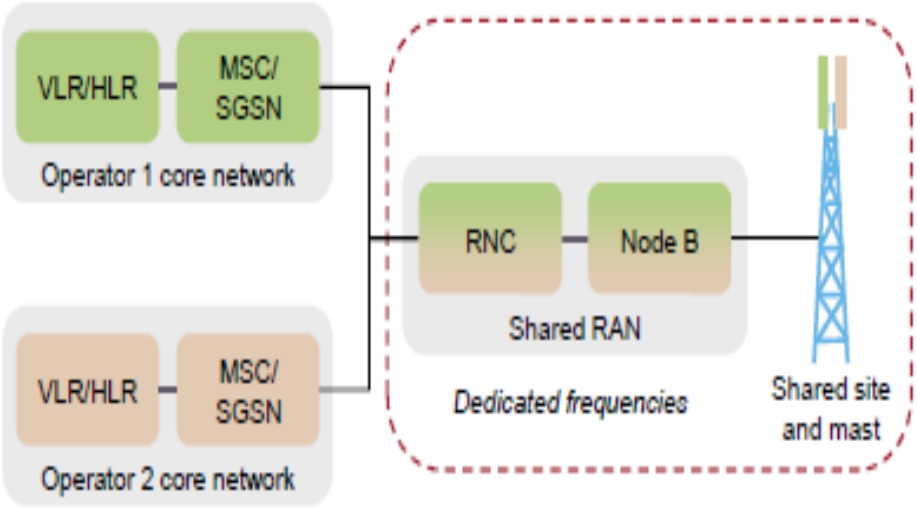
What became obvious from the onset was that the concepts of wholesale open access and managed spectrum parks were not clearly defined for the industry to share a common understanding and as a result operators and everyone else had their own different interpretations. This makes the regulation unclear and unreliable. One of the active manufacturers in the technical regulatory environment stated that “these models are untested and complex and can only be successful through thorough discussion among all stakeholders” (MA3, 20 January 2014). This view and concern was raised by one incumbent (IN5) and an interviewee from a manufacturer (MA1) as highlighted in the quotes above that “the model is very complex” and that “it is subject to different interpretations” (interview, 09 January 2014 & 08 January 2014 respectively). Not properly defining the proposed spectrum licensing models makes it difficult for operators to define their business models within the new environment as it is not explicit what the regulator is proposing and how it will be implemented.

ICASA only gave a ‘no locking’, ‘no blocking’, and ‘no retail’ as a way of defining the wholesale open access model and this means nothing for the operators who need a clear view in terms of where they fit into this new environment. The incumbents are anxious about getting clarity on the proposed models as one of them further asked “where is the business model especially with no retail” (IN5, 09 January 2014).

Technically though, it remains unclear what form the wholesale open access would take including the technical measures to ensure practical implementation. The concept of MVNO’s has been suggested by some of the participants indicating that to be the only form that retail providers would access the network. Along the same lines of this discussion, ICASA would not have gone through so much length coming up with ‘modern’ licensing models just to introduce MVNO’s, there must have been an ideal of how the retail operators were to access the wholesaler’s network. MVNO’s are virtual operators who buy bulk minutes at a discounted price. Fortunately some of interviewees from policy and regulatory institutions were interviewed amongst the last group of interviewees to solicit views behind the practical technical implementation details on what form ICASA anticipates. The policy and regulatory officials are sure the proposed model is not MVNO’s but rather that the retail operators would still be allowed and expected to build the last mile and sublet spectrum from the wholesale open access operator as one of the interviewees stated “in terms of network architecture the network operator will provide switches, etc. but retailer will still build their own base stations” (PR22, 20 January 2014). What this means is that the retail operators will be ‘assigned’ bandwidth by the wholesale provider as per the individual requests. One of the incumbent interviewees expressed a view that “access to [such] spectrum must be clear and no one operator should be allowed to buy all the capacity but also having too many retail operators will affect the quality of service” (IN2, 18 November 2013). At the end of the day it goes back to the fact that only a limited few will have access to this high demand spectrum as the bandwidth ‘assigned’ cannot be too small in such a way

that the consumers end up not getting the value of high speed. 4G technologies are bandwidth hungry and therefore, retail providers will need access to a reasonable minimum for their businesses to make sense. Figure 7 below illustrates one of the examples of 'open access' being considered and identified as indicated by one of the interviewees, (PR22, 20 January 2014). The question asked is, is this open access or infrastructure sharing by any operator including the existing operators?

Figure 7: Proposed wholesale open access model



Source: BIPT

The matter to seriously investigate is whether the concern is a lack of a proper definition or different interpretations by the industry? Either way the models need to be given an explicit description to minimise any ambiguity that may arise.

4.1.2 No clarity on the role of government or state owned entities in wholesale open access

Internationally, a number of countries who are trying to address ubiquitous broadband connectivity have introduced innovative ways including public private partnerships. They do this using market-based licensing mechanisms e.g. wholesale open access amongst others. In the 2011 proposal, Sentech was given access to spectrum in the 800 MHz band on

a ‘silver platter’ in exchange for the return of some spectrum in their 2600 MHz assignment which lay dormant for many years making Sentech one of the potential wholesale open access operators. This was an unfortunate regulatory transaction by ICASA given the different characteristics and the differences in economic value of the two different bands, the 800 and 2600 MHz bands. With the introduction of the AIP, Sentech has since returned all the spectrum in the 2600 MHz band, making ICASA’s proposal null and void. At the time of the proposal there was a serious uproar with regard to this decision from the incumbent operators who would have given anything to get their hands on the 800 MHz band spectrum. However, during the interviews there were mixed reactions on the involvement of state owned entities (SOE’s) but the majority agree that only through government funding will the country ever come close to the desired aim of ‘broadband connectivity for all’. The question is how can government get involved, through SOE or just making funds available? The reality is government or private sector, no entity or organisation can just handover billions of rands and not be involved. One of the academics raised this concern over lack of clarity on the involvement of SOE’s. This academic raised the following questions “what is the role of state-owned companies like Broadband InfraCo and Sentech, how can they be used to effect government objectives, e.g. the network infrastructure for rural areas”, and further stated that “they [SOE’s] need to be funded properly cause the National Broadband Network (NBN) can be done properly at the back of a state owned entity” (AC1, 11 December 2013). “Broadband in rural areas cannot be done without infrastructure sharing, spectrum pooling, and government involvement”, this is a view expressed by one of the manufacturers but voicing a strong disagreement with Sentech receiving free spectrum in the 800 MHz band indicating that “Sentech was getting a blank cheque having failed in the past with the 2.6 GHz spectrum” (MA1, 08 January 2014). The government entities are themselves not sure where they feature in these new spectrum licensing models as they have a mandate to fulfil. Incumbents though are a bit divided on this view, one of

the incumbents stated that “wholesale open access network licensee should be a Public Private Partnership (PPP) so that state and private funding can be combined with private sector business principles to form -a self-sufficient operating company that does not need constant government financial bailouts” (IN4, 12 December 2013). A contrasting view from another incumbent was that “government involvement in making this country a digital country should be focused on the demand side and leave the supply side to the market forces” (IN3, 26 November 2013). The different views show disunity and in a way lack of confidence in government’s ability in addressing its own objective of broadband connectivity for all but also a lack of confidence on the willingness of the incumbents to go to rural areas. The OECD (2013) argues that “open access [in this instance this refers to open access at wholesale level] refers to mandated, transparent, non-discriminatory and effective wholesale access to broadband network(s) as a condition for being awarded subsidies”. The condition is that where there is no state funding, obligations will be imposed on the wholesale open access operator but where there is state funding, it must be a mandated effective wholesale open access network, for all, (OECD, 2013). The recently published Broadband Policy (2013) also suggests the involvement of state-owned entities in rolling out these networks and what remains to be seen is the detail of their involvement.

4.1.3 Lack of spectrum strategy

IN2 expressed a view that *one cannot talk about high speed connectivity without discussing and publishing the spectrum strategy, an economic or baseline study needs to be conducted in order to understand what the need is for high speed connectivity, this will assist in determining what kind of spectrum would make it practical to have rural connectivity.*

NE3 stated that *there is no consistency from government meaning they do not know what they want and what they are doing, no document to source their mandate to understand what they want to achieve.*

The majority of the operators welcomed the progress made by the regulator acknowledging that the proposed regulation coupled with the Invitation to Apply (ITA) was a step in the right direction but rather citing a number of issues as areas of concern that require further investigation and answers before implementation. Those include amongst others the fact that the country lacks spectrum strategy to direct and guide the regulator on how to licence spectrum, for which services, to whom and how much including which spectrum. One of the incumbent interviewees stated that "there is a serious lack of policies, the spectrum bands in question including the 700 MHz will address broadband rollout especially in rural areas that is why policy issue must be resolved" (IN5, 09 January 2014). In supporting a similar view one of the new entrants stated that "[Government] has no document to source their mandate to understand what they want to achieve" (NE3, 09 December 2013). The fact that e-services like e-health, e-learning and other government services are not clearly mentioned and how they can be achieved, which spectrum is set aside to achieve these goals, shows this clear indication of the lack of strategy or spectrum policy. An interviewee from policy and regulatory institutions noted that "the regulation was too broad and talking in numbers, the regulation must drill down and mention e.g. which municipalities require what ICT services and what kind of infrastructure exist currently, do a proper needs analysis" (PR22, 20 January 2014). One of the incumbents during the interview raised a question of a study that will feed into the strategy from a well-researched and informed position instead of introducing regulations without a needs and impact assessment. This would cushion the regulator against litigation or other related challenges.

4.1.4 No clear definition for USA and no clear obligations

IN3 stated that *there is currently no proper definition of underserviced areas and this should be clearly spelt out and has not worked in the past and in many*

countries.

SO1 expressed a view that *performance obligations must be defined upfront even if ICASA decides to go the auction way so that they are not left until afterwards in the negotiations, this will help operators filter in the obligations into their business plans*

NE3 stressed that *the regulator should have a clear statement of intent about the rural connectivity in the regulations not just as an obligation.*

IN3 also stated that *it seems the obligations are more focused on covering sheep and other animals in empty spaces where there are no people. The concern is why geographic coverage is made to be more important than population coverage*

The following section includes the discussion on both the underserviced area and USA obligations. The reasoning behind is that when USA obligations are imposed, what constitutes an underserved area that requires the regulator's intervention should ideally be clearly spelt out.

In the discussions with the operators, it became clear that the regulations were not explicit on universal service and access and there was a common feeling of uneasiness on the obligations proposed. ICASA published regulations on the definitions of under-serviced areas in 2012 but operators feel that such regulation still does not assist in giving an explicit definition for universal service and access including its obligations. The approach as proposed in the draft spectrum licensing regulations will not help achieve government goal of broadband connectivity for all nor will it encourage ubiquitous and high speed connectivity as no proper definition has been given in the under-serviced area's definition and the regulations under review. One of the incumbents raised a concern over lack of clarity on e-government services including e-health and e-education and how these regulations will help achieve these, which

spectrum is put aside for rural broadband connectivity. This goes back to an issue about the country not having a spectrum strategy and the fact that there was never a baseline study to inform the proposals in the regulation as alluded to by one of the incumbents, (IN2, 18 November 2013). In the absence of a spectrum strategy, a proposal from one of the interviewees from state entity was that the universal service obligations must be properly and explicitly defined upfront in order to minimise disputes and communicate expectations upfront so that operators know what they are in for when bidding for high demand spectrum licences, (SO1, 06 December 2013). This gives confidence to operators as well as investors instead of being met with surprises after the awarding of licences.

Now with regard to the issue of not realistically defining obligations, just to highlight the level at which universal service obligations have been messed up due to lack of thorough investigations prior to imposing them, Hodge (n.d) observed that initially "the mobile operators were not given specific rollout targets because a) they were licenced prior to the consultative policy process, and b) this [mobile phone service] was considered a luxury service that did not have mass appeal", hence the additional obligations that were introduced like an after-thought, after realising the missed opportunity and the potential of mobile technologies in a developing country like South Africa. Hodge (n.d) confirms that "rollout targets [especially Telkom's targets] are themselves set with a limited information set and in an uncertain [fast-evolving technological] environment, making their suitability subject to enormous potential error". These obligations were merely set based on service licences.

Just before the introduction of convergence framework and after the promulgation of the EC Act, the regulator imposed obligations on operators with high demand spectrum licences e.g. to connect clinics, schools, tele-centres etc. per operator. It is during this era that universal

service obligations were based on the type of spectrum assigned. Table 2 below illustrates some of these obligations.

Table 2: Universal service obligations for SA operators

	Rollout Obligations	Community Service obligations
Telkom	• 2.69m lines brought into service of which: ➢ 1.676m in underserviced areas ➢ 20,246 for priority customers ➢ 3204 villages	• 120,000 payphones
Vodacom	• 60% population coverage in 2 years • 70% population coverage in 4 years	• 22,000 community service telephones in underserviced areas over 5 years • low community service tariff
MTN	• 60% population coverage in 2 years • 70% population coverage in 4 years	• 7,500 community service telephones in underserviced areas over 5 years • low community service tariff
Cell C	• 8% geographic coverage in 5 years, 40% with roaming agreements • 60% population coverage in 5 years; 80% through roaming agreements in 1 year	• 52,000 community service telephones in underserviced areas over 7 years • low community service tariff
Sentech (multimedia)	None	• 500 internet labs in rural schools over 5 years
[Neotel] (proposed)	• Coverage of all Metropoles in 5 years • 80% of territory in 10 years	• 30,000 community service telephones in rural areas over 10 years • 2500 internet labs in rural schools over 10 years

Source: Hodge (n.d)

Added obligations for mobile operators included “the supply of 250,000 free cell phones over 5 years, provision of 4 million free SIM cards over 5 years, more public payphones, Internet labs in schools and multi-purpose community centres” (Business Day 30 May 2003) in Hodge (n.d).

Universal service and obligations was an issue of concern on most of the participants given that the draft regulation is focused on licensing the 800 and 2600 MHz spectrum to selected few and mainly new entrants indirectly prohibiting the incumbents from acquiring the licences. The question that followed was that of funding for rural coverage with suggestion that government makes funds or some form of incentive available to operators to make the obligations achievable. Looking into the obligations for Cell C and Neotel from the table above, they were given stiffer community service obligations than Vodacom and MTN despite the fact that they were entering the market almost 10 years after the two mobile giants. It is clear that government’s focus and aim through ICASA’s action was to encourage rural connectivity. Government through the National Development Plan (2012) and the Broadband Policy (2013) is still highly concerned about the lack of rural broadband connectivity so surely something in their formula is not working. As a proposal and a way of enforcing compliance with obligations, all incumbents, one of the SOE’s and a new entrant suggested that a German model be studied and adopted as a more realistic way in imposing universal service obligations. The model is more specific, making rural connectivity a priority with clear incentives for rolling out in those rural areas. As one of the interviewees from the policy and regulatory institutions commented that the regulations are too broad and are talking in numbers and suggesting that they must drill down and do needs analysis e.g. mention the municipalities which are under-served and direct operators to start rolling out in those areas before moving to urban areas.

Incumbents as well as the new entrants agree that setting obligations on geographic coverage seems to be unrealistic instead of focusing on

population as geographic coverage tends to include areas that are not habitable and operators will cherry-pick just to meet the obligation without fulfilling the objective from government.

4.1.5 No incentives for rural coverage

IN3 argued that *money follows infrastructure, what is the incentive to rollout broadband services to rural areas, with the current proposal there is none.*

AC1 stated that *in theory the 3G network is supposed to be national and don't see how these licensing models will enforce building in rural areas, it will have to be done and built in universal service obligations*

IN1 further stated that *the country is still not achieving, the operators are cherry picking cause there is no incentive to go to rural areas*

The incumbents believe that the regulator whilst imposing obligations is not clear on the incentives to rollout broadband in rural areas. As one of them put it "money follows infrastructure" (IN3, 26 November 2013), and therefore operators in general would provide services in areas where infrastructure already exists or rollout networks in densely populated areas making it challenging for government to achieve its goal of broadband connectivity for all. This view is supported by another incumbent as he stated that "for new operators to have obligations, there must be some form of incentive or funding", (IN1, 18 November 2014). As already stated, the majority of interviewees support the German model when introducing obligations for rolling out in rural areas. In the model, the operators were also allowed to share infrastructure and lease spectrum which are concepts not yet put into practice in South Africa. However, one of the incumbents who suggested that sounded sceptical as well as he expressed his view to "also look at the German model i.e. start from the edges and work your way in but not sure how feasible that is, because 'infrastructure follows money' and Germany already has lots of fibre". Another incumbent suggested the same model stating that the "rollout

targets, such as those used in Germany to ensure that operators meet 50% rural coverage before being allowed to roll out in urban areas, may be appropriate". Government entities are proposing the same suggesting that the regulator should look into the "German model, posing obligations and give incentives for licensees to start in rural areas with minimum quality of service obligations then be allowed to move to urban areas", (SO1, 06 December 2013). This is an area that requires a very firm and decisive regulator as there is no guarantee that the incumbents or any operator for that matter would rollout in rural areas.

This brings us back to the issue of under-serviced areas as defined in GG No. 35675, which refers to amongst others, areas where no infrastructure exists. Both incumbents and the new entrants were very emphatic about the exorbitant capital investment required to build a national network from scratch, let alone rolling out in rural areas as an obligation. An interviewee from the policy and regulatory institutions stated that "the problem with rural areas is that the perception is that there is no money to be made there, it is expensive to rollout, operators are scared they will not get a return on their investment", (PR12, 13 January 2014). The Broadband Policy (2013) published by the Department of communications is proposing a public private partnership with the inclusion of SOE's, which could be one incentive for government to bring a certain percentage of funds. The final regulation dealing with the spectrum licensing models will have to look into all the policies that have been published post the publication of the 2011 draft regulations including scrutinising a funding model proposed by the new entrants to guard against possible failures.

4.2 Emerging new markets

4.2.1 Introduction of Wholesale open access only and Infrastructure sharing

NE3 expressed a view that *the draft as is was not in favor or against a specific market structure and is not clear which direction it is proposing to take*

IN2 stated that *the wholesale open access, pairing 800 and 2600 MHz and licence that into a form of a consortium and let incumbents take assets and be the shareholders.*

SO1 also stated that *the trend is infrastructure sharing to minimise capex requirements*

The general view from the interviewees is that the wholesale open access model is a good model given the demand-side that exceeds supply-side on a high demand spectrum. The challenge is lack of clarity on how it will be implemented and the majority of interviewees do not support the wholesale only and no retail. The interviewee from the policy and regulatory institutions stated that “the issue of wholesale open access is a good concept but who is going to be that wholesale open access operator especially with no retail services because the mobile operators will not be interested in becoming wholesale open access operator”, (PR12, 13 January 2014). This view was confirmed by an interviewee from one government entity who stated that “wholesale open access is a good idea only if it is government funded especially with no retail, none of the mobile operators would want to be a wholesale open access operator and not provide services” (SO2, 13 January 2014). The access part or last mile on a communications network is the core part for the business of the incumbents; their current businesses actually do not exist without retail. In agreement with this, one interviewee from the incumbents stated that “the wholesale open access network operator should be licenced to provide both wholesale and retail services so that it has first-hand experience of retail customer requirements”, (IN4, 12 December 2013). Another interviewee from the incumbents stressed a point that “the success of the wholesale open access model depends on the type of technology chosen by the wholesale open access operator otherwise for retailers there is no guarantee for quality of service”, (IN5, 09 January 2014). The

differentiating factor on who can succeed just providing at a retail level will be providing ‘unique, exceptional services, make end-user devices available’ to support those services. One of the incumbent interviewees gave an example of spaza shops in townships, what makes one to stand out is the packaging e.g one spaza shop might sell the same sugar bought from the same Makro but have a car wash or ‘bring and braai services’ in the same shop whilst another will only be selling sugar. The differentiator is all the different services packaged together and that applies to the services provided by the communications operators.

For the sake of bringing the analysis from the 2011 draft regulations under discussion, all operators with spectrum in the high demand bands (IMT spectrum), that refers to all the mobile operators, were in any case excluded from becoming wholesale operators meaning the target from ICASA was for a new entrant and Sentech to become wholesale providers. This is also an issue according to a government entity interviewee who stated that “it has never been seen anywhere where new entrants [commercial] would be wholesale open access operators because it does not make sense for them to do it given the non-existent infrastructure on their part”, (SO1, 06 December 2013) especially with no retail.

The understanding from the interviewees is that introduction of wholesale open access model and the managed spectrum park models will encourage infrastructure sharing especially for rural coverage. Infrastructure sharing is supported by the majority of the interviewees for rural areas as it reduces capital investment. The incumbents argue that there is enough infrastructure competition in urban areas and therefore the operators will have to combine forces to cover rural areas. Explaining this, the interviewee from the incumbents stated that “wholesale open access has its space and merits especially for rural areas, operators will have to combine forces in order to rollout services in rural areas”, (IN5, 09 January 2014). He further suggests to “have two joint ventures (JV’s) to still have

facilities competition even in rural areas, operators must be allowed to have flexibility to lease spectrum in rural areas". The manufacturers agree as they believe that "broadband in rural areas cannot be done without infrastructure sharing, spectrum pooling and government involvement", (MA1, 08 January 2014). The question that comes to mind is; does wholesale open access and managed spectrum park equate to infrastructure sharing? The interviewees seem to think so especially if the consideration is rural coverage. One academic interviewed suggested that "NBN will not be a messiah alone, infrastructure sharing generally would help if regulated", (AC1, 11 December 2014). This will be the case only if operators form a consortium and the 2011 regulation is stressing 'sharing of spectrum' and specifically 'sharing of common spectrum' for managed spectrum park. However, the OECD (2013) seems to agree that "infrastructure sharing could also be discussed in the context of open network access" and further explains that it "is becoming an important means of promoting access to networks and offering affordable broadband services by reducing expenditures and ongoing expenses associated with the rollout and operation of networks".

'In theory open access model looks good' and really ideal where demand exceeds supply 'but according to the same OECD report, internationally there is no open access model' on mobile services 'that is operationally proven to be successful', and the final decision is left to the regulator to be innovative in implementing this.

4.2.2 Introduction of secondary markets and Spectrum sharing

The quotes below are taken from the data collection process and indicate just how much the industry is waiting for the introduction of secondary markets within the sector either through leasing or trading of spectrum:

IN1 stated that *for access spectrum the regulator should introduce spectrum trading and allow operators to share spectrum.*

PR11 also stated that *unfortunately there is currently no secondary market regulation e.g. spectrum trading* but further stated that *if it is introduced it will have to be well defined as the auctions go hand in hand with spectrum trading.*

SO1 indicated that *the bad part with the old traditional spectrum management is the limitation of spectrum, and that leasing is not allowed.*

MN1 further indicated that *the regulations should allow operators to allow technology to evolve but introduction of secondary markets not yet been seen e.g spectrum trading, and that also the regulations should consider white space technology that is being piloted in the country but specifically look at spectrum trading and spectrum pooling for rural areas.*

AC1 suggested that *the regulator should remove regulatory bottlenecks, and look at auctioning the spectrum but ensure that auctions are carefully designed or alternatively create secondary markets for spectrum trading.*

Adding to the support of secondary markets IN5 further suggested that *they[the regulator] should allow operators to have flexibility to lease spectrum in rural areas*

The promulgation of the Electronic Communications Act of 2005 introduced a converged licensing framework which encouraged a technology neutral environment. The regulator however has been moving very slowly in terms of introducing market-based licensing models that talk to the converged framework. The draft radio regulations proposed the introduction of secondary markets such as spectrum trading, subletting and spectrum leasing but unfortunately these were taken out of the final radio regulations document that was published at the end of March 2011. Unfortunately the regulator missed an opportunity of assisting the smaller players who do not want to build their own networks from scratch to provide services in areas that do not make business and economic sense for the incumbents. As one academic stated that:

looking at the demand versus supply, the introduction of wholesale open access is justified for operators who don't have to build their own networks but want to have access to spectrum as and when needed like secondary markets where spectrum is used and regulated on a website for operators to use for specific periods, (AC1, 11 December 2013).

One of the interviewees in the policy and regulatory environment does not even believe that the regulator needs to go through the process of drafting regulations to introduce secondary markets but cautions that "those secondary market regulations will have to be well defined as the auctions go hand in hand with spectrum trading" (PR11, 08 January 2014). Unfortunately there is currently no real appetite for auctions in the country. The NDP (2012) stresses the point that "mechanisms for allocating radio frequency spectrum need to be smarter (for example spectrum auctions and reverse bids for underserviced areas), with robust and transparent governance". Some of the operators including academics suggest that instead of licensing more operators, the regulator should assist the incumbents, create a level playing field, and assist those who entered the market last by actually removing regulatory hurdles and creating secondary markets for spectrum trading and other forms. Expressing this view the interviewee from one of the incumbents stated that "for access spectrum the regulator should introduce spectrum trading and allow operators to share spectrum". The proposal in terms of managing this suggestion is such that the "responsibility still sits with operators and the fees go towards offsetting the license fees and incumbents can lease or sublet spare capacity for regional operators where incumbents do not want to go" (AC1, 11 December 2013). The design of the secondary markets will eventually be determined by the regulator as there are services that sublet spectrum currently.

4.3. Introducing competition for a wider choice to reduce costs

Globally the rule for the maximum number of operators is 3+1 otherwise you start seeing consolidations, (GSMA, 2012). The belief is always that

competition will provide consumers with a wider choice and therefore drive down costs. In South Africa there are currently more than 4 operators in the market and yet South Africa is amongst countries with the highest communications costs. Introducing more competitors will not on its own ensure competition and therefore will not drive down costs.

During the interviews there were conflicting views sometimes from the same interviewees and sometimes amongst the whole group regarding introducing competition. The interviewees were all asked to indicate to what extent they thought the proposed spectrum licensing models would encourage competition. The idea with this was to get a sense from the industry whether they viewed the introduction of the new competitors as a warranted step by the regulator and whether that will assist South Africa in becoming a digital country.

4.3.1 Introduce competition on services and encourage competitiveness

The majority of operators agreed on the issue of introducing competition on services especially for rural areas and encourage infrastructure sharing to reduce capital investments in uneconomical areas and also encouraging competitiveness by putting measures in place to achieve this. Below are some of the quotes on the views regarding competition on services:

IN2 stated that if going rural and responding to government's goal of bridging the digital divide, rural communities must enjoy the same benefits as those in urban areas, a consideration could be to give the lower band spectrum which is relevant for rural coverage to one operator and let all others compete on services.

IN3 further stated that *having 3 to 4 operators in South Africa is the maximum number that is sustainable. There is however scope for more competition on services instead of infrastructure competition.*

PR12 also stated *that the wholesale open access is a good idea and then have*

competition on services especially for underserviced areas but comes back to who is going to be that wholesale open access operator.

Most of the interviewees if not all of them agree that for the proposed models to be implementable, effective and be able to achieve the regulator's goals of introducing competition, reduce costs, introduce new markets and rollout broadband in rural areas, there has to be some collaboration amongst operators. The regulations were however, indirectly excluding the incumbents meaning that ICASA was determined in introducing another competitor to compete on infrastructure. One of the interviewees in expressing his view on competition stated that "competition is good but when is competition enough? Why doesn't ICASA try and assist the current incumbents and create a level playing field, create effective competition with the current operators", (IN5, 09 January 2014). This view is shared by the representative for the policy and regulatory institutions as he cautioned that "the regulation as is will increase the number of operators and insisted that "a market analysis study is needed to determine how many more operators should be introduced into the market otherwise if the document is implemented as is, the country might even double the number of operators". An interviewee representing one of the manufactures also cautioned that "the new entrants might not survive, 3 or 4 maximum in terms of the number of operators is what is practical" (MA1, 08 January 2014). Agreeing with this concern another incumbent raised an issue that "having 3 to 4 operators in South Africa is the optimal/ maximum number of infrastructure operators that is sustainable", (IN3, 26 November 2013). The argument presented by the interviewees is that there is a limited number of operators that any country can sustain before it loses economies of scale, operators get a return on their investment. However, there is scope for more competition on services instead of infrastructure competition", (IN3, 26 November 2013). The view is that there should be competition at both infrastructure and services level but in areas that are economically not viable it is better to have competition at

service level than infrastructure, (PR22, 13 January 2014). This is where the proposed models can be adopted if operators are prepared to work together and form consortiums.

A word of caution from another operator was that “government should be careful of confusing competition and competitiveness, increasing the number of operators in the market does not guarantee or determine competitiveness”, (IN3, 26 November 2013). The respondent from the policy and regulatory institutions agrees with this statement as he stated that “currently there are 4 ‘mobile’ operators, why is there no competition, that is the fundamental question, is the market big enough? Telkom mobile is supported by Telkom, why are they battling, why are they not making it?”, (PR12, 13 January 2014). He further argued that “Cell C has been around for so many years, why cant they crack MTN and Vodacom duopoly, if you bring in a new guy, the conditions are the same, what is going to assist that guy to make it?”, (PR12, 13 January 2014). What the interviewees argued was that it has taken Cell C (third mobile operator) more than 10 years to be profitable even though they did not have to build a national network as they were roaming on Vodacom for years. Cell C is still finding it difficult to be really competitive and take on operators like Vodacom and MTN as they are bigger and have been in operation far too long. They have gained enough market share, enough subscribers, revenue, experience and technical expertise in the past 20 years. Operators like Neotel and WBS are also finding it difficult to rollout and operate outside the golden triangle i.e. Gauteng, Durban or Cape Town. The concern is that the introduction of the 4th ‘mobile’ operator through Telkom Mobile caused an even more saturated market to introduce more new operators. The argument is that the 4th mobile operator though it has Telkom’s advantage of a national backhaul and roaming on MTN network that have national presence has been struggling to reach just 1 million subscribers. On this note during the interview one of the incumbents asked “what makes ICASA think these new entrants will be any different especially in rural areas, where is the business model especially with no

retail", (IN5, 09 January 2014). The point to consider then is what makes ICASA think the new entrants will introduce effective competition or even encourage competitiveness in the market. A 'guest' academic who shared in this study asked "what mechanisms did ICASA put in place to assist the new entrants to compete successfully", and "whether ICASA has done any investigation to determine whether the number portability was successful or unsuccessful", (AC3, 08 February 2014). Secondary markets as mentioned in 4.2.2 above are not yet supported; there is currently no spectrum trading, leasing or subletting permitted by law. These are the issues that ICASA needs to investigate to encourage competitiveness. Another academic's view was that the country might not necessarily need more new operators but rather new investors to boost and assist those operators that are already in the market but are struggling financially, (AC1, 13 December 2013) as supported by the incumbent above that the regulator should rather level the playing field for the current operators.

The operators including both incumbents and new entrants believe that the lack of competitiveness in a South African environment is due to not having a strong and pro-active regulator. A concern was that there was no market study conducted to determine the maximum number of operators that can be sustainable. The regulator is believed to be too weak and re-active and either does not exercise its powers or does not know what powers it holds.

4.3.2 Lack of resources for the new entrants to be competitive

All the interviewees were asked to give a view on how much they think it will cost operators and the country at large if incumbents are left out of the wholesale open access and managed spectrum park approaches. Coupled with that they also had to respond to the question regarding the effect the draft spectrum licensing models would have on the rollout of 4G and the broader communications industry. This came about because in the 2011 regulations, the incumbents were indirectly excluded from participating in the licensing process. It was therefore important for the

researcher to seek views from the industry itself to determine whether the advantages expected from the proposed models outweigh the disadvantages taking into consideration the broader context under which the models were introduced. The sub-theme discussed below emerged from the discussions related to the questions mentioned above.

IN3 stated that *the industry is a very capex oriented industry and licensing new entrants is setting the country up for failure as it costs billions of rands to build a network from scratch.*

PR21 also expressed a view that *to start from scratch costs a lot of money, since it has been a natural progression for mobile operators, and therefore excluding the incumbents, the country will miss-out on faster broadband rollout because for incumbents it's an upgrade of what currently exists*

IN5 also expressed a concern that *if incumbents are not going to rural areas what guarantees that new entrant will go to rural areas, where is the money coming from.*

Managed liberalisation in South Africa was overtaken by events thanks to the *Altech-Autopage court judgement*. The country moved from having a handful of operators to 400+ ECNS/ECS operators hence the need or even an obligation from ICASA to introduce mechanisms that will assist these operators or at least some of them gain access to high demand spectrum. The reality is that there are way too many of these operators to accommodate with the current spectrum supply. These 'new smaller operators' vary in sizes, skill, technical expertise and finances. With the exception of the interviewee from one of the new entrants, all other respondents agree that licensing only the new entrants and excluding the incumbents will be the biggest mistake the country has ever made. This new entrant believes that:

> *excluding deep pockets is a problem but not necessarily a bad idea, new entrants have no legacy systems to maintain, some small operators have been able to rollout networks faster since they did not have the legacy systems, the range of dedicated resources is higher but limited in terms of complementing existing networks e.g. 3G and other backward compatible networks is not there, both sides have benefits but the bigger benefit is to do it faster*, (NE3, 09 December 2013).

Another new entrant stated that "the new entrants would start rolling out sooner than incumbents because incumbents are well established and are therefore not under pressure. They might want to 'capitalise' on their current 3G networks before rolling out 4G (NE4, submission to ICASA, 28 February 2012).

The argument from most respondents is that it costs a lot of money to build a network from scratch and that the new entrants do not have that kind of money, they do not have existing infrastructure and no experience to make it. As one interviewee puts it, "this is a very capex oriented industry, licensing new entrants is setting the country up for failure as it costs billions of rands to build a network from scratch", (IN3, 26 November 2013). Building a national network will cost billions of rands which the new entrants on their own may not have especially in rural areas where there may not be a return on investment even in the longer term. Another interviewee expressing a similar view stated that "to start from scratch costs a lot of money, and it has been a natural progression for mobile operators, and therefore excluding the incumbents, the country will miss-out on faster broadband rollout because for incumbents it's an upgrade of what currently exists", (PR21, 20 January 2014). One interviewee cautioned that in licensing the new entrants "there is a need to avoid creation of stand-alone networks that don't integrate/interoperate with the existing 2G/3G networks", (MA2, 20 January 2014). There still needs to be backward compatibility so that when subscribers move out of the LTE/4G

coverage areas they can still connect to the existing networks, e.g. 3G and 2G. One interviewee suggested that as an alternative, ICASA should "give existing operators spectrum and encourage them to form a consortium because they have networks and base stations, and that will accelerate connectivity". He further commented that "it will take up to 15 years for the new entrants to build the network so it will be more practical to allow the incumbents to be network providers but prohibit them from competing with their retail service providers", (IN2, 18 November 2013). Another one of the new entrants proposes that there should be mandatory voice and data roaming to minimise barriers to entry for new entrants, *(*NE5, submission to ICASA, 29 February). An academic who agrees with these views stated that "new entrants might not be looking at building the new national infrastructure but looking at gaining access to networks", (AC1, 09 December 2013) because "new entrants will need capex and subscribers to run a successful business" (SO1, 13 December 2013), because making money is the objective of getting into business. In fact another interviewee stated that "it is debatable whether these new entrants have the resources needed to deploy national networks in a short period", (IN4, 12 December 2013). Once the network is built, which will take a number of years before it reaches national coverage, most respondents assuming 10-15 years, the new entrant needs to have users of the network, make money and become profitable to be able to service the loan. As confirmed by another respondent "the new operators will need economies of scale, some form of market share, subscribers to compete", (IN3, 26 November 2013). These views were confirmed by one of the smaller entrants as expressed below:

> *[the] primary concern is that excluding Cell C, MTN, Vodacom and Telkom from the bidding process at the wholesale level, will severely undermine the rollout of 800 MHz and 2,6GHz spectrum and the availability of 4th generation services such as LTE at the retail level. Cell C, MTN, Vodacom and Telkom have existing physical networks in place, the financial capability, technical know-how and experience required to roll-out the 800 MHZ and 2,6GHz*

spectrum on a national basis in a relative short space of time, (NE6, submission to ICASA).

However, the same concern exists as raised by the respondents as to who will fund rural broadband networks and propose that government gets involved and make funds available even if through the universal service fund. Quite refreshing was a comment that “the concept of SMME and BEE is supported but the guys who can do this are those with a lot of money, the last thing we want is another USALs”, (PR12, 13 January 2014). It is evident as can be seen from the discussions above that there are concerns on the issue of lack of resources for new entrants and whether the new entrants have what it takes to rollout a national broadband network to meet the goal of broadband connectivity for all by the year 2020.

4.3.3 No market study conducted

IN3 stated that *the amount of competitors in the market does not determine competitiveness in the market. Internationally there is a lot of consolidation in terms of the number of sustainable operators. Optimal number is not one, there needs to be some form of infrastructure competition, otherwise there is no incentive to be competitive and to upgrade networks e.g moving from 4G to 5G.*

PR1 cautioned that *the proposal from ICASA will increase the number of operators but market study analysis is needed to determine how many to introduce into the market. If the document is implemented as is, the country might even double the number of operators.*

ICASA is introducing one new national wholesale open access operator to build a broadband network and some new regional operators. That already takes the number of national operators competing at infrastructure level closer to 10 if not more when one considers the signal distributors and Broadband InfraCo. The questions being asked by the respondents include ‘when is the number of operators enough and when should the

market be regarded as saturated. Further questions raised by the interviewees were (1) ‘on what basis did ICASA justify the introduction of new operators, (2) what was ICASA’s decision based on to increase the number of operators as no market study was done to determine the maximum number justifiable in a country with a population size of South Africa and also taking into consideration the economic environment of the country. One interviewee from policy and regulatory institutions stated that “the market study analysis is needed to determine how many operators to introduce into the market”, (PR12, 08 January 2014). Another policy and regulatory interviewee expressed his concerns already mentioned above that there are currently 4 mobile operators and yet there is lack of competition. He further asked whether the market was big enough to cater for the new entrant, (PR22, 13 January, 2014). Even though most interviewees agree that competition at service level is necessary and not so much infrastructure competition especially for rural areas, there is a concern over the fact that the wholesale open access model and the managed spectrum park models are targeting new entrants. The real issue is that the models are new in the South African environment, they introduce new operators, wholesale open access with no retail and there was no mention of government involvement. One academic interviewed stated that “ICASA has the mandate to license spectrum at a broad level but the assumption is that economic study should have been done to decide on the approach”, (AC1, 13 December 2013). Another interviewee sharing on the concern stated that “these models (wholesale open access and managed spectrum parks) are untested and complex and can only be successful through thorough discussion among all stakeholders”, (MA2, 20 January 2014). It became apparent that the operators including the industry at large would have preferred some form of pre-consultation from the regulator before the draft regulation was published so that they could debate and give input but none was made.

One interesting observation from the interviews and information gathered is that the incumbents themselves have different views in terms of

alternative approaches to the wholesale open access and the managed spectrum parks. What was even more interesting was their different views even on the amount of spectrum reasonable for an operator to be successful in rolling out an LTE network, some believe the 2X10 MHz is adequate in the 800 MHz as the band is mainly addressing coverage issues whereas others believe that given the bandwidth hungry nature of LTE and future LTE-Advanced, 2X10 will be very limited and rather 2X20 MHz will rather make more sense for operators. The regulator needs to take the lead, investigate and make those decisions in licensing hence the recommendation to do thorough investigations to assist in decision-making. These are the issues that require some form of a study so that the regulator can make informed decisions.

4.4. A look at the previous policy and regulatory landscape and future interventions

The policy and regulatory intervention is shown and analysed separately as it is not one of the themes but the backdrop under which the themes were developed. The following are regulatory issues that emerged during interviews highlighting failures including few successes by the policy maker and the regulator in assessing the market and assisting the industry.

Lack of Policy and Regulatory intervention
Inability to create a conducive regulatory environment
Regulator to relax regulatory rules

Some of the incumbents, especially the late entrants believe ICASA could do better for the industry by assisting in minimising the regulatory bottlenecks. A number of examples were discussed e.g. accessing sites and getting approvals when rolling out networks is one of the most frustrating processes for operators and it is one of the major contributing factors to the delays experienced in network rollout. Looking into the historical models for licensing spectrum, all interviewees with the

exception of one agree that there has been some progress made, though others believe more could have been achieved had the Department of Communications and ICASA managed the industry properly. One interviewee pointed out to serious policy gaps that exist making it challenging for ICASA to operate in a vacuum. Confirming this, another interviewee challenged “on what basis was ICASA going ahead [with the 2011 regulation] then as there was no policy in place. In an ideal world it is important to have some direction, policy first then regulation thereof but it is not happening hence ICASA’s action”, (NE3, 09 December 2013). An academic respondent questioned the interdependence of ICASA to DoC when according to the EC Act it is no longer a must for ICASA to implement the policy directives but rather to consider them. She stated that “things have changed since the times of the old Telecommunications Act and therefore it is strange that the policy and the regulation are managed hand in hand”, (AC1, 13 December 2013) and yet regulatory inaction affects progress within the sector.

An observation from the operators was that ICASA was not operating as one organisation; regulations that are produced and published contradict each other. An example between the Frequency Migration and the Spectrum Licensing regulation under discussion was noted. An interviewee stated that for example “Migration regulation and spectrum licensing regulation are conflicting because one is compensating for migration and the other says no compensation”, (NE1, 09 December 2013). Confirming this view another interviewee commented “ICASA is operating in silos, there is no holistic approach e.g. the regulations, the licensing models should be linked to facilities leasing and interconnection regulations, the barrier of entry is the cost of infrastructure, affordability is due to interconnection rates that were superficially increased prior to the introduction of Cell C”, (SO2, 13 January 2014). The issue of regulatory intervention to make the industry more competitive came up a lot, another interviewee stating that “if the policy goal is to facilitate infrastructure based competition, then regulation was wrong, what about creating an

enabling environment for all 4 mobile operators" (IN5, 09 January 2014). On the same issues of regulatory intervention another incumbent stated that "if the regulator could relax some of the provisions it will be easier for the incumbents to interconnect their networks without having to go through the regulatory compliance rules of charging and paying each other e.g. 56 or 92 cents etc", (IN2, 18 November 2013).

Some interviewees cautioned against creating another USAL story by licensing operators who will fail because they either do not have enough money to build the network or they do not have the technical expertise or both. One of the incumbents proposes that instead of excluding the incumbents as per the proposal, rather the alternative approach to fast track the rural connectivity would be to use the incumbents' networks and empower the new entrants to provide and compete on the level of services. One thing almost certain from the discussions though is that the incumbents will not be interested in wholesale only where they do not have to provide retail services as that is their 'bread and butter', the core of their businesses. The regulator will have to relook at the no-retail proposal or revise the regulation to cater for the provisions made by the recently published Broadband Policy (2013) e.g. have the wholesale provider as a partnership between private and public service.

4.5. Conclusion

The researcher started out with the following themes as the focal points, broadband connectivity for all, markets and competition but the number of issues as listed below were identified during the process of data collection:

i. Lack of spectrum strategy
ii. No clear definition for USA and no realistic obligations
iii. No incentives to go to rural areas
iv. Introduction of wholesale open access only and Infrastructure sharing
v. Introduction of secondary markets and spectrum sharing

vi. Introduce competition on services and encourage competitiveness
vii. Lack of resources for the new entrants to be competitive
viii. No market study conducted
ix. Create conducive regulatory environment and relax regulatory rules

These issues identified that have emerged from the data collection process will be discussed and analysed in the following chapter.

Chapter 5: Analysis: The impact of ICASA's actions on the broader communication's industry

All the data collected through interviews and information gathered from document analysis will be analysed to make sure all the sub-questions and the themes highlighted in the previous chapters have been answered. The aim of this analysis is to define concepts, categorise different types of attitudes, behaviours and finding associations amongst others, (Ritchie & Spencer, 2002). Observations will be drawn to answer the research questions and problem statement. The findings from the previous chapter will be compared with the literature reviewed and will be analysed to determine whether they try to answer the main question of this study and the sub-questions.

The main objective of the study was to analyse and understand the advantages and disadvantages of ICASA's 2011 proposed draft spectrum licensing models of wholesale open access and managed spectrum parks. As explained in the previous chapter, during the interviews it became clear that it was impractical to discuss the models exclusively without taking the broader context of the entire regulations document into consideration. What became clear was that the models were proposed within a certain background of the South African context and considering the status of the communications industry at large hence the discussions include not just the models but other aspects proposed in the regulations. As Neuman (2011, p15) observes "qualitative researchers do not narrowly focus on a specific question, but ponder the theoretical-philosophical paradigm in an inquisitive, open -ended settling-in process as they adopt a perspective". For example, the main research question for the study is to determine the extent to which ICASA's 2011 spectrum licensing models would encourage ubiquitous and high speed connectivity for South Africa. This question assumes theoretically that the proposed models would encourage ubiquitous and high speed connectivity for South Africa, but

leaves room for further exploration of the spectrum licensing models and to investigate the magnitude.

In expanding on the main question, the sub-questions attempted to get a view from the industry in terms of the impact that the proposed models will have on the broader communication industry and how they will affect technology progression. Also, regulatory impact assessment type questions were included in the interviews to deepen the understanding of the benefits to be drawn from the models as well as understanding ICASA's actions and government's intentions. The discussions below demonstrate how the themes and the issues that emerged had to be argued with the background of the entire draft regulation. The results will be analysed and interpreted under the following themes: (1) regulatory environment, (2) the behaviour of the main actors and, (3) market-based spectrum management models. Some themes and sub-themes that emerged as highlighted in the previous chapter will be added as areas for discussion and analysed against the literature reviewed.

5.1. The regulatory environment

The regulatory cycle of telecommunications reform has always been: from state entities, creation of independent regulators, privatisation of incumbent monopolies then liberalisation, whichever comes first. In all the stages, the regulator is expected to regulate the market *ex-ante* in order to protect consumers, new smaller operators and enforce universal service obligations. Once the market is fully liberalised, the expectation is that the market moves from being regulated to limited regulation and the regulator only gets involved *ex-post* to address issues of anticompetitive behaviours. The reality in a fully liberalised market is that, "regulators [still] need to maintain a prominent role because market forces often fall short of creating the conditions necessary to satisfy public interest objectives such as universal access and service", (ITU, 2011, p10). ICASA imposed USA obligations on all the big telecommunications operators and yet the country is still at less than 10% in broadband penetration. In trying to

address these market failures, ICASA proposed the introduction of wholesale open access and managed spectrum park in 2011 as modern spectrum licensing models due to limited supply which could not accommodate the demand. Amongst others one of the key issues was to address lack of broadband connectivity especially in rural areas. Baldwin, Cave & Lodge (2012) argue that the objective of regulation in a market is to address market-failures amongst others "i.e. imperfections that lead unregulated markets to perform sub-optimally relative to some social welfare function", (Joskow & Rose, 1989). As also highlighted in the literature review chapter these would also include, information failures, externalities, natural monopolies, and would require government intervention hence ICASA's action.

Almost all the participants commended ICASA for taking the first step in starting the process of licensing the highly sought after 'digital dividend' and the remaining available high demand spectrum but all raised serious concerns with the approach taken. The first issue, however was that all interviewees with the exception of some of the smaller new entrants agreed that the exclusion by the regulator of the incumbents in the process of licensing the 800 and 2600 MHz bands would be the biggest mistake for the country. The NDP (South African 2030 vision) states verbatim that "spectrum policy should favour competition, but incumbents should not be excluded from gaining access to bands they need to build networks using new technologies". GSMA (2012, p3) refers to spectrum as the "lifeblood of the mobile industry" which comes back to the point raised in the previous chapter that mobile operators might find it difficult to participate under the proposed spectrum licensing models as spectrum is one of the core assets for their businesses and key to their business models. The reality is that the incumbents have existing infrastructure that covers the majority of the population even if it is just second generation mobile voice telephony. The response from one interviewee from the policy and regulatory institutions stated that, LTE/4G technology is a natural progression from the current 2G, 3G technologies (PR22, 20

January 2014) and only the incumbent operators run those networks. Another interviewee warned against creating standalone networks (MA3, 20 January 2014) as consumers would want continuous connection even when outside LTE/4G coverage areas.

5.1.1. Policy and regulatory key events since the publishing of the 2011 regulations

The 2011 regulations around which this discussion revolves have been overtaken by events. The picture has changed since the draft was published; the WRC 12 identified the 700 MHz band as the second digital dividend to be made available in the African region for 'mobile broadband technologies'. Sentech gave back to the regulator all the chunks of spectrum in the 2600 MHz band. What this means is that the assignment plan and the approach proposed by ICASA needs serious review, instead of 3 operators that can be accommodated in the 800 MHz band now there is now a potential for at least 6 making it possible for ICASA to consider either accommodating the incumbents or more new entrants and even licensing the wholesale open access operator if need be. In view of all this it would seem like ICASA failed to act proactively in leading the industry as the regulator because when the regulations were published, it was two months away from the beginning of the world radio conference in 2012, unless there were other reasons unknown to the researcher somehow missed an opportunity to show leadership by planning the 700 and the 800 MHz bands together but continue licensing the 800 MHz to ensure that rural communities get connected. The OECD (2008) report states that "people place a higher value on a benefit that they obtain today than one they will obtain in the future", (OECD, 2008, p13). All the active participants to the ITU processes cited the anticipated WRC12 decisions regarding the 700 MHz band as one of the reasons for the 'forced' delay in finalising the licensing process. Coupled with this was political lobbying due to the exclusion of incumbents as confirmed and confessed by some of the interviewees.

Secondly the interviewees agreed that ICASA introduced the models in a vacuum as there was no policy in place which was one of the reasons cited by majority of interviewees why the regulations were not finalised. In terms of the EC Act, Section 3(1)(a) states that "The Minister may make policies on matters of national policy applicable to the ICT sector, consistent with the objects of this Act and of the related legislation in relation to the radio frequency spectrum". Section 3(3) further states:

> *No policy made by the Minister in terms of subsection (1) or policy direction issued by the Minister in terms of subsection (2) may be made or issued regarding the granting, amendment, transfer, renewal, suspension or revocation of a licence, except as permitted in terms of this Act,* (RSA, 2005).

Lastly, Section 4 states that "The Authority, in exercising its powers and performing its duties in terms of this Act and the related legislation must consider policies made by the Minister in terms of subsection (1)…". The minister published a policy directive on high demand spectrum of which 800 and 2600 MHz band are a part, a day before ICASA published the regulations on licensing 800 and 2600 MHz bands. Or put differently, ICASA published its regulation on licensing the 800 and 2600 MHz bands a day after the policy directive on high demand spectrum was published. Does this mean ICASA had considered the policy directive published by the minister before publishing its regulations? Can ICASA issue regulations where no policy or policy directive exists? The researcher has not found a section where the minister must issue policy directive regarding licensing of spectrum or a section where the Authority must act in accordance with the policy directive as was the case under the Telecommunications Act. Limpitlaw (2009) attest to this and explains:

> *ICASA, in exercising its functions and performing its duties in terms of the ECA and the related legislation, is required to "consider" such Ministerial policy and policy directions but is no longer required to act in accordance therewith. The effect of this*

formulation is that ICASA would be free to depart from such policy and/or policy directions if it felt such a course of action was in the public interest (Limpitlaw, 2009, p8) and yet ICASA seems to be failing to act independently or rather held at ransom.

5.1.2. The impact of DoC policies on spectrum regulation

The regulations have since been put on hold pending the finalisation of the policy directive on high demand spectrum. An academic interviewee during the interviews commented that it is strange that the regulation and policy are managed hand in hand and yet this is not the requirement under the ECA, (AC1, 11 December 2013). If ICASA had waited for WRC12 and given some time after the publication of the draft policy directive, would the situation be any different? It has been more than two years and to date the policy directive has not yet been finalised. The minister published a Broadband Policy at the end of 2013. Points to note that are related to the process under discussion include the following:

- Wholesale open access
- Service-based competition
- Policy directive on high demand broadband spectrum
- Public private partnership for NBN
- Roles of SOE's

Judging by the actions by the DoC and ICASA in the past two years, the expectation from the ECA on ICASA in relation to the policy directive and the Broadband Policy (2013), the licensing of the 'available high demand broadband spectrum' can only proceed once ICASA has 'considered' the final policy directive from the Minister whenever it gets published. There are good and bad consequences of the delays in licensing. The good: More bandwidth for operators is now available for higher speeds or for more operators to be licensed, whatever ICASA decides. The bad: The models were not well-thought out giving ICASA an opportunity to review and clearly define the proposed models including the proper form in which

the wholesale open access will be licensed. This was a concern raised by a number of interviewees regarding the lack of clarity on the definition of wholesale open access, one interviewee stated that “there is nowhere where WOA is clearly defined since there are so many different models of wholesale open access, no one understanding on what wholesale open access is and what model government and ICASA are introducing” (NE3, 09 December 2013). This provides an opportunity for proper coordination between mobile and fixed broadband services, coordination within all spheres of government and that government is directly involved in ensuring that even the most remote rural areas are connected through partnerships, incentives or subsidies.

5.1.3. Creating an enabling regulatory environment to improve competitiveness

Lastly, the regulatory environment in South Africa since the licensing of Cell C and Neotel was never prepared for the introduction of any new operators; even at the time when these proposed spectrum licensing models were introduced, there was no regulatory intervention to make sure that the atmosphere is conducive to introduce competition. Looking at the obligations imposed on Cell C and Neotel, they were given stiffer USO’s than Vodacom and MTN even though the duo had 10 years in existence before the introduction of Cell C and Neotel. Even though it was a known secret that Vodacom and MTN increased the interconnection rates, there was no regulatory intervention to ensure stricter facilities leasing regulations and interconnection regulations that actually favour the new smaller incumbents. Due to higher costs of telecommunications despite the introduction of competitors, ICASA was ‘forced’ by parliament to take action and the call termination rates were reduced on a glide path. Asymmetric rates were proposed favouring the late entrants when ICASA reviewed these rates at the beginning of 2014. The regulations, however, did not indicate what the relation between the wholesale open access provider and the current incumbents’ networks would be, assuming this

would be left to commercial agreements hence again that would be a big mistake. It is only time that will show to what extent these interventions will make a difference for the late entrants and consumers.

The discussions above reveal a rapidly changing technology driven regulatory landscape, they reveal a pace at which changes take place in a technology driven environment. It is important for regulators to keep abreast and consistently conduct regulatory impact assessments in order to decide whether to act or to do nothing. This data reveals that ICASA and the South African government in general lost an opportunity to diffuse ICT services earlier contributing and encouraging ICT skills training, job creation and economic growth thereby improving lives of the poor communities. Unfortunately time wasted never returns and “the effect of time on money makes a dollar received or spent today worth more than a dollar received (or spent) in the future”, (OECD, 2008, p13). Broadband Policy (2013) might address some of the government concerns and objectives if implemented properly.

5.2. Analysing the 2011 proposed models and considering other market-based spectrum management models

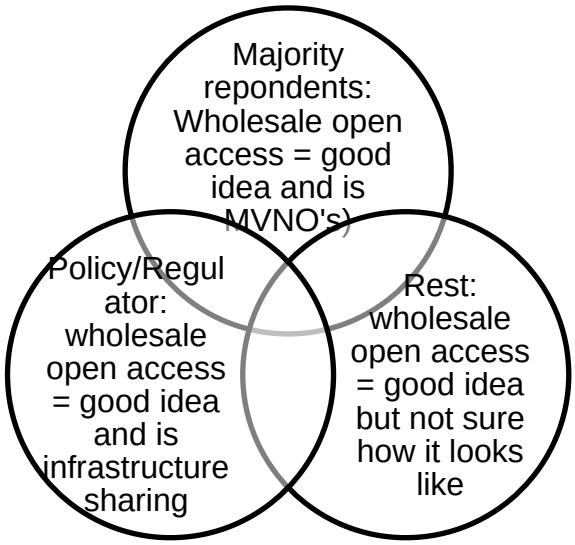
Looking at the 2011 draft regulation under discussion, ICASA proposed that a combination of beauty contest and sealed bid auction be used to assign high demand spectrum to a new entrant that will be licensed to provide wholesale only services on a wholesale open access basis. Auctions and wholesale open access models are viewed as market-based assignment and licensing mechanisms, respectively. South Africa has never in the past used these models for assigning and licensing spectrum. As highlighted in the previous chapters, the country has more than 400 ECNS/ECS licensees who require spectrum to provide services so these ‘market-based models came about as a result of demand exceeding supply in high demand bands.

5.2.1. Interpreting the wholesale open access model

The findings from the interviews reflect a huge support of the wholesale open access concept as the licensing model especially for rural connectivity. The concern though raised with ICASA's concept is the wholesale with no retail approach. However, the view is different for urban areas especially from the incumbent operators, the view is that there is enough infrastructure competition in urban areas and there is therefore no need to introduce another infrastructure operator or competitor.

Another major concern revealed by the data is the fact that there are no two operators or people who have a uniform or similar understanding of how the wholesale open access for mobile or wireless will look. There are similarities amongst operators as far as the thinking that the wholesale open access concept introduces MVNO's but the view is different from policy and regulatory institutions. The policy and regulatory institutions lean more on the infrastructure sharing concept as the form that wholesale open access will take. The OECD (2013) report refers to the fact that for LTE networks, infrastructure sharing seems to be gaining prominence and that there is no evidence where the mobile wholesale open access has been successfully implemented. The Broadband Policy (2013) unfortunately also does not give detail except encouraging wholesale open access to enable infrastructure sharing and promote service-based competition. The figure below depicts a view from the participants on the wholesale open access model:

Figure 8: Different interpretations of wholesale open access



Source: Researcher's own

In the light of this confusion, lack of clarity and dis-unity on the description of wholesale open access, there is too little unity or agreement on the structure meaning that ICASA needs to go back and do a full review of the proposed model to try and bring all these parties to at least a uniform continuous circle.

5.2.2. Evaluating the managed spectrum park model

On the issue of managed spectrum park model, the majority of operators did not give any views on the model citing concerns that the model was just introduced and not for discussion or to be used for licensing; it was deferred to a later process. The very few who commented in passing stated that the approach is similar to the existing commons or licence-exempt regime and that there might be space for it given the successes of Wi-Fi technologies. One of the incumbent interviewees alluded to the fact that "the managed spectrum parks model is no different to the current licence exempt model; the only difference is that the licensing is done on a managed basis", (IN1, 15 November 2013) with another interviewee agreeing that "managed spectrum access is the way to go as it is not a free for all", (IN2, 18 November 2013). Ohanga (2009) and Freyens (2009)

describe this model as a common band of spectrum shared privately and managed by those co-owners. At the time this model was considered it made sense to propose an approach that will facilitate as much spectrum sharing as possible within the limited supply. A number of authors (Peha (2007), Lehr (2005), Banerjee (n.d)) are even advocating for more spectrum to be made available on a licence-exempt basis citing that it encourages innovation and spectrum efficiency. There has been an ongoing debate between economists and engineers regarding licence-exempt vs exclusive licensing: whether that is still relevant with the introduction of market-based models remains to be seen. Given the events that have occurred since the publication of the draft, it is debatable whether there is still a need to consider the managed spectrum park model moving forward or a consideration rather to include the block set aside for managed spectrum park to the wholesale open access proposal given its recent prominence. Alternatively the regulator might have to review what it wants to achieve with managed spectrum parks and therefore review how it will be implemented.

5.2.3. Introducing secondary markets in addressing 'artificial spectrum scarcity'

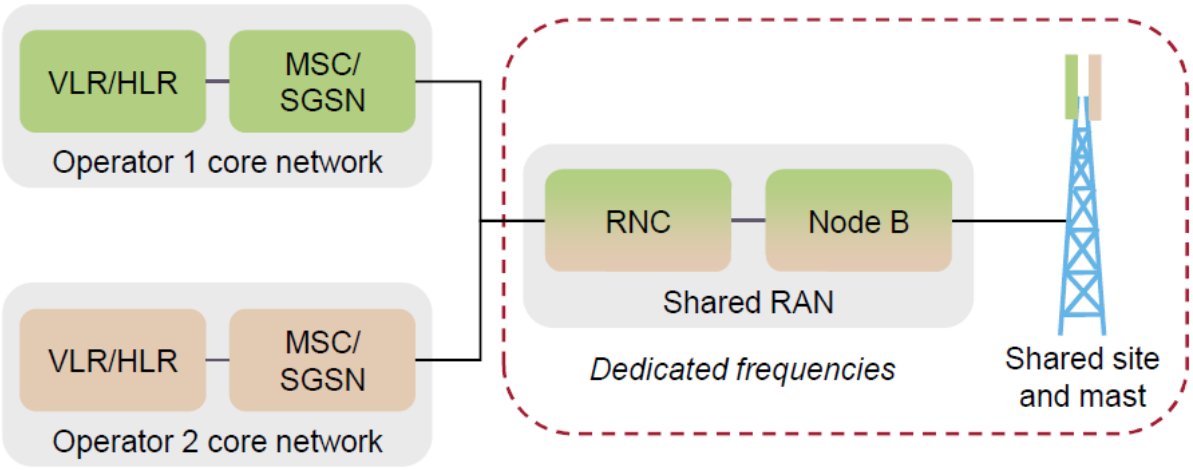
Most respondents proposed the introduction of secondary markets with the anticipated market-based spectrum management models especially since the 2011 proposal was targeting mainly new entrants with the expected failure of those new entrants to be successful and to meet the obligations imposed. Of high interest and the most popular was spectrum trading. The majority of interviewees proposed that ICASA should consider introducing secondary markets e.g. spectrum trading. One of the interviewees alluded to the fact that spectrum trading is a buy-product of auctions. The reality though is that spectrum trading can be introduced regardless of the spectrum assignment method. Cave (2002) seems to agree that a combination of auctions with secondary trading and liberalisation does amount to a genuine market-based reform. Interestingly

during the interviews, the findings revealed that the majority of operators especially the incumbents do not favour auctions and yet they support the introduction of spectrum trading. Their preference is that spectrum is assigned to those with ‘experience, technical skill and financial muscle to build’. The new entrants accept that auction is the only practical assignment method under the current situation in South Africa. How else is high demand (IMT) spectrum in cases where demand exceeds supply going to be assigned in a way that is objective, transparent and fair without using market-based mechanism which in this instance is auction. The only concern from these operators that are ‘pro-auction’ is that, it must be designed ‘properly’. McMillan (1995) explains that governments can redress past wrong doing by designing the auctions in different ways to address this, one of those being to set-aside spectrum for specific firms to bid for them. This is exactly how ICASA had proposed to run the auction; it designated the spectrum only for new entrants. From this discussion it is evident that auctions can be designed in any form that the regulator in this instance desires to achieve a specific objective and that for high demand spectrum, market-based mechanisms is the only way to assign and licence. It is also evident that operators would want to see spectrum trading made compulsory in cases where spectrum is assigned through auctions.

5.2.4. Considering infrastructure and spectrum sharing concepts

From the discussions above and considering the Broadband Policy (2013), it seems as if the regulatory view of wholesale open access lean more on operators sharing the infrastructure. The figure below illustrates a form of infrastructure sharing that even existing operators are expected to adopt by some jurisdictions when moving to less densely populated areas and is one of the forms considered as ’wholesale open access’.

Figure 9: Proposed wholesale open access model 2



Source: BIPT

The data revealed however, that ICASA has been very reluctant in fact has not taken leadership in encouraging spectrum sharing despite operators not rolling out networks in certain areas, some hoarding spectrum for a number of years and also the supply exceeding demand. This is of course with the exception of the sharing that was encouraged in the 800 MHz broadcasting channels when Neotel was licensed to share the 800 MHz band with the broadcasters. This was done in the absence of any regulation by the regulator making it difficult for this kind of sharing to take place in other bands. As one of the interviewees noted during the interviews that the draft radio regulations attempted to introduce spectrum trading but was removed in the final radio regulations document. This was another missed opportunity for ICASA to formalise secondary markets as the leasing of spectrum (a form of spectrum trading) does take place in ancillary services like alarm systems and repeater systems. This issue cannot go on unattended for longer, the regulator will have to formalise and regulate this side of the market eventually to protect smaller players and consumers.

5.3. The view and behaviour of the main actors

As highlighted in the previous chapter, the incumbent operators opposed the proposal by ICASA to introduce another competitor even though this

competitor was a wholesale open access network operator. They were also protesting against their exclusion from the process of bidding for one of the highly sought spectrum in the history of mobile technologies. Of all the participants to the study, only one interviewee clarified that, the 2011 regulations did not exclude the incumbent operators but that they were only excluded from bidding for being the wholesale providers otherwise they were allowed to get capacity from the wholesaler to provide retail services. What this meant is a change to the business model of the incumbents which became clear that they are not ready to accept. As the GSMA (2012) report explained, 'spectrum is the lifeblood of the mobile industry', without which their businesses do not exist. It became clear during the interviews that to the mobile industry, spectrum is the core asset, the most valuable of all and incumbents will do almost anything to get their hands on it. Looking closely at the reaction from the main actors, why are they opposed to the introduction of the new competitor? The argument from most interviewees especially the incumbents is that there was never a market study done to determine the maximum number of operators allowed before declaring the market saturated. One of those incumbent interviewees also stated that "there is a limited number of operators any country can sustain before it loses economies of scale, get a return on investment", (IN3, 26 November 2013). Another incumbent interviewee suggested a similar investigation by the regulator and stated that "the regulations should address the issue of the maximum number of operators". This view is confirmed by the GSMA report that "across developed markets the average number of mobile operators is 3.5 and across emerging markets the average number of mobile operators is 3.9", (GSMA, 2012, p51). The data from the interviews reveal that none of the main actors are supportive of the fact that ICASA is introducing competition which could mean that they do not want competition as this will affect their market share. The effect of their exclusion and anticipated competition was that the incumbent operators started re-farming their current high demand spectrum launching the LTE technologies ahead of

the anticipated new entrant/s. Would LTE services have been introduced at the time they were, had ICASA not published the regulation when it did and excluded the incumbents? The answer is probably not. One of the interviewees alluded to the fact that the 800 and 2600 MHz bands were meant for the rollout of LTE technologies and therefore the incumbents might delay or would have delayed the introduction of such services as they "would not want to cannibalise their existing investments in order to get their return on investment on the existing networks", i.e. 3G network, (MA1, 08 January 2014).

5.3.1. Exclusive spectrum licensing as a norm for the main actors

ICASA's mandate is to ensure efficient use of spectrum. The bulk of the currently available traditional high demand spectrum is assigned and licensed to the incumbents. What this means is that they have exclusive usage rights to these specific bands. From the literature reviewed some scholars argue that exclusive licensing limit innovation, efficiency and flexibility, they assert the 'exclusive' spectrum licensing approach is static and leads to artificial spectrum scarcity and under-utilisation, (Banerjee et al (n.d) & Lehr, 2005). With all the spectrum and obligations imposed, the main actors have failed to rollout broadband in rural areas. The findings from the interviews reveal that operators will not necessarily go to rural areas unless specifically required to do so with clearly defined specific instruction in a form of those obligations and they also expect to be incentivised. The questions of whether ICASA's actions were justified in introducing these new spectrum licensing models, whether it was a best form of action and whether the intentions were clearly defined are answered by the discussion and findings made hereafter.

It is evident from the data collected that all interviewees understood the objectives from ICASA was rural broadband connectivity and accepted by many that rural areas do not have broadband. ICASA was therefore well justified and within their rights to act the way they did otherwise the main actors would not have seen a need to start rolling out LTE though not

necessarily addressing rural broadband. What ICASA needs to do is to monitor the quality of service closely to ensure that the very poor communities do not get sub-standard voice services due to re-farmed spectrum. From the discussions, it is clear that the main actors could be either enablers or obstacles to creating a dynamic competitive market and fostering a digital country. It is up to the policy and regulatory bodies to ensure that they are always a step ahead in enforcing some of the government objectives because for commercial entities, the business is about the bottom line. However, that must be done in an informed and well investigated environment, which brings us to the next theme.

5.4. Lack of market study and no regulatory impact assessment conducted

South Africa is starting to move in the right direction exploring infrastructure and spectrum sharing models though at a very slow pace. This is the view from some of the interviewees who applauded the step taken by ICASA. One thing though that most respondents agree on is the lack of market study, research or market analysis before introducing new concepts. The incumbent operators who are active participants in the industry argue that ICASA has slowly been introducing new concepts e.g. administrative incentive pricing (AIP) for spectrum fees and now the wholesale open access and managed spectrum parks for spectrum licensing but unfortunately fails to consult properly. The argument from some is that the process of consultation has changed dramatically from the days when the country started formulating the Telecoms legislative framework post-apartheid. The process used to follow a green paper, white paper, draft legislation, public consultation then the final legislation. Now there is no longer pre-consultation during the process, ICASA publishes a draft document for consultation which most of the time seriously lacks clarity and detail. The wholesale open access and managed spectrum parks are new concepts in the South African communications environment and the effects of their implementation are

unknown but potentially huge. What this means is that they have a potential of introducing new markets and changing the business models for the operators. All the stakeholders who participated in interviews agree that the proposed spectrum licensing models were not clearly defined to an extent that operators are making their own assumptions in terms of what form the proposed wholesale open access will take. This they all do in a manner that will benefit their businesses.

5.4.1. Using RIA as an approach to conduct market studies

A number of scholars (Kirkpatrick &Parker, Radaelli, Goggin & Lauder) all agree that when a new regulation is introduced, conducting a regulatory impact assessment plays a key role in assisting governments to take evidence-based decisions. They insist on conducting a cost-benefit analysis to get an understanding of how the different players will be affected and the magnitude of those effects. In the process of assessment, clear definitions and government's intentions will be highlighted, how the different parties are affected and also identifying who the beneficiaries are. Sutherland (2010, p22) concurs that as one prepares for an impact assessment, "a detailed understanding of the economics of specific markets in order to see how the different players will be affected" is required and to determine the distribution of such effects across society. RIA assists in deciding also when the benefit to be derived from the regulation cannot justify the cost for the government action and yet the problem will still not be addressed effectively, (OECD, 2008). During the interviews, a number of respondents raised a lack of investigative or market studies and a lack of impact assessments as a concern in that ICASA's documents lack detail and clarity. One of the incumbent interviewees even alluded to the fact that as the incumbents they come across as criticising everything even in areas where ICASA is doing well because of short-circuited processes by ICASA. He insisted that they never get an opportunity to participate in the drafting stages of the regulation, the only consultation is when the draft is published which is too

late to understand the way of thinking. They are therefore forced to analyse the document in detail, critique and almost re-write the document. This view agrees with the scholars in that ICASA did not conduct any regulatory impact assessment before introducing the wholesale open access and managed spectrum park models. No form of analysis, be it social, economic or environmental was done to determine the impact on the market, its role players and consumers. The reference was also made to the fact that ICASA usually publishes a 10-page document whilst introducing an unknown concept whereas similar institutions like OFCOM (UK regulator) would normally produce 300 pages more showing the amount of detail in OFCOM's documents and the lack thereof in ICASA's documents. Interestingly though, OFCOM does policy and regulations, whilst ICASA implements policy as a regulator only, therefore the comparison is not comparing likes for likes. This view was elaborated on independently by one of the SOE's with concern also that ICASA unfortunately does benchmarking with OFCOM on the results without even researching and understanding the principles applied. Having made that observation, it still does not excuse ICASA from doing in-depth research and impact assessments before introducing new concepts and new regulations.

5.4.2. Introducing competition or enhancing competitiveness

The discussions above reveal a lack of proper research conducted by ICASA. A more inclusive process that solicits views from the industry in the drafting stages of any regulation would facilitate buy-in and faster implementation.

Secondly, the operators are concerned that no market study was conducted to decide on introducing more operators into the market be it infrastructure competition or service competition. There is no evidence that justifies ICASA's action to introduce competition. The question asked by many was, when is the number of operators enough for the market to be declared 'saturated'? Even though all agree on service competition, the

argument posed is that increasing the number of operators in the market does not guarantee competitiveness if one considers operators like Cell C and Neotel, not to mention Telkom Mobile who are finding it really difficult to significantly break MTN and Vodacom's duopoly. Cell C and Neotel have been struggling for years to break-even and Telkom Mobile with all the backbone infrastructure, financial and technical backing from Telkom is still so insignificant in the mobile market, the question is what makes ICASA think that a 'greenfield' operator will do any better. The reality though is that in South Africa there is either no real competition or competitiveness. Without having done a market study to determine the maximum number of operators that the South African market can handle, it will be unrealistic to announce upfront the acceptable number of operators in the country. As already highlighted above, the GSMA report suggests that for emerging market the average number of operators is 3.9.

The reality in the country is that those operators that came in last into the market are not finding it easy to compete, there could be a number of reasons contributing to this including lack of regulatory protection and assistance as alluded to by these operators and the new smaller entrants and as already highlighted in 5.1 above. Regulatory failure to act pro-actively is what is revealed from these discussions and what needs to be addressed moving forward.

5.5. The appropriate level at which ICASA and Government should take action

The findings from the previous chapter expose that what is more of a reality is that the incumbents are doing very little to ensure broadband connectivity for all especially outside the cities which is one of the major goals of government. The people in rural areas of this country are sitting with limited, if at all, 3G network making it impossible to access internet and emails. It was such a shocking experience during the interviews when some of the interviewees asked the question of why government would want 4G networks for rural areas in the first place. In 2014, there are

operators who do not see a need for regulator and government to see through the vision of broadband connectivity for all especially in rural areas because the people in rural areas are very poor to afford broadband services and do not have the skill to use 3G or LTE devices? This is the debate that should not even be entertained. As true as it is that majority of rural communities lack skill, the operators should rather stress the importance of government involvement in assisting with rolling out the broadband infrastructure especially to those areas that are completely under-served and to rollout projects that facilitate the training of rural communities. The debate of whether to address demand or supply regarding infrastructure for rural areas should not be entertained. The World Bank has published reports where it confirms that broadband services contribute to job creation and economic growth. For example, other countries have taken a decision to have government play a central role in bringing broadband to every citizen in their countries and have started reaping the rewards. In Korea for example, as a way of encouraging and ensuring the take-up, government embarked on awareness campaigns and training, it "set up the Internet Education to Ten Million People Project, aimed at providing IT literacy training for all citizens", (Qiang, Rossotto & Kimura, 2009, p9). Fortunately the Broadband Policy (2013) identifies illiteracy and issues of costs for gadgets as an issue that government will have to address. One of the interviewees also cited some of these issues as areas for government to address as connectivity alone will not achieve the desired outcomes; during the interviews this interviewee stated that:

> *Assigning a combination of low (coverage) frequencies with higher capacity) spectrum is one strategy to provide connectivity to both urban and rural areas. However connectivity alone does not result in the full benefit of broadband for the populace. Issues of affordability, usability, and relevant localized content are integral and should be addressed, particularly in the rural areas*, (MA2, 20 January 2014).

Germany however, still insisted on imposing the obligation on the incumbents. The German regulator auctioned the 800 MHz and imposed conditions on all three operators who managed to secure 2X10 MHz bandwidth. The condition was that the operators must rollout broadband network to 90% of the population starting with the communities who are less densely populated before moving on to the next level. All interviewees with the exception of the policy and regulatory interviewees, proposed that ICASA should consider models like the German model (GSMA, 2011) where rural connectivity is prioritised, meaning the operators start at the out-skirts and make their way into the urban areas but strictly once the minimum of 90% of the population in those areas has been covered. The difference with the ICASA proposal is that there was no new entity that was assigned spectrum; the licenses were given to the incumbent operators with the exception of one who could not be assigned as there was nothing left anyway. What ICASA might want to consider in doing the benchmarking especially with the developed countries is to ensure that they customise the approach to suit the South African environment. The level of infrastructure development in developed countries is far different from countries like South Africa so customisation will be key to address the unique environment. No one size fits all and unfortunately a number of developing countries fall into a trap of adopting policies that were established for developed countries. A number of authors (Ladegaard 2005, Kirkpatrick & Parker 2004) agree that developing countries need to customise policies to suit their own circumstances including when conducting RIA.

5.5.1. Mandatory wholesale open access for rural areas

For this country (SA), it is evident that to achieve broadband connectivity for all, wholesale open access network is necessary especially for rural areas, what needs to be investigated and defined properly is how it will be implemented, who should build the network and how. The OECD (2013) report observes that “there is little evidence to date of wholesale-only

mobile operators enjoying commercial success. Infrastructure sharing agreements appear to be gaining importance and this may be the trend in many countries for the deployment of LTE networks", (OECD, 2013, p12). The Broadband Policy (2013) might be a good start in answering some of the questions and giving guidance to ICASA on how to approach and design the wholesale open access network moving forward though the policy also does not explicitly explain how the wholesale open access model will look.

To decide on whether there are benefits in introducing the wholesale open access model or not, there is an overwhelming agreement amongst operators and the literature reviewed that wholesale open access is the way to go especially for rural areas. The respondents agree that it will be costly to implement the proposed models but the benefits especially for consumers are even bigger and the best approach is to do it faster. This touches on the regulatory decision making ability and power to act and implement without external influences be it from government, operators or any other. The regulator might want to understand the level at which to take action and the powers it has in order to be able 'regulate without fear or favour' because the inaction is costing the country and the sector even more.

5.6. Infrastructure versus service competition

Wholesale open access and Managed Spectrum Parks models trigger infrastructure sharing, infrastructure competition and service competition. There has been infrastructure competition in the country for a while to an extent that mobile operators would erect high-sites opposite each other until they started realising how costly that exercise was and so they started sharing infrastructure on their own without real intervention from the regulator or government especially the passive infrastructure. Also the roaming agreements amongst mobile operators mainly have been entered into as forms of infrastructure sharing but only until the late entrants start building their own networks. The operators have, nonetheless, been very

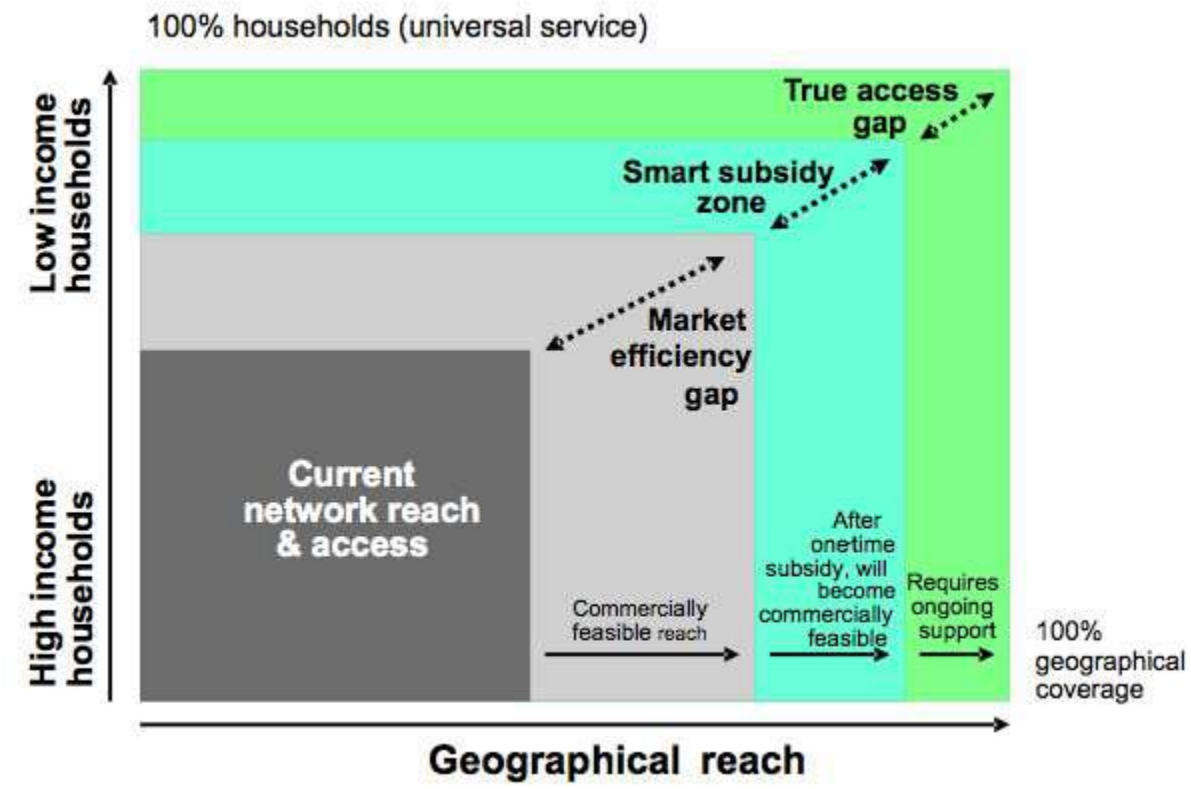
cautious on what parts of their networks are shared. Bauer, Westerveld & Maitland, (2001) encourage network sharing to reduce capital expenditure; this is particularly relevant for rural networks. From the data collected almost all operators agree that there is a need for competition on services and not so much on infrastructure. Be that as it may, one interviewee stated that, this does not mean that there should be monopoly on infrastructure, some level of competition is still necessary on infrastructure otherwise that one operator will not see a need to upgrade its network e.g. moving from 4G to 5G, (IN3, 26 November 2013). A proposal from some of the interviewees is that there should be competition even for the wholesale open access providers. This protects the country from a risk of sitting with one wholesale provider who in case of failure the whole country suffers. The trick as proposed by non-incumbents is to licence the entire spectrum to the wholesale open access provider/s to avoid other entities competing with wholesale only provider/s and with retailers. This would jeopardise the wholesale provider/s' business and whatever chances of profitability. The better alternative that Cave (2002) suggests is that "regulators should be interested in inserting competition in infrastructure as deeply as possible in the spectrum value-chain in order to sharpen commercial rivalries and promote service differentiation". For rural areas it is evident though that competition will only make business sense at the retail level and the regulator must take the lead in addressing the rest of the country. Again regulatory failure or inaction is what compromises the country more.

5.6.1. True gap analysis and using the 400+ operators to achieve 100% population coverage

In the country there are currently 400+ ECNS/ECS operators who need access to some form of high demand access spectrum for them to be able to provide wireless and/or mobile services. The spectrum to be licensed at wholesale level is very limited in terms of available bandwidth to accommodate the demand and therefore it is justified to introduce

wholesale open access model so that operators can compete on services. Innovative ways could be used to get the bulk of the smaller operators involved without crippling the industry or duplicating networks e.g. using them as service providers and competitors (encouraging consortiums) in deep rural areas or where incumbents will not go. Most of the interviewees re-iterated that the approach applied for urban and rural areas will have to be different as urban areas do not necessarily need serious regulatory intervention. Moving to semi-urban areas, the approach might be a bit different and might require a mild push from the regulator then up to the deep rural areas where no infrastructure exists. This is where government needs to take over and ensure the infrastructure is built and make services available at a minimum or no cost to communities. A proper needs analysis and coordination from all stakeholders is necessary to ensure that the market addresses those gaps that can easily be accommodated by the market so that the true-access gap is clearly defined. This maximises on the available resources and minimises duplication to help keep costs down to a minimum. The diagram below depicts how a coordinated approach could encourage inclusive broadband connectivity.

Figure 10: Different levels to address geographic reach



Source: Intelecon, 2009.

The smart subsidy zone and the true access gap both require government funding and this is the main focus of government and is what ICASA is trying to address with the introduction of the wholesale open access models. The issue of funding is a major concern raised by the all those interviewed as the commercial operators will not willingly rollout in rural areas unless there is some form of an incentive or government subsidy. As one of them indicated, ‘money follows infrastructure’. What has not been discussed and considered is addressing the true access gap using other means, other than terrestrial networks. From the data collected, it became clear that this is not one of those areas that government or private sector can drive on their own. It became evident that government and private sector need to get together to address this part of the market regardless of the selective objections and proposed approach from some incumbents. Considering the discussion and the explanation as depicted

by the diagram above, neither private sector nor government can afford to duplicate infrastructure in rural areas so a coordinated approach is the only way to apply so as to avoid wasting the limited resources. The wholesale open access and managed spectrum park models will therefore not encourage ubiquitous and high speed connectivity on their own. An inclusive approach that brings private sector with government has to be adopted to achieve government objectives of broadband connectivity for all.

5.7. Lack of involvement of SOE's

The discussion under this topic is not necessarily highlighted as one of the themes but rather an area for consideration in reviewing and revising the 2011 regulations. As previously highlighted, the 2011 proposed regulation assigned some spectrum in the 800 MHz band to Sentech to build the wholesale open access network. Sentech has since returned the entire high demand spectrum that was licensed to them due to high spectrum fees costs. During the interviews almost all interviewees with the exception of an academic, state entities and policy institution mentioned the lack of involvement of the state owned entities. One interviewee from the policy and regulatory institutions stated that it was unfortunate that there was no government-owned operator that could be mandated to rollout the broadband network in rural areas, (PR12, 13 January 2014). Another concern and confusion is why Broadband InfraCo is not at the centre of 100% broadband connectivity in the country and yet it was created to ensure that the country achieves national broadband coverage. One academic also raised this concern that rolling out in rural areas will be expensive and given the issues of costs, what was the role of Broadband InfraCo given that they were formed to assist with broadband connectivity, (AC1, 06 December 2013).

Given Sentech's track record, financial burdens, negative publicity, DTT focused priority and their inability to provide broadband services in the past, it was no surprise that eventually they returned the spectrum back to

ICASA hence the sceptics from the majority of the interviewees. This does not necessarily mean that Sentech is completely out of the game, there have been talks of SOE's getting involved as key players in the broadband wholesale open access network from some of the interviewees, but it is currently not clear what role they will play, if at all, in making sure the government's objective is achieved. After all, everyone agrees that government's goal of broadband connectivity for all can only be achieved through partnership between government and private sector. None of these institutions can do it alone and that has been proven in the past with Telkom's exclusivity period and the mobile operators, Vodacom and MTN who are making their profit from voice services hence no urgency to ensure national 3G data coverage whilst consumers sit with substandard data network quality even in urban areas.

5.8. Conclusion

The chapter attempted to analyse the data from interviews, providing a better understanding of the advantages of introducing wholesale open access and managed spectrum parks as spectrum licensing mechanisms. This was done contrasting the views from data collected and literature reviewed. New themes that emerged were discussed together with some of the themes from the previous chapter. The analysis reveals that the benefits of the proposed spectrum licensing models outweigh disadvantages of not introducing them even though they may not achieve the objective on their own; other aspects will have to be incorporated. Concluding remarks on key issues that arose and recommendations for consideration by the regulator will be done in the next chapter.

Chapter 6: Conclusion: Regulating spectrum for a digital country needs dynamic thinking and mechanisms

The radio frequency spectrum is generally referred to as a 'scarce resource'. This depends on who you are talking to, an economist or an engineer. Engineers believe exclusive licensing creates 'artificial scarcity' whilst economists want to protect the huge initial investments on networks and therefore pro-exclusivity. Traditionally spectrum was regulated to avoid interference, to ensure different services are accommodated (e.g. mobile, broadcasting, maritime etc.) and consumer protection amongst others. The wider liberalisation and arrival of digital technologies present benefits and challenges i.e. digital technologies are more spectrum efficient but are also more bandwidth hungry and there are more competitors for the limited available spectrum. Regulators face an even bigger challenge of regulating for the digital signal.

Spectrum regulation in the 21st century is about access to digital services e.g. broadband and digital broadcasting services. The regulators have a responsibility to allocate spectrum 'equally' amongst these digital services and taking into consideration, existing infrastructure, what consumers want and value most but also what is needed to grow the economy. To achieve an all-inclusive digital country, a collective approach to spectrum regulation that combines market-based mechanisms with the traditional command and control is the only way because it has been proven that markets alone cherry-pick lucrative areas and command and control results in hoarding of spectrum. For countries and regulators to bring digital services e.g. 100% broadband coverage and digital broadcasting to its citizens, spectrum regulation remains at the fore-front and an enabler. The markets have proved that they will rollout networks and provide services in areas that are more economically viable and will not voluntarily go to areas where affordability and skill is a challenge. In identifying this challenge in a digital era, the regulator needs to regulate spectrum, (including defining the exact frequency bands), in a way that addresses

the true-access gap bringing e-services to at least closer to 100% population coverage.

It also became clear that the market on its own will not address government goal of greater broadband inclusivity. As part of the evidence-based decision making required by a RIA process, regulators need to do close investigation and monitoring of the industry to understand the problem they are trying to solve and how best to solve it. A cost-benefit analysis of any intervention will assist in determining the consequences of the regulatory action and impact on the affected players. In understanding the gaps, the regulator will act from a well-informed position cushioning itself from any form of regulatory capture or litigation and will help realise that the markets need a push to fulfil some of their obligations.

It is important also to note and realise that spectrum alone will not bring a digital country; a more coordinated all-inclusive technology neutral approach is required. This involves bringing copper and fibre network operators, mobile network operators and satellite network operators together including infrastructure of SOE's; to interconnect these networks for broader coverage and capacity. Also encouraging the markets to be competitive by removing regulatory bottle necks e.g. interconnection, facilities leasing, allowing secondary markets and rights of way will assist innovation thereby contributing to the digital country.

6.1. Concluding remarks and recommendations for decision-making

This chapter will draw from the arguments and findings in other chapters and recommendations will be made including the way forward. The chapter reflects on the critical issues that came out from the previous chapter as they relate to the main research question. The main research question in the study is to determine the extent to which the wholesale open access and managed spectrum park as licensing models would encourage ubiquitous and high speed connectivity for all.

It was highlighted in the previous chapters that the difficulty experienced by the broader electronic communications industry was the introduction of market-based spectrum management models that were not work-shopped and no evidence shown to justify the action. It became clear that a regulatory impact assessment or any form of a market or baseline study is necessary for any regulatory intervention that changes the market structure and business models.

The discussions from the analysis chapter also revealed a lack of consistency, lack of decision making ability and will-power to embrace progression (e.g. secondary markets) by the regulator. Given the realities of evolving technologies demanding more spectrum and limited spectrum supply to accommodate the demand, it is evident that the South African communications environment will only be satisfied through innovative and flexible regulatory mechanisms. The deliberations below touch on issues for consideration as a step to make some of these issues a reality, areas for improvement as well as the way forward.

6.2. Making RIA a permanent process in decision making

The regulatory impact assessment has become part of the process of developing regulations in developed countries and a number of developing countries have also started adopting a RIA approach. ICASA is nonetheless lagging behind in terms of adopting RIA despite the country having documented guidelines. For the regulator to gain credibility within the industry and to produce well-thought, easy to understand regulations, it is important to embrace and internalise the culture of conducting research and assessment studies. This process needs to be inclusive starting with well-directed, well-researched and pro-active policies from government. The process of RIA in itself entails consultation, and all relevant and affected stakeholders need to be part of the process. What this means is that the process of RIA should not only be adopted by the regulator, a coordinated approach between the policy-maker and the regulator is important.

6.3. Seizing opportunities in a rapidly changing digital landscape

The communications environment is a highly paced technology driven industry such that it becomes a challenge for policy and regulations to remain relevant. Approaches to regulation in the 21st Century need to be flexible in a way that encourages progression; the policies and regulations therefore should be easily adjustable for technologies of the day. It is also important for the regulator to remain flexible by embracing disruptive technologies that are introduced so that it doesn't stay rigid such that it misses opportunities to get ahead. For these disruptive technologies to flourish, the regulator should allow and introduce secondary markets e.g. spectrum trading, spectrum leasing. For example, as explained previously, ICASA approved the use of 'white spaces' by Neotel in the 800 MHz band, but did not expand or allow such practices to other bands, services and areas. There are a number of interests from the smaller new entrants to provide services outside the golden triangle and there are already pilot projects using 'white spaces' in the broadcasting channels. ICASA should investigate the availability of these white spaces post the digital migration and their existence outside the broadcasting channels as an example. In some instances it becomes difficult for the regulator to determine whether it needs to regulate a certain sector and technology, this is one of those instances that the regulator should assess the advantages and disadvantages of regulating versus not regulating. And lastly, it is a fact that the available high demand spectrum will never be enough to accommodate the current supply, it is therefore important for ICASA to forge ahead and seize the opportunities that the market-based spectrum management models unveil.

6.4. Firm behaviour: An enabler or an obstacle

The issue of broadband connectivity for all will remain a dream unless ICASA is prepared to be unpopular with the industry especially the main actors. ICASA cannot try to satisfy everyone whilst everyone gets frustrated in the process. It has been revealed by the data collected that

operators will not build infrastructure in rural areas unless a drastic step is taken by those in power and it is therefore ICASA's responsibility to take radical measures to ensure broadband services are brought to the people with or without the main actors in the sector. This is the investigation and decision that ICASA will have to take eventually but the action should be sooner than later otherwise the spectrum economic value is lost. However, ICASA needs to create a conducive environment for the operators to be competitive in order to force operators to be innovative. For commercial entities, it is business as usual and it is about shareholder interests whilst the majority of the citizens remain in the dark.

6.5. Clarify the regulatory view of wholesale open access and spectrum sharing

The previous chapters discovered that under the context of this research wholesale open access and infrastructure sharing are described in a way that implies that the introduction of wholesale open access means infrastructure sharing. However the 2011 spectrum plan and ITA did not explicitly promote or even propose infrastructure sharing and the interviews revealed different interpretations including MVNO's. This kind of confusion in the definitions of wholesale open access and managed spectrum parks including how they can be implemented is what is creating havoc and will continue to do so until the concepts are properly defined and reasons document produced for the chosen interpretation. It is common practice that ICASA publishes a reasons document when publishing a regulation to explain its interpretation and the reasons for its decisions. These concepts (wholesale open access and managed spectrum park) seemed to have gained some prominence in as far as rural networks are concerned and not so much for the rest of the country. This is mainly due to the understanding that these models encourage infrastructure sharing. ICASA must use that to the advantage of those poor rural communities and make infrastructure and spectrum sharing compulsory moving forward especially when licensing high demand

spectrum with the intention to connect rural communities. This will assist to minimise network rollout costs for operators which will reduce service costs for consumers.

Spectrum sharing on the other hand; is not a popular topic especially in the commercial environment. Co-existence in the same channels in the same area was never an option, for technical reasons, e.g. interference. Spectrum has always been allocated to specific services and assigned exclusively to operators. Technology is advancing and engineers are experimenting with dynamic spectrum access technologies using cognitive radio. During the interviews, one of the interviewees suggested spectrum pooling as one of the spectrum sharing models that could be experimented with, coupled with white spaces as they go hand in hand with cognitive radio. ICASA has started supporting pilot projects on white spaces but it is important to ensure coordinated and all-inclusive efforts so that the benefits are realised sooner.

The regulator can do a lot with the concept of ‘managed spectrum parks’ as a form of spectrum sharing although it is not clearly defined as yet. From the literature, the managed spectrum parks are meant to take a form of open access for a private user group with limited regulatory intervention. Some of the authors are advocating for increased bandwidth in licence-exempt bands, why not consider either limiting or eliminating the part of management on spectrum parks. This will increase bandwidth in lucrative bands where research and development could be encouraged as was achieved with Wi-Fi technology. In reality, it is the regulator that can determine what impact such an approach will have; whether it assists the country achieve the goal of broadband for all.

6.6. Analyse capacity requirements for rural areas.

The Broadband Policy that was published at the end of 2013 introduced ambitious broadband targets and yet is not giving a comprehensive view and approach of the implementation. Nonetheless, this is where the

regulator should apply an all-inclusive technology neutral regulatory strategy to foster implementation. For this strategy to make sense, an analysis of the smart subsidy zone and the true access gap needs to be done so that licensing is carried out with an understanding of the background. This understanding makes it possible for the regulator for example to choose a satellite operator over a fibre network operator for deep rural coverage. The one size fits all kind of approach and ambition does not work and tends to deny rural communities access to ICT services using cost efficient, technically feasible alternatives. The example here is that the 450 MHz band is one of those bands identified for possible future broadband services in rural areas due to its propagation characteristics. Of concern with the band is the amount of bandwidth available for broadband, the availability of end user equipment then comparing the cost of deployment of broadband in the band in rural area versus using alternative technologies e.g. satellite. The issue raised during the interviews by one operator was that the demand-side priorities are not defined e.g. e-health, e-education, e-government etc. to determine the appropriate technology and therefore the capacity requirements. These are the kind of engagements that the regulator should have with all the relevant stakeholders to define the problem clearly and then come up with realistic mechanisms to address the problem otherwise ubiquitous and high speed broadband coverage may never be achieved.

6.7. Conclusion

Throughout the discussions, the investigation was whether the main question and sub-questions are being answered. In concluding the issue, the main question has been answered despite limitations which will be highlighted below. The wholesale open access and managed spectrum park spectrum licensing models will assist government and the country to achieve ubiquitous and high speed connectivity, however, not on their own; a number of other issues need to be factored in. An example of this, is, defining and understanding the problem to be solved (conducting RIA),

defining and describing the models clearly (MVNO's, infrastructure sharing or any other), licensing now or later, licensing new entrants, incumbents or PPP's and creating a conducive technology neutral regulatory environment. These are amongst the top critical issues to be addressed when implementing ICASA' 2011 spectrum licensing models otherwise ICASA's regulation process will forever be challenged.

The sub-questions have also been answered in the sense that it is highlighted that none of the government objectives can be addressed without a coordinated approach with all the affected stakeholders taking into consideration the regulators' mandate. The questions were grouped under different themes of universal service and broadband connectivity, technology and digital era, competition and lastly policy and regulatory. On the questions of universal service and broadband, the analysis shows that the traditional spectrum assignment and licensing models have introduced the basic infrastructure but resulted in hoarding and artificial spectrum scarcity. However, the market-based spectrum management models will assist government and the regulator in addressing issues of low broadband connectivity but not on their own. Creating standalone networks with these models will affect 4G rollout unless the regulator designs the licensing in a way that either involves the current networks or at least enforces access to existing networks through regulatory intervention. Again it is a question of coordination amongst the affected stakeholders and employing a technology neutral, all-inclusive national network rollout.

The critical areas in the RIA investigative questions were addressed in the sense that, the stakeholders do agree that ICASA is justified to act and the introduction of the 2011 spectrum licensing models is the best form of action. The issues of demand versus supply had to be addressed, nevertheless the regulator failed to make a thorough investigation and consultation of the affected parties. The affected parties were identified and the basic effects discussed though they could not be quantified. The

participants to this study could not really identify alternative spectrum licensing models to address rural connectivity other than the proposed ‘sharing’ models; they agree that for rural connectivity a form of infrastructure sharing is the only cost-effective and sensible model. The issues of compliance and technicality of the models can only be properly defined once clarity has been given and stakeholders have managed to gain some comfort and understanding of the proposal.

The limitations though with the study were a lack of understanding by the interviewees of the differences between spectrum assignment models and spectrum licensing models. For example, in asking for alternative spectrum licensing models, interviewees would refer to auctions as licensing models and yet they are assignment models. In any case this made for an interesting engagement and debate getting to the common level with the interviewees. One of the main limiting factors was limited availability of academic journals researching some of the critical areas of this study e.g. ‘wholesale open access for mobile’ and ‘managed spectrum park models’. Another limitation was the reluctance from the participants to divulge costs related with rolling out a national network in order to make an estimate and comparison with rolling out a national broadband network as a result the table on costs that was meant to quantify costs was not used. The direct involvement of the interviewees with the project made for a possibility of subjective participation with an objective of influencing the regulatory end result but literature reviewed was used to confirm some of the views.

REFERENCES

AESMO, (2006). *Spectrum Management*. Title page lost. Army Electromagnetic Spectrum Management Operations. Headquarters, Department of the Army. Washington D.C.

Anderson, J.D. (2006). *Qualitative and quantitative research*. Superintendent of Schools. Imperial COE.

Babbie, E., & Mouton, J. (2004). *The practice of social research.* Cape Town: Oxford University Press.

Baldwin, R., Cave, M., & Lodge, M. (2012). *Understanding Regulation. Theory, Strategy, and Practice (*2nd ed). Oxford University Press.

Banerjee, S., Mishra, A., Brik, V., Shrivastava, V., & Bahl, V., (n.d). *Towards An Architecture for Efficient Spectrum Slicing*. University of Wisconsin-Madison: Microsoft Research

Bauer, J.M., Kwon, Y & Wildman, S.S. (2006). *A Framework for Determining the Optimal Mix of Spectrum Management Regimes. Ministry of Information and Communication*. Korea

Bauer, J.M., Westerveld, J.R. & Maitland, C.F. (2001). *Advanced wireless communications infrastructure:* Technical, economic and regulatory conditions of UMTS network deployment. Delft: Technische Universiteit Delft.

Berec. (2011). *Berec report on 'open access'*. Body of European Regulators for Electronic Communications.

BIPT. (2012). Communication Of The BIPT Of 17 January 2012 Containing Guidelines For Infrastructure Sharing. Brussels.

Blackman, C., & Srivastava, L. (2011). *Telecommunications Regulation Handbook*. The World Bank. InfoDev. ITU.

Bondelind, L., Brito, P., & Tan, Z. (2007). *A Manufacturers' Perspective to Spectrum Management.* Huawei Technologies.

Bowen, G.A. (2009). *Document Analysis as a Qualitative Research Method*. Western Carolina University

Boylaud, O. and Nicoletti, G. (2000). *Regulation, Market Structure and Performance in Telecommunications.* OECD Economics Department Working Papers, No. 237, OECD Publishing.

Brito, J. (2007). *The Spectrum Commons in Theory and Practice*. Stanford Technology Law Review.

Buddhikot, M.M. (2007). *Understanding dynamic spectrum access: Models, Taxonomy and challenges*. In Proceedings of IEEE DySPAN. Dublin.

Carp, D., Dunogue', J., & Murakami, T. (2002). *Convergence Spectrum Management Policy & Licensing Approaches Recommendations*. Global Business Dialogue on Electronic Commerce.

Cave, M. (2002). *Review of radio spectrum management*. An independent review for Department of Trade and Industry and HM Treasury, London.

Cave, M. (2005). *New spectrum-using Technologies and The future of spectrum management*: The European Perspective.

Cordova-Novion, (2007). *Evaluating The Impact Of Regulations And Regulatory Policies On The Private Sector*. Jacobs and Associates.

Crandall, R.W. (2003). Broadband Communications. Preliminary Draft of a Chapter in: Cave, M.E., Majumdar, S.K. & Vogelsang, I. eds., *The Handbook of Telecommunications Economics*, Vol. II, North-Holland.

Creswell, J.W. (2002). *Research Design: Qualitative, Quantitative and Mixed Approaches.* University of Nebraska. London: Sage Publications.

Creswell, J.W. (2003). *Research Design: Qualitative, Quantitative and Mixed Approaches*. 2nd Edition. University of Nebraska. London: Sage Publications.

Department of Communications. (2010). National Radio Frequency Spectrum Policy. *Government Gazette*. Volume 306. No. 33116/33119.

Department of Communications. (2012). *Making South Africa a Global Leader in Harnessing ICTs for Socio-economic Development*. Broadband Presentation. Ministry of Communications.

Falch, M. & Henten, A. (2010). Public Private Partnerships as a Tool for Stimulating Investments in Broadband. *Telecommunications Policy 34*, p496-504. Center for Communication, Media and Information Technologies (CMI), Department of Development and Planning, Aalborg University Copenhagen, Denmark.

Faulhaber, G. R., & Farber, D.J. (2002). *Spectrum Management: Property rights, markets and the commons.* Working paper 02-12.

Firth, L. & Mellor, D. (2005). Broadband: benefits and problems. *Telecommunications Policy 29*. Department of Information Systems. University of Melbourne. Australia.

Foster, M. (2011). *Radio Frequency Spectrum Management.* ICT Regulatory Toolkit. Module 5. ITU. InfoDev.

Freyens, B. (2009). A Policy Spectrum for Spectrum Economics: *Information Economics and Policy*.

Freyens, B. P. (2010). Shared or exclusive radio waves? A dilemma gone astray. *Telematics and Informatics 27*. p293–304. School of Economics, University of Wollongong, Australia.

Frisanco, T., Tafertshofer, P., Lurrin, P. & Ang, R. (2008). Infrastructure Sharing and Shared Operations for Mobile Network Operators From a Deployment and Operations View. *IEEE.*

Glass, G.V. (1976). *Primary, Secondary, and Meta-Analysis of Research. American Educational; Research Association*. Educational Researcher, Vol. 5, No. 10. p. 3-8.

GSMA. (2012). *Licensing to support the mobile broadband revolution*. A Report for GSM Association. Competition Economists Group.

Given, J. (2010). Take your partners: Public private interplay in Australian and New Zealand plans for next generation broadband. *Telecommunications Policy*. Swinburne University of Technology, Melbourne, Australia.

Goddard, W. & Melville, S. (2001). *Research Methodology*: An introduction: (2nd ed). Juta and Co. Ltd.

Goggin, I. & Lauder, G. (2008). *Review of the Operation of Regulatory Impact Analysis*. Department of the Taoiseach. Dublin.

Goodman, E. P. (2009). Spectrum Auctions and the Public Interest. *Telecomm. & High Tech*. L. Vol. 7.

GSMA. (2011). *Case Studies for the Award of the 700MHz/800MHz Band*: Germany. AETHA.

Hahn, R.W., Burnett, J.K., Chan, Y.I., Mader, E.A., & Moyle, P.R. (2000). Assessing the Quality of Regulatory Impact Analyses. *Aei-Brookings Joint Center For Regulatory Studies*. Working Paper 00-01.

Hennink, M., Hutter, I. & Bailey, A. (2011). *Qualitative research methods*. SAGE Publications Ltd. London.

Hodge, J. (n.d). *Universal Service through Rollout Targets and Licence Conditions*: Lessons from Telecommunications in South Africa. School of Economics, University of Cape Town.

http://www.broadbandstats.co.za/

http://europa.eu/about_eu/countries/member-countries/germany/index_en.htm accessed on 30 September 2013.

http://www.nbnco.com.au/industry/service-providers.html accessed on 30 September 2013.

http://www.statssa.gov.za/

http://www.techcentral.co.za/telkom-sheds-more-fixed-lines/41111/ accessed on 27 September 2013.

http:// www.worldbank.org/countries/

ICASA. (2010a). ICASA Monitoring Report. 450MHz – 470MHz Consolidated Audit Report.

ICASA. (2010b). Regulations regarding standard terms and conditions for Individual Electronic Communication Licences under Chapter 3 of The Electronic Communications Act, 2005 (No. 36 of 2005). *Government Gazette.* Volume 523. No. 33294.

ICASA. (2011a). Radio Frequency Spectrum Regulations. *Government Gazette.* Volume 549. No. 34172. Government Printers. Pretoria

ICASA. (2011b). The 800MHz and 2.6 GHz Draft spectrum Assignment Plan In Terms of Section 31(1) of the ECA and Regulations 3 and 7 of The Radio Frequency Spectrum Regulations of March 2011. *Government Gazette*. Volume 558. No. 34872. Government Printers. Pretoria

Intelecon (2009) in Blackman, C., & Srivastava, L. (2011). *Telecommunications Regulation Handbook*. The World Bank. InfoDev. ITU.

ITU. (2011). Legal and Institutional Framework. Module 6. *ICT Regulatory Toolkit*. InfoDev. Downloaded 05 January 2011.

ITU. (2012). *The Impact of Broadband on the Economy*: Research to Date and Policy Issues. Broadband Series.

ITU. (2013). *The State of Broadband 2013*: Universalizing Broadband. Broadband commission. UNESCO.

ITU-R. (2010). Guidance on the Regulatory Framework for National Spectrum Management. ITU-R SM 2093-1. ITU.

Jacobs, S. (2006). *Current Trends in Regulatory Impact Analysis*: *The Challenges of Mainstreaming RIA into Policy-making*. Jacobs and Associates. The International Trade Center.

Jensen, M. (2011). *Broadband in Brazil: A Multipronged Public Sector Approach to Digital Inclusion*. Washington, D.C: infoDev / World Bank.

Joskow, P.L. & Rose, N.L. (1989). The Effects of Economic Regulation. *Handbook of Industrial Organization*. Volume II. Massachusetts Institute of Technology. Elsievier Science Publishers.

Kelly, T. & Rossotto, C.M. (2012). *Broadband Strategies Handbook*. Washington, D.C: infoDev. World Bank.

Kim, Y., Kelly, T. & Raja, S. (2010). *Building Broadband*. *Strategies and Policies for The Developing World*. InfoDev. WorldBank.

Kirkpatrick, C. & Parker, D. (2003). *Regulatory Impact Assessment: Developing its Potential for Use in Developing Countries*. Centre on Regulation and Competition, Institute for Development Policy and Management, University of Manchester. UK.

Kirkpatrick, C. & Parker, D. (2004). *Regulatory Impact Assessment and Regulatory Governance in Developing Countries*. Centre on Regulation and Competition, Institute for Development Policy and Management, University of Manchester. UK.

Kruger, L. G. (2013). *The National Broadband Plan Goals: Where Do We Stand?* Congressional Research Service.

Kushida, K. & Oh, S. (2006). *Understanding South Korea and Japan's Spectacular Broadband Development*: Strategic Liberalization of the Telecommunications Sectors BRIE Working Paper 175.

Ladergaard, P. (2005). *Improving Business Environments through Regulatory Impact Analysis* - Opportunities and Challenges for Developing Countries. World Bank.

Leedy, P.D., & Ormrod, J.E. (2005). *Practical Research: Planning and Design.* (8th ed,) Pearson Education International: Prentice Hall.

Lehr, W. (2005). *The Role of Unlicensed in Spectrum Reform.* Massachusetts Institute of Technology.

Lehr, W., Sirbu, M. & Gillett, S. (2006). *Broadband Open Access*: *Lessons from Municipal Network Case Studies.*

Levine, J. H. (1996). *Introduction to Data analysis*: *The Rules of Evidence.*

Limpitlaw, J. (2009). *Global Telecommunications law and practices.*

Marshall, M. N. (1996). *Sampling for Qualitative Research*. Oxford University Press.

Lunsford, T.R & Lunsford, B.R. (1995). The Research Sample, Part I. Sampling. *Journal of Prosthetics and Orthotics*, Volume 7, Number 3. Research Forum.

McMillan, J. (1994). *Why Auction the Spectrum?* Telecommunications Policy. Graduate School of International Relations and Pacific Studies. University of California. USA.

Merriam, S.B. (2002). *Qualitative Research in Practice*. *Examples for discussion and analysis*. 1st Edition: Jossey-Bass. San Fransisco.

Miedema, T. (2011). *Trends in Telecommunication Reform*. Enabling Tomorrows' Digital World. ITU. Geneva.

Neuman, W.L. (1997). *Social Research Methods: Qualitative and Quantitative Approaches*. 3rd Edition: Boston: Pearson.

Neuman, W.L. (2011). *Social Research Methods: Qualitative and Quantitative Approaches*. 7th Edition: Boston: Pearson.

Nolan, D. (n.d). *Spectrum Policy: Regulation and Markets*. Commission for Communications Regulation.

Northfield, D. (2011). *Russia's Open Access Path to LTE*. Tolaga Research.

OECD. (1997). *The OECD Report on Regulatory Reform Synthesis*. Paris

OECD. (2008). *Introductory Handbook for Undertaking Regulatory Impact Analysis (RIA)*. Version 1.

OECD. (2009). *The Role of Communication Infrastructure Investment in Economic Recovery*. Directorate for Science, Technology and Industry.

OECD. (2013). *Broadband Networks and Open Access*, OECD Digital Economy Papers, No. 218, OECD Publishing.

Ohanga, M. (2008). *Proposals for operation of the Managed Spectrum Park in the 2.5 GHz band.* Radio Spectrum Management. Ministry of Economic Development. New Zealand.

Ohanga, M. (2009). *Managed Spectrum Park*: Park Rules. Radio Spectrum Management. Ministry of Economic Development. New Zealand.

Oliver, C. (2009). *Toward Universal Broadband Access in Australia*. Department of Broadband, Communications and the Digital Economy, Government of Australia.

Oliver, C. (2012). *Toward Universal Broadband Access in Australia*. Department of Broadband, Communications and the Digital Economy, Government of Australia.

Ovum. (2009). *Broadband Policy Development in the Republic of Korea*. Ovum Consulting. A Report for GICT. World Bank.

Peha, J. M. (2007). *Emerging Technology and Spectrum Policy Reform*. Carnegie Institute of Technology. ITU Headquarters, Geneva.

Peha, J. M. (2008). *Sharing Spectrum through Spectrum Policy Reform and Cognitive Radio*. Research Showcase 1-1-2008. Carnegie Institute of Technology.

Prince, M. (2004). *Spectrum Management Issues Ocean Science Community*. UNOLS office.

Qiang, C. (2010). *Broadband Infrastructure Investment in Stimulus Packages*: Relevance for Developing Countries. World Bank. Washington DC.

Qiang, C., Rossotto, C. & Kimura, K. (2009) '*Economic Impacts of broadband*', Chapter 3 in World Bank (2009) Information and Communications for Development: Extending Reach and Increasing Impact, World Bank, Washington DC.

Radaelli, C.M. (2003). *Getting to Grips with the Notion of Quality in the Diffusion of Regulatory Impact Assessment in Europe*. Regulatory Impact Assessment: Strengthening Regulation Policy and Practice. Bradford University.

Republic of Kenya. (2013). *The National Broadband Strategy For Kenya*. Ministry of Information and Communication.

Republic of South Africa. (2000). Independent Communications Authority of South Africa Act. No. 13 of 2000. *Government Gazette*. Pretoria. Government Printers.

Republic of South Africa. (2001). Telecommunications Amendment Act. No. 64. *Government Gazette*. Pretoria. Government Printers.

Republic of South Africa. (2005). Electronic communications Act. No. 36 of 2005. *Government Gazette*. Pretoria. Government Printers.

Republic of South Africa, (2012). *Guidelines for the Implementation of the Regulatory Impact Analysis/Assessment Process in South Africa*. The Presidency.

Republic of South Africa, (2011). National Development Plan: Vision For 2030. National Planning Commission. The Presidency.

Resolution 224 (2007). Final Acts. WRC-07. World Radiocommunication Conference. Geneva.

Resolution 154 (2012). Final Acts. WRC-12. World Radiocommunication Conference. Resolution 154. Geneva.

Ritchie, J. & Lewis, J. (2003). *Qualitative Research Practice*. *A Guide For Social Science Students and Researchers*. SAGE Publications. London.

Ritchie, J. & Spencer, L. (2002). *Qualitative Data Analysis for Applied Policy Research.* In The Qualitative Researcher's Companion.

Rocco, T.S., & Plakhotnik, M.S. (2009). *Literature Reviews, Conceptual Frameworks, and theoretical Frameworks*: Terms, Functions, and Distinctions. *Human Resource Development Review 8* (1) p120-130.

Rodrigo, D. (2005). *Regulatory Impact Analysis in OECD Countries*. Challenges for developing countries. Dhaka, Bangladesh.

Roemer, F., Zhang, J., Haardt, M., & Jorswieck, E. (2010). *Spectrum and Infrastructure Sharing in Wireless Networks*: A Case Study with Relay-Assisted Communications.

Rosston, G.L. & Steinberg, J.S. (n.d). *Using Market-Based Spectrum Policy to Promote the Public Interest*.

Roetter, M.F. (2013). Global Broadband Benchmarking 2013: Best Practice Lessons for Governments. *Journal Of Information Policy 3*: p201-246.

Shaw, E. (1999). A guide to the qualitative research process. Qualitative Market Research: *An International Journal.* Volume 2 · Number 2 · p59–70.

Sutherland, E. (2010). *The European Union Approach to Better Regulation: Impact Assessment*. CRASA. research papers.

Sutherland, E. (2012). *Broadband in South Africa: Politics, Regulation & Service Delivery*. research papers.

Viscusi, W.K. (1997). *Improving the Analytical Basis for Regulatory Decision-Making in Regulatory Impact Analysis* : Best Practices In OECD Countries.

World Bank. (2013). *Doing Business 2014: Understanding Regulations for Small and Medium-Size Enterprises*. Washington, DC: World Bank Group.

Appendix A: Interview Protocol

My name is Yolisa Kedama. I am a student at the University of Witwatersrand doing a Masters of Management in ICT Policy and Regulation. I am currently doing research as part of the requirements to complete the degree and I request an interview as part of the data collection for my studies. I would like to assure you that the information gathered from the interview will be treated with the strictest confidence and will be used for study purposes only and no names will be published in the final report.

Please be advised that you are under no obligation to participate and that you may choose not to answer any of the questions and you may opt out of the interview at any time, however I would really appreciate your participation.

Lastly I request your permission to record the interview and to consult with you in future for clarification on any point you make. The interview will be limited to 45-60 minutes.

I have combined the questions under different subheadings to reflect some themes as per my study and government goals of universal service and access, digital connectivity, competition and then looking at the policy and regulatory space.

Organisation :_____

Occupation :_____

Date of interview :_____

Annexure A: INTERVIEW QUESTIONS

1. Universal service obligations and Broadband penetration

a) To what extent would ICASA's 2011 (draft) spectrum licensing models encourage ubiquitous and high speed connectivity for South Africa?
b) To what extent would this regulatory approach address issues of low broadband connectivity in both urban and rural areas?
c) How much progress has the communications industry seen with the traditional spectrum management and licensing models? Explain
d) How would the models proposed in the 2011 draft regulations affect 4G rollout?
e) In your view, what are the reasons why the 2011 draft regulations were not finalised?
f) What alternative approaches to spectrum licensing would be appropriate to enabling faster broadband rollout and further technology advancement in broadband?

2. Technology and the digital era

a) To what extent do the proposed spectrum licensing models foster a digital country?
b) What other effects could this regulatory approach have on services offered by the broader electronic communications market?
c) What types of spectrum licensing models should be used in licensing the available high demand bands in future? E.g. 450 MHz band etc.
d) What technical measures would need to be in place to make the implementation of these licensing models practical? Please explain

3. Competition

a) To what extent are the proposed spectrum licensing models expected to encourage competition in electronic communications markets?
b) How will the proposed new spectrum licensing models impact on the industry and the broader electronic communications market?

c) In your view, what form should the wholesale open access take?
d) How much will it cost operators and the country at large if incumbents are left out of the wholesale open access and managed spectrum park approaches?
e) Would the five fixed and mobile incumbents be adequately catered for by the licensing measures other than open access and spectrum park?

4. Policy and regulatory framework (RIA questions)

a) In your view what is the legal or economic basis for this proposed regulation?
b) Is the introduction of wholesale open access and managed spectrum parks justified, why?
c) Have ICASA and government correctly defined what they want to achieve? What is their goal?
d) How is the introduction of this regulation the best form of action by ICASA and government, or not?
e) What is the appropriate level (or levels) at which ICASA and government should take this action?
f) Who are the affected parties, operators, consumers, regulators, government itself, treasury?
g) Is the distribution of effects across society transparent, how, who are the beneficiaries?
h) How will this affect your organisation? Revenue, costs, profitability, business model, infrastructure investment?
i) In which ways do the anticipated benefits justify the costs associated with implementing the proposed spectrum assignment plan/regulations?
j) Is the regulation clear, reliable, understandable? How can it be implemented?
k) What are practical steps to follow to ensure compliance?

l) What is the alternative to the wholesale open access and how can that alternative be used to achieve the same government objectives of competition and broadband connectivity for all by 2020?

m) What are the benefits of using this alternative licensing method and how much do the benefits outweigh the costs involved, please explain?

Source: OECD (1995).

Table 1. Estimating regulatory costs.

Cost	**Time taken**	**Hourly cost**	**Frequency per year**	**Groups affected**	**Total cost**

Source: OECD, 2008