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THE EFFECTS OF BOTSWANA'S POLICY AND REGULATORY FRAMEWORKS ON COMPETITION IN THE PROVISION OF BROADBAND INTERNET

Kenaope Phetogo Pelaelo

A research report submitted

to the Faculty of Humanities, University of the Witwatersrand,

in partial fulfilment of the requirements

for the degree of Master of Arts in the field of ICT Policy and Regulation

March 2017

Abstract

A country's policy and regulatory frameworks can be favourable or detrimental to competition amongst operators and service providers in a given market. This report presents the outcomes of an investigation conducted on Botswana's broadband policy and regulatory frameworks, to determine their effects on competition in the provision of services. The study examined market liberalisation; open access to infrastructure networks; and initiatives for universal access to broadband Internet, exploring several components under each intervention. It reached the overall conclusion that policy and regulation in Botswana have enabled significant service-based competition in the broadband market, while remaining less favourable to facility-based competition.

The study briefly explored the framework on open access to infrastructure networks in relation to the ladder of investment (LoI) theory, which is a theoretical underpinning of competition in telecommunications markets. It concluded that the framework does not take heed of the LoI theory, more so that its key assumption that infrastructure investment can be stimulated through systematic price regulation of facilities, such as local loop unbundling and Mobile Virtual Network Operator (MVNOs) access to networks owned by other operators, have not been applicable in Botswana. This is mainly because local loop unbundling and authorisation of MVNOs have never been implemented in the country.

While the study calls for improvements to encourage facility-based competition as the most ideal form that is considered to have higher efficiency, it makes an argument for factors that may have constrained the country and made service-based competition a preferred route for most of the service providers. Qualitative research techniques have been employed, using semi-structured interviews and document analysis to explore the focus area. Acknowledging that other factors such as population size and distribution; cost of infrastructure

deployment; and choice of business models may have contributed to the key research conclusion, the study draws recommendations for the consideration of policy makers, the regulator and service providers.

Keywords: Broadband Internet, policy, regulation, infrastructure, services, investment, service-based competition, facility-based competition, Botswana.

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 Arts 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.



Kenaope Phetogo Pelaelo

March 2017

Dedication

For the rest of my family.

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Table of Contents

Declaration 3

CHAPTER 1: COMPETITION IN THE SUPPLY OF BROADBAND AND ASSOCIATED POLICY AND REGULATORY FRAMEWORKS 12

1. Introduction 12

1.1 Global trends in broadband policy and forms of competition 13

1.2 Direction of the study 15

1.3 Structure of the research report 16

1.4 Demographic and economic context of Botswana 18

1.5 Botswana's telecommunications environment 21

1.5.1 Telecommunications policy and regulation 21

1.5.2 Structure of the market (Service provision) 23

1.5.3 Fixed and mobile telephony 24

1.5.4 Broadband Internet services 26

1.5.4.1 Understanding broadband in the context of Botswana 26

1.6. Statement of the research problem 33

1.7 Research purpose 34

1.8 Research questions 35

1.8.1 Main research question: 35

1.8.2 Subsidiary questions: 35

CHAPTER 2: BODY OF KNOWLEDGE ON POLICY AND REGULATORY INTERVENTIONS TOWARDS COMPETITION IN THE PROVISION OF BROADBAND INTERNET 36

2.0 Frameworks toward competition in the provision of broadband Internet and experiences across countries 37

2.1 Liberalisation of telecommunications markets 37

2.1.1 Optimisation of access to spectrum resources 39

2.1.2 Spectrum allocation mechanisms: Auctions versus beauty contests 40

2.1.3 The need for lower spectrum licences fees 42

2.1.4 Additional broadband access through television (tv) whitespace and digital dividend bands 43

2.1.5 Spectrum secondary markets vital 45

2.2 Access regulation and network infrastructure sharing 46

2.2.1 Mandated local loop unbundling and authorisation of mobile virtual network operators 47
2.2.2 Access regulation and the ladder of investment theory 50
2.3 Approaches to universal access for broadband internet 51
2.4 Other factors affecting competition in the provision of broadband Internet 53
2.4.1 Socio-economic factors 53
2.4.2 Geographical factors 55
2.5 Conceptual analytical framework 55
2.6 Chapter summary 57
CHAPTER 3: METHODOLOGIES TOWARD UNDERSTANDING THE EFFECTS OF BOTSWANA'S POLICY AND REGULATORY FRAMEWORKS ON COMPETITION IN THE PROVISION OF BROADBAND INTERNET 59
3. Qualitative research methods 59
3.1 An interpretive and analytical case study 60
3.2 Data collection 61
3.2.1 Purposive sampling 61
3.2.2 Semi-structured interviews 63
3.2.4 Data collected from documents 66
3.3 Data presentation 67
3.4 Data analysis 67
3.4.1 Thematic analysis 67
3.5 Challenges and limitations to the research 68
3.6 Chapter summary 69
CHAPTER 4: INSIGHTS INTO THE IMPACT OF POLICY AND REGULATORY FRAMEWORKS ON COMPETITION IN THE PROVISION OF BROADBAND INTERNET 70
4. Liberalisation of telecommunications markets 70
4.1 Firms market entry, service neutrality and spectrum efficiency and flexibility 70
4.2 Open access to communications infrastructure networks 75
4.2.1 Infrastructure sharing and wholesale broadband price regulation 75
4.3 Approaches for universal access to broadband Internet 79
4.3.1 Funding of universal access projects 79
4.3.2 Mandatory roll-out obligations for broadband Internet 81
4.4 The effects of other factors on competition in the supply of broadband Internet 82

4.4.1 Low population density and land locked position of Botswana 82
4.4.2 Choice of business models 83
4.4.3 Chapter summary 84
CHAPTER 5: UNDERSTANDING THE EFFECTS OF BOTSWANA'S POLICY AND REGULATORY FRAMEWORKS ON COMPETITION IN THE PROVISION OF BROADBAND INTERNET 85
5.1 Significant service-based competition is evident in the supply of broadband Internet 85
5.1.1 Liberalisation of the telecommunications market 85
5.1.2 Ease of market entry and expansion of footprint for VANS and PTOs 85
5.1.3 Efficient spectrum management strategies 87
5.2 Open access to infrastructure networks 88
5.2.1 Transparency and fairness in infrastructure sharing 88
5.2.2 Price reduction and product differentiation for broadband services 89
5.3 Initiatives for universal access to broadband Internet: 90
5.3.1 Universal Access and Service Fund 90
5.3.2 Mandatory roll-out obligations for broadband Internet 92
5.4 Botswana's broadband supply market depicts minimal levels of facility-based competition 93
5.4.1 Service-specific licences and barriers to market entry in the PTO licence category 93
5.5 The LoI theory commonly applied in broadband competition is non-applicable for Botswana 96
5.6 Competition in the provision of broadband Internet in Botswana has been reactive to other factors apart from policy and regulation 96
5.6.1 Low population density 96
5.6.2 Historic high cost of international bandwidth 97
5.7 Relationship between researcher's analytical framework and the research findings/analysis 98
CHAPTER 6: THE OVERALL EFFECTS OF POLICY AND REGULATORY INTERVENTIONS ON BROADBAND COMPETITION AND THE WAY FORWARD. 101
6.1 Recommendations 101
6.1.1 Market liberalisation in the wake of the unified licensing framework 101
6.1.2 Strengthening the legality of policies for open access to infrastructure networks 102
6.1.3 Recognising the place of TV white space technology and digital dividend in spectrum management 103

6.1.4 UASF non-discriminative incentives with respect to service-based and facility-based competition 103
6.2 Area for Further Research 104

List of Figures

Figure 1: Stages of the Research Report.....17
Figure 2: Republic of Botswana Maps .....**Error! Bookmark not defined.**
Figure 3: PTO (Fixed and Mobile) Percentage Market Share (March 2016).....24
Figure 4: Minimum Broadband Access Speeds for Botswana (2014-2021).....27
Figure 5: Simplified Illustration of Botswana' Broadband Supply Chain.....28
Figure 6: Undersea Cables (EASSy and WACS).....29
Figure 7: BoFiNet National Figure Networks (2016).....29
Figure 8: Mascom, Orange and BTC Mobile Network Coverage, March 2016 32
Figure 9: Illustration of a Typical LLU Network.....48
Figure 10: Analytical Framework; The Impact of Policy and Regulatory Frameworks on Competition in the Provision of Broadband Internet.....56

List of Annexures

Annexures 1 Interviewee Descriptions.....113
Annexures 2: Data Collection Tool (Interview Guide).....116
Annexures 3: Participant Information Sheet.....118
Annexures 4: Ethics Clearance Certificate.....121

List of Abbreviations

ADSL: Asymmetric Digital Subscriber Lines
ASO: Analogue Switch Off
BTC: Botswana Telecommunications Corporation
FBO: Facility Based Operator
FTTx: Fibre To The facility (home/business)
ITU: International Telecommunication Union
LLU: Local Loop Unbundling
LoI: Ladder of Investment (theory)
MNO: Mobile Network Operator:
MNP: Mobile Network Provider
MVNO: Mobile Virtual Network Operator
MTC: Ministry of Transport and Communications
NBS: National Broadband Strategy
NFP: National Facility Provider
PTO: Public Telecommunications Operator
SAP: Service and Applications Provider

UASF: Universal Access and Service Fund
ULF: Unified Licensing Framework
VANS: Value Added Network Services
VoIP: Voice over Internet Protocol
Wi-Fi: Wireless Fidelity
WiMAX: World Wide Interoperability for Microwave Access
wLANS: Wireless Local Area Network System

CHAPTER 1: COMPETITION IN THE SUPPLY OF BROADBAND AND ASSOCIATED POLICY AND REGULATORY FRAMEWORKS

1. Introduction

In her quest for national development and the need to reduce the economy's dependency on diamond mining, Botswana has shown commitment towards improvement of other sectors, including the communications industry on which this report is premised. In this study, investigation was focused on the country's development efforts in the area of broadband Internet, exploring adopted policy and regulatory frameworks to determine their effects on competition in the provision of broadband.

Botswana has through the Ministry responsible for communications and the national regulatory authority, introduced several industry reforms that have seen the telecommunications market evolve from its monopolistic status of the eighties to an active converged environment. Policy and regulatory interventions adopted towards development of the broadband sector, particularly supply-oriented objectives aimed at stimulating competition amongst service providers, have been well documented and are accessible to stakeholders. These include in a broader sense, liberalisation of the communications market; open access to infrastructure networks; and initiatives for universal access to broadband Internet, which the study has explored to draw an understanding of the effects they have had on competition in the provision of broadband Internet.

In this regard, lack of research informed knowledge on the effects of the said competition-oriented broadband policy and regulatory frameworks has been identified as the key research problem that formed the basis for conducting the study.

1.1 Global trends in broadband policy and forms of competition

In today's era of technological applications and services, broadband Internet has become quite indispensable for a wide range of consumers, enabling communication through different access networks and devices. Broadband Internet is believed to have a transformative effect on the socio-economic development of individuals and different groups of people (Katz, 2009; ITU, 2012; Broadband Commission, 2016), making it a key priority of national policies across the world. To increase accessibility and usage of broadband services, most countries seek to attain competitive markets through formulation and execution of specific policy and regulatory frameworks. Attesting to such commitment, the Broadband Commission (2016) has indicated that by 2016, a total of 151 countries reported to have finalised their national broadband plans/policies, while seven were at planning stages.

It is generally argued that the most effective policy and regulatory approach to broadband involves setting objectives and employing processes that address both its supply and demand sides. (Broadband Commission, 2015; A4AI, 2015; Kelly & Rossotto, 2012; Mugei, Wanyembi & Wafula, 2012). While noting that policy makers and regulators seek not to address broadband infrastructural and service provision factors (supply-side) in isolation from issues of usage and affordability (demand-side), this study has been selective in its approach, focusing on the former side through investigating frameworks that are often adopted in line with competition within broadband environments.

Competition in broadband markets is often viewed in two-fold; service-based competition and facility-based competition, where he former, according to Cave (2004) and Dogan and Bourreau (2004), involves a market in which firms rely on network facilities of a larger company, usually the incumbent operator, either reselling existing offerings or acquiring part of the infrastructure (local loop unbundling and bit stream access) to provide services. The latter exists when

operators invest in their own infrastructure networks, and are not dependent on facilities of other firms to deliver services to consumers (Belvins, 2008; Cave, 2004).

Unlike service-based competition that is often said to be achievable in the short-run and comparably less efficient in terms of benefits to consumers (Belvins, 2008), competition at broadband infrastructure level is considered to have long lasting efficiencies that include product differentiation, lower prices, improved quality of service and higher levels of network security (Belvins, 2008; Bender & Gotz, 2011; Bourreau, Marc, Pinar Doan & Matthieu Manant, 2010).

In making a case for service-based competition, Laffont and Tirole (2000) note that it is possible for markets with higher levels of this form of competition to serve consumers satisfactorily, and further warns that the benefits associated with facility-based competition may be outweighed by poor or lack of returns to investment, which can result due to unnecessary duplication of existing infrastructure.

One of the markets that has shown increased existence and support for facility-based competition is the United States of America (UAS), where the Federal Communications Commission (FCC) has openly encouraged firms to deploy and operate their own network infrastructure. The former FCC Chairman Michael Powell is often quoted as an advocate for facility based competition, having emphasised in one of his 2008 speeches that (Powell, 2008, p.1):

> Only through facilities based competition can an entity offer true product and pricing differentiation for consumers. Only through facilities based competition will corporate spending on equipment thrive. Only through facilities based competition can a competitor lessen its dependency on an intransigent incumbent, who if committed to frustrate entry has a thousand ways to do so in small, imperceptible ways. Only through facilities based competition can an entity bypass the incumbent completely and force the incumbent to innovate to offset lost wholesale revenues.

For some developed parts of the world such as the Europe, markets are often found with both forms of competition, with some cases where service-based competition is seen as a stepping stone to facility-based competition (Cave, 2004). East Asia has also shown significant levels of both facility-based and service-based competition, with countries such as Japan and South Korea boasting increased government participation in broadband development through funding of private entities to invest in infrastructure deployment and service provision (Cambini & Jiang, 2009). Further, developing broadband markets such as most African countries have depicted high levels of service-based competition, with policy decisions such as state ownership of incumbent companies and heavy government shareholding in mainstream network operators discouraging entrants from competing at infrastructure deployment level (Bouras, Giannaka & Tsiatsos, 2009).

1.2 Direction of the study

While some literature argues for the form of broadband competition that has to be embraced or one that should be avoided, this investigation brings in an different direction, exploring the manner in which both service-based and facility-based competition may be influenced by policy and regulatory intervention. It analysed this perspective in context of the Republic of Botswana (Botswana), examining how frameworks adopted by government, through the Ministry of Transport and Communications (MTC), and the sector regulator, Botswana Communications Regulatory Authority (BOCRA) have influenced competition in the country's broadband market. The study investigated three supply-oriented interventions: market liberalisation; open access to infrastructure networks; and initiatives for universal access to broadband Internet, examining each broad area to reveal its perceived effects on service-based and facility-based competition, and ultimately identifying justifications behind the country's dominant form of competition. The study achieved its objectives through considering the views and

experiences of a number of stakeholder representatives, and through exploring existing information as captured in pertinent documentation.

Further, the researcher explored the Ladder of Investment (LoI) theory as a theoretical perspective that is often associated with competition in communications markets, to determine the stance of Botswana with regards to its key assumptions. Cave (2004) developed the LoI theory in the early 2000s, and through it argues that National Regulatory Authorities (NRAs) are capable of transforming service-based competition to facility-based competition through strategically increasing prices paid by other operators for access to different stages of incumbents' network infrastructures, with such operators eventually choosing to invest in their own infrastructure. Providing further detail to Cave's LoI, it has been noted that the LoI theory (Distaso, Lupi & Manenti, 2009, p. 56):

> …requires to regulate the price of bitstream services at a very low level in order to promote service based entry. Once entry has occurred, NRAs should stimulate infrastructure investment (i.e. to climb the ladder) by *a)* increasing the price of bitstream services and *b)* decreasing the price of LLU services, a more infrastructured form of access. If the regulatory authorities follow a LoI regulatory approach, we should expect the ratio between LLU and bitstream access to decrease through time. Finally, in order to incentivize firms to develop proprietary networks, NRAs should progressively increase the price of LLU services.

Throughout the research report, the terms "broadband supply" and "provision of broadband Internet" carry the same meaning and are used interchangeably.

1.3 Structure of the research report

Figure 1 below illustrates the six research stages that make up the report. Each stage constitutes a chapter that bares a title best suited for its key focus and context.

Figure 1: Stages of the research report



Design: Author

The introductory chapter presents background information on Botswana as the country under study, providing an overview of the telecommunications sector with more emphasis on the broadband segment on which the investigation was centred. This chapter presents the research problem, purpose and objectives to enable comprehension of the intended aim of study.

The second chapter reviews existing literature to reveal some of the views, experiences and debates on supply-oriented policy and regulatory interventions and their impact on broadband competition. It reviews Martin Cave's ladder of investment theory and the essential facilities doctrine in its exploration of theoretical perspectives surrounding competition in broadband markets. The chapter then presents a conceptual framework that is drawn from key concepts of the reviewed body of knowledge, showing their interdependencies and the end results that are often anticipated. It is through this conceptual framework that the researcher proposes a multi-faceted approach to addressing broadband competition at policy and regulatory levels.

Chapter 3 outlines the research design and methodologies employed in conducting the study, explaining methods adopted for data collection, presentation (findings) and interpretation (analysis). It also outlines limitations that were encountered during the research process. The study findings are presented in Chapter 4, outlining the opinions of research participants on the studied area are outlined, together with information obtained from relevant documentation. Chapter 5 covers analysis of the research findings, with the researcher interpreting collected data to derive its different connotations. Chapter 6 concludes the study and provides recommendations for the attention of industry stakeholders. Chapter 6 also highlights areas that may require future research. The chapters begin with a brief introduction and end with a summary of all key issues covered.

1.4 Demographic and economic context of Botswana

Figure 2: Republic of Botswana



Source: Botswana Government (2014)

Botswana is located at the centre of Southern Africa, surrounded by South Africa, Namibia, Zambia and Zimbabwe (see figure 2 above). The country covers a total land area of 581 730 square kilometres, with a small population size of

approximately two million (2 024 787) recorded in 2011 (Statistics Botswana, 2013). Due to the semi-arid climate that presents vast desert coverage, limited fertile soils and unreliable rainfall, the population tends to concentrate in the eastern and south-eastern regions that bear better conditions (Statistics Botswana, 2014). The south-east region hosts the capital city Gaborone, and was reported to have a total of 43.7 % of the country's population during the 2011 national census (Statistics Botswana, 2014). Table 1 below records percentage population across different types of localities, indicating that most of the people (approximately 64 %) occupy urban centres, while lower numbers are sparsely distributed across rural villages, ploughing lands, and cattle posts.

Table 1: Botswana population distribution by type of locality (2011)

Locality	**% Population**
Cities/towns	21.7
Urban Villages	42.13
Rural Villages	25.9
Lands Areas	4.6
Cattle Posts	2.6
Free Hold Farms	0.7
Mix of Lands and Cattle Posts	1.0
Camp sites or Other	1.1
	100

Source: Statistics Botswana (2014)

Botswana's urban and rural monthly income levels have shown great disparities, having recorded an average of BWP11, 475.40 (1,337 USD) for towns and cities; BWP5, 815.80 (678 USD) for semi-urban villages and BWP2, 345.90 (273 USD) for rural areas by 2010 (Central Statistics Office, 2012). The CSO (2012) has also recorded the percentage of the population living below 1 USD a day at 3.3% for urban centres, while semi-urban areas and rural areas were at 6.1% and 8.3% respectively. Such an indication of better living conditions in

urban centres makes one of the factors behind the country's high rural-urban migration, which as indicated by Statistics

Botswana (2014)[1], has resulted in a number of urban dwellers. The country's average literacy rate was recorded at 88.2 % by 2014 (Statistics Botswana, 2016, p. 68).

Botswana was ranked among the world's poorest when it gained independence from the United Kingdom (UK) in 1966, a status that has faded with rapid economic transformation attributed to decades of good governance, disciplined fiscal policy and prudent natural resources management (Osei-Hwedie & Sebudubudu, 2004; Research ICT Africa, 2013; Honde & Abraha, 2015; World Bank, 2016). The middle-income economy is mostly reliant on diamond mining, which accounts for more than a third of the Gross Domestic Product (GDP), while other significant contributors include coal mining, tourism, cattle farming, and government services (Research ICT Africa, 2013; Honde & Abraha, 2015, World Bank, 2013). Botswana's 2015 GDP per capita was recorded at USD 14, 876.33 [adjusted for Purchasing Power Parity (PPP)] (World Bank, 2016). While the economic status of Botswana is considered satisfactory relative to that of most African countries, global uncertainties especially reductions in the demand for diamonds remain the source of its vulnerability (KPMG, 2014).

Other factors unfavourable to Botswana's economy include prolonged droughts that threaten food security and beef exports; electricity and water supply outages; and high prevalence of HIV/AIDS infections, which all impact adversely on productivity across sectors (World Bank, 2013). The economy has also been growing at a declining rate since 2010, mainly due to the 2008 global financial crisis and limited diversification measures (RIA, 2013; World Bank, 2013; BoB,

[1]Previously Central Statistics Office (CSO), Statistics Botswana is a state agency that collects, processes and analyses different categories of national data for reporting purposes.

2015). To diversify the economy and reduce diamond mining dependency, the country seeks to create a conducive environment for private sector development across all sectors (Republic of Botswana, 2010).

1.5 Botswana's telecommunications environment

1.5.1 Telecommunications policy and regulation

Botswana's communications industry (telecoms, Internet, broadcasting, and postal services) is overseen by the regulator, Botswana Communications Regulatory Authority (BOCRA), which was established under the provisions of the Communications Regulatory Authority (CRA) Act No. 19 of 2012 (Republic of Botswana, 2012). The regulator's core mandate encompasses formulation of regulatory frameworks, strategies and policies for governing and guiding the industry (BOCRA, 2016). Its key responsibilities involve licensing and monitoring the operations of all communications service providers, including management of spectrum resources (BOCRA, 2016). The regulator is therefore necessary for accomplishment of market efficiency, competition, quality of service and network security (BOCRA, 2016). BOCRA exercises its regulatory roles in close consultation with, and under the supervision of the Ministry of Transport and Communications (MTC or the Ministry), which is the key policy maker for the communications industry (BOCRA, 2016).

The role of MTC involves formulation and coordination of objectives meant to drive development of Information and Communication Technologies (ICTs), ensuring implementation of associated initiatives and promotion of increased access and usage of services at a national level (MTC, 2016). The Ministry takes pride in achievement of several policy goals that include; A 2002 Rural Telecom Programme (Nteletsa II project) that connected close to 200 rural villages with telephone services and access to other ICTs (photocopying, printing, facsimile, scanning and Internet services); Connecting the country internationally through investment in undersea cables [East African Submarine Systems (EASSy) and

West Africa Cable System (WACS)]; Development of the National Broadband Strategy (2012, revised 2016) and supporting implementation of its recommendations; and Establishment of a special purpose vehicle in the form of a state-owned fibre company for provision of wholesale access infrastructure (MTC, 2016).

As a rather overdue policy plan and as provided for by the CRA Act (2012) and the Notarial Deed of Trust (2014), a Universal Access and Service Fund (UASF or the Fund) was established in 2014, to promote delivery of communication services to unserved and underserved communities across the country (UASF, 2015; BOCRA, 2016). The UASF collects and manages a levy of 1% gross turn-over from selected service providers, namely; network operators, private television and radio broadcasters and the national postal operator. The regulator also channels its annual excess revenues into the Fund. The funds are used to subsidise delivery of communications projects to areas that are considered commercially unviable by service providers, such as rural and remote areas, low income parts of urban centres, and key economic facilities such as major transport routes, commercial farming areas and tourism establishments (UASF, 2015).

An independent board of trustees (The UASF Board) manages the Fund, with the assistance of BOCRA as secretariat (UASF, 2015; UASF, 2016). Entrusted with roles that include approval, supervision and monitoring of the Fund's strategic plans and programmes, the Board of Trustees is expected to promote digital inclusion across the country in a transparent manner (UASF, 2016). The Board members, who are appointed in consultation with the Minister, represent different segments of the communications sector, each sitting for renewable period of 2 years. By the end of 2016, the UASF had subsidised BoFiNet for deployment of wholesale Wi-Fi hotspots in seven locations across the country, enabling reduced retailer costs for access infrastructure, hence lower

Internet prices for consumers (UASF, 2016). The hotspots had been deployed in public areas such as shopping malls, airports, hospitals, and bus stations to service large numbers of consumers visiting such areas. Further, the UASF's three years' (2015-2018) strategic plan outlines schools' broadband connectivity and expansion of signal coverage for private broadcasters as some of the areas that would require financial assistance (UASF, 2016).

1.5.2 Structure of the market (Service provision)

Botswana adopted a Unified Licensing Framework (ULF) in 2015, a regulatory development from the 2007 regime that categorised service providers along specific lines of operation, and differentiated between network operators and smaller Internet firms (BOCRA, 2016). In defining the new framework, the regulator has stated that (BOCRA, 2015, p. 3):

> ULF is a regulatory framework which embraces technological convergence and encourages innovativeness. Under the framework there is no distinction between, say, mobile or fixed services, satellite or terrestrial, data or voice services, etc. It is also a framework where the differences among licenses is dependent on which layers of the model one operates in.

Operators had been given until February 2017 to have migrated to the new licensing framework which carries two major categories; Network Facilities Provider Licence (NFP) and the Services and Applications Provider Licence (SAP) (BOCRA, 2016). However, at the time of this investigation, none of the network operators had migrated, thus all operated under initial licence conditions. The market therefore consisted of three public telecommunications operators (PTOs), a single facility based operator (FBO) (fibre company) and more than eighty Internet service providers (ISPs), which are also referred to as Value Added Network Service providers (VANS) (BOCRA, 2016).

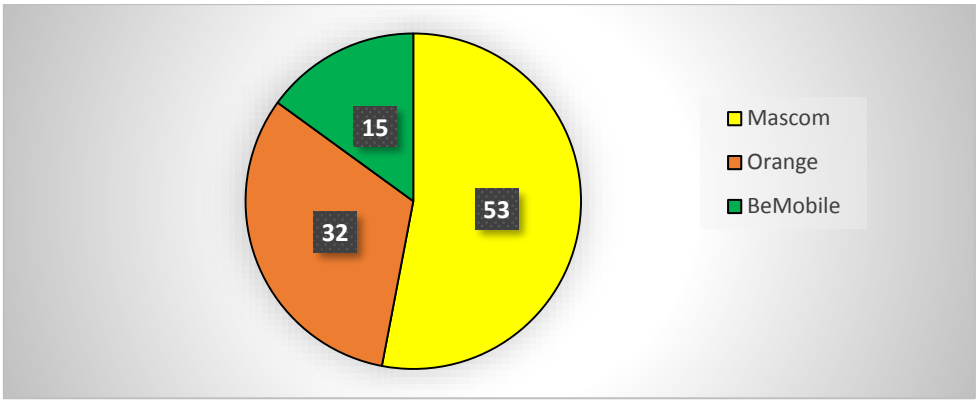
1.5.3 Fixed and mobile telephony

Competition was first introduced to Botswana's telecommunications sector in 1998, when the monopolistic status of the state-owned incumbent Botswana Telecommunications Corporation (BTC) ended with entry of two private network operators; Mascom Wireless (Pty) Ltd and Vista Cellular (Pty) Ltd (now Orange Botswana) (BOCRA, 2014). This was as per the requirements of the 1996 Telecommunications Act that called for market liberalisation and establishment of a regulatory authority (Republic of Botswana, 1996; BOCRA, 2014). Participation of foreign investors in the mobile market is recognised through Mascom Wireless's affiliation with South Africa's MTN, while Orange is backed by France Telecom (Lancaster & Lange, 2015).

Since establishment of the regulator [then Botswana Telecommunications Authority (BTA) and currently BOCRA], the market has gone through a series of reforms, moving from a service-specific licensing framework of 1996 to a service-neutral regime in 2007, thereby giving the three network operators an opportunity to provide mobile and fixed telephony, Internet offerings and related services using any suitable technology (BOCRA, 2014).

While Mascom Wireless and Orange Botswana kept to provision of mobile services and avoided the fixed telephony route, BTC (fixed network operator) established a mobile wing under the BeMobile designation (BOCRA, 2014). The third mobile entrant leveraged on the countrywide infrastructure of its parent-company, rapidly increasing its telephone market share to 15 % by early 2016 (BOCRA, 2016). Figure 3 below shows the telephone market share of the three Public Telecommunications Operators (PTOs) as at March 2016.

Figure 2: PTO percentage market share for mobile services (March 2016)



Source: BOCRA (2016)

The total number of mobile telephone subscribers exceeded three million (3,460,331) by March 2016, with a teledensity of 171%, while for fixed line services, a total of 161,641 subscribers and teledensity of 8% were recorded (BOCRA, 2016). The high mobile teledensity has been attributed to multiple ownership of SIM cards, as most individuals prefer access to services from different PTOs, benefitting mostly from promotional discounted prices, price reductions and the need to connect in areas where other networks may have poor or no coverage (BOCRA, 2015, 2016). The use of fixed telephone services has remained low despite a historical countrywide deployment of copper cables by the incumbent operator. A notable decline in fixed telephone subscription began with the arrival of mobile telephone companies in the late 1990s (BOCRA, 2016).

The regulator has indicated that mobile networks covered an estimated 95% of the population by March 2016, with all three operators providing 2G, 3G and 4G technologies (BOCRA, 2016). Operators also provide a variety of value add services, including mobile banking, mobile money, music on demand, promotional SMS services and Internet packages (BOCRA, 2016).

1.5.4 Broadband Internet services

1.5.4.1 Understanding broadband in the context of Botswana

Botswana's National Broadband Strategy (2014, revised 2016) refers to broadband as "an ecosystem comprising of high capacity, speed and quality networks, services, content and applications that provide high value information and communications for a variety of users" (Republic of Botswana, 2016, p. 16). This extensive description is in line with the one adopted by the World Bank, that the broadband ecosystem brings together the supply and demand sides of high speed and high capacity Internet networks for the delivery of information content through the use of applications (World Bank, 2012; 2015). However, countries often simplify the understanding of broadband Internet to bandwidth capacities and transmission speeds that befit their respective contexts. Below is a simplified description of broadband Internet by Botswana's communications regulator (BOCRA, 2015, p. 1):

> Broadband is associated with a particular speed of transmission or a certain set of services, such as digital subscriber loop (DSL) or wireless local area networks (wLANs). However, since broadband technologies are always changing, the definition of broadband also continues to evolve. Today, the term broadband typically describes recent Internet connections that are faster than earlier Internet dial-up technologies.

A similar understanding is expressed by Picot and Wernick (2007, p.661), who have indicated that broadband access platforms can be grouped into wired, wireless and fixed wireless. The authors further note that "wired access platforms include digital subscriber line (DSL)/copper line, fibre optics, powerline and cable. Wireless platforms comprise 3G cellular and satellite transmission, while fixed wireless encompasses WiFi and WiMax"

Botswana's National Broadband Strategy (NBS) also acknowledges that technological advancement and increasing demand for faster applications and digital services require increasing connection capabilities over time (Republic of

Botswana, 2016, p. 16). The NBS has therefore proposed increasing targets for minimum access speeds as shown on figure 4 below.

Figure 3: Minimum Broadband Access Speeds for Botswana (2014-2021)

Minimum Target Access Speed (Mbps)	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Urban & Major Areas	*2MB*	*4MB*	*5MB*	*10MB*	*50MB*	*500MB*	*1G*
Rural Areas	*512KB*	*1MB*	*2MB*	*5MB*	*10MB*	*50MB*	*100MB*
Agricultural Areas			*512KB*	*1MB*	*2MB*	*5MB*	*10MB*

Source: Botswana Government (2014)

Targeted broadband access speeds by the year 2012 are expected to be at a minimum of 1 Gbps, 100 Mbps and 10 Mbps for urban areas, rural and agricultural areas respectively.

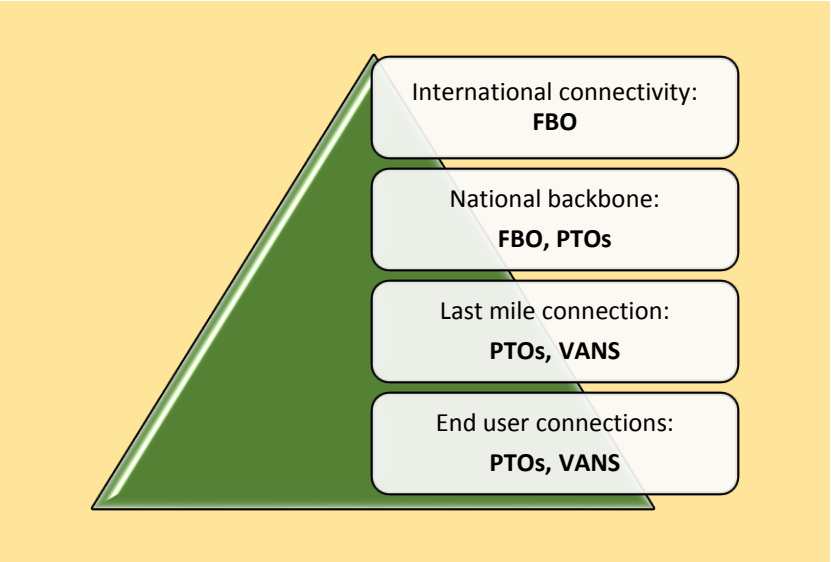
1.6.5 Provision of broadband Internet in Botswana-The supply chain

Williams (2010, pp. 3-4) describes a supply-chain in the communications environment as a "combination of network elements, processing, and business services". The author further notes that (Williams, 2010, pp. 3-4):

> At the top of the chain is the international connectivity that provides the link to the rest of the world. The second level is the domestic and regional backbone networks that carry traffic from the landing point of the international communications infrastructure to other points within the country. The third level is the "intelligence" contained in the networks. Below this is the access network that links the core network to the customer. Finally, there is a suite of retail services such as customer acquisition, billing, and customer care that allow the business to function.

In assuming this typical structure, Botswana's FBO, Botswana Fibre Networks (BoFiNet) provides broadband services at wholesale level, while the PTOs and VANS occupy the retail space, each licence category operating in a particular layer or layers of the supply-chain. Figure 5 below is a basic illustration of the country's broadband supply-chain.

Figure 4: Simplified illustration of Botswana' broadband supply chain



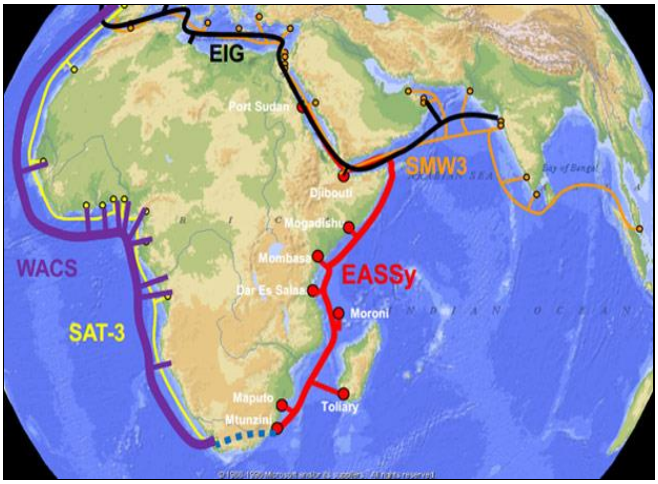
Source: Author, as adapted from World Bank (2010)

1.5.6 The place of the FBO in the broadband supply chain

BoFiNet was established in 2013 following a policy decision to improve market efficiency through structurally separating the incumbent operator into stand-alone retail and wholesale entities (MTC, 2016). A major contributor to the separation was the need to promote competition, triggered by a general concern that the incumbent operator had significant market power for Internet services and was disadvantaging competitors through vertical integration and cross-subsidisation practices (BOCRA, 2015).

BoFiNet provides international and national telecommunication infrastructure, managing EASSy and WACS on behalf of government to connect licensed service providers (PTOs and VANS) to these undersea cables and other wholesale fibre infrastructure on an open-access principle (BoFiNet, BOCRA, 2016). Figure 6 illustrates EASSy and WACS, which land on the coasts of South Africa and Namibia respectively.

Figure 5: Undersea cables (EASSy and WACS)

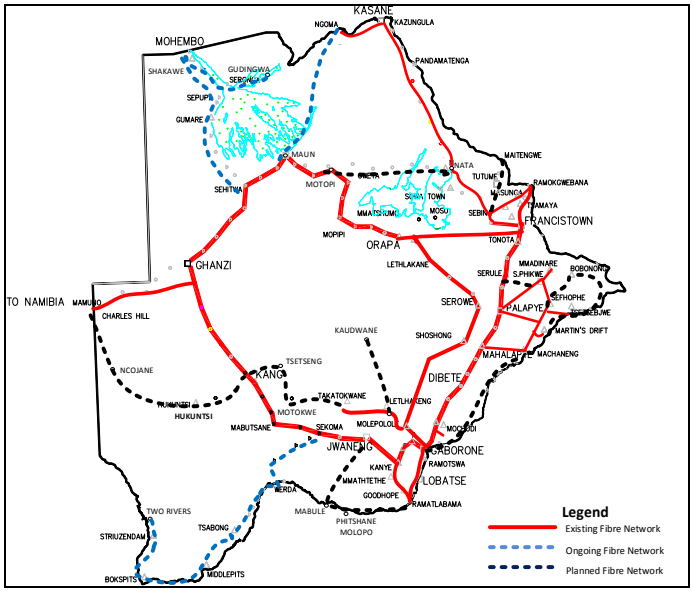


Source: Techzim (2013)

BoFiNet deploys inland routes to connect to the undersea cable landing points in Mtunzini Port, South Africa, and Walvis Bay Port, Namibia, enabling transmission of Internet content in and out of the country, with resilient routing (BoFiNet, 2016, para 4). Further at national level, a network of leased lines has been deployed across major villages, towns and cities (BoFiNet, 2016, para 1).

Figure 7 below illustrates the wholesaler's national fibre infrastructure, with red coloration for existing networks, while dotted blue and black are for ongoing and planned fibre deployment respectively.

Figure 6: BoFiNet national fibre networks (2016)



Source: BoFiNet (2016)

BoFiNet further plays in the last mile market through offering wholesale fibre access for business and residential connections in urban centres, a service commonly termed "Fibre-To-The-x" or FTTx (BoFiNet, 2016; BOCRA, 2016), where "x" represents households, businesses, etc. The Internet market experienced a significant price reduction in 2015, when BoFiNet reduced prices for wholesale infrastructure at about 70%, enabling increased take up of its services by retail service providers and an anticipated trickle-down effect on the price of retail Internet services. Further, the company has in 2015 deployed wholesale Wi-Fi hotspots for the access of retail service providers in major towns and villages, a project subsidised by the UASF to reduce investment expenses for smaller firms (UASF, 2015). Smaller Internet firms that have often cried exorbitant costs would benefit from the subsidised wholesale access links brought closer to populated areas for ease of connection (UASF, 2015).

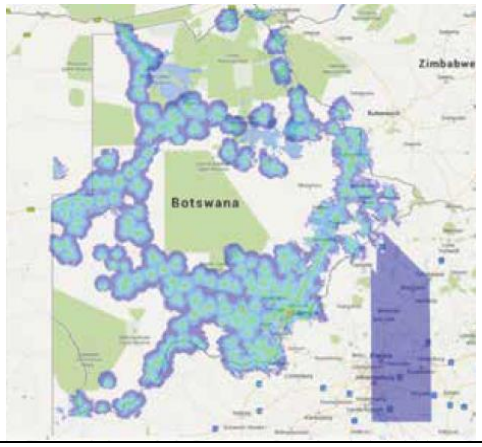
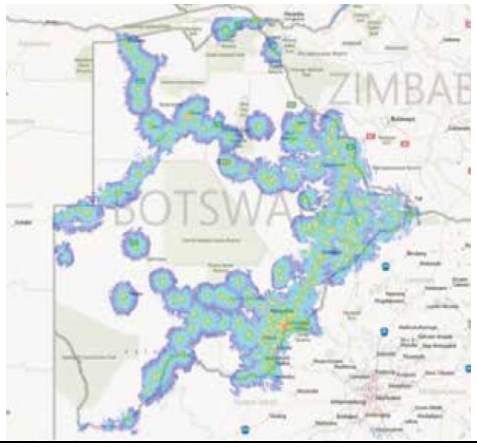
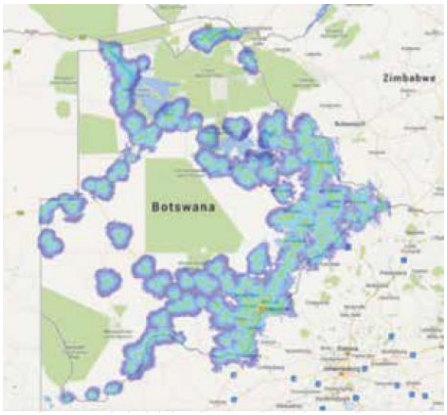
1.5.7 The retail segment (PTOs and VANS) of the supply-chain

Botswana's retail broadband market is highly active with PTOs providing services that include Asymmetric Digital Subscriber Lines (ADSL), wireless Internet access and a range of mobile broadband packages (BOCRA, 2016).

While mostly dependent on BoFiNet for backbone infrastructure, some of the PTOs have also shown interest in deployment of their own backhaul infrastructure (BOCRA, 2014, Lancaster & Lange, 2015), hence this licence category occupies the bottom three ranks of the broadband supply-chain (Figure 5). Figures 8.0, 8.1 and 8.2 below illustrate mobile network coverage for Mascom, Orange and BTC as at March 2016. Mobile data connection is supported through 3G and 4G network technologies by all operators, found mostly in the urban centres and big villages (BOCRA, 2016).

BOCRA has often applied mandatory roll-out obligations in its spectrum allocation strategies to stimulate network expansion to less populated regions that are considered less profitable by PTOs. The regulator employed 'beauty contest' methods of spectrum allocation and awarded Long Term Evolution (1800MHz) and Fixed Wireless Spectrum (3400MHz) frequency bands to PTOs in 2015, incorporating roll-out obligations in the licences to ensure coverage of localities with at least five thousand inhabitants (BOCRA, 2016). BOCRA has also shown interest in the exploration of TV white space bands as another option for availing broadband spectrum, authorising two innovation-oriented agencies to conduct trials on the use of the technology in 2014 (BOCRA, 2016). However, no reports have been released on the outcome of the TV white space studies to date.

Figure 7: Mascom, Orange and BTC Mobile network coverage, March 2016

Mascom Mobile Network	Orange Mobile network
	
BeMobile Network	
	

Source; BOCRA (2016)

A comparison across the coverage maps picks high network concentration along the eastern corridor that connects the country's capital Gaborone in the south to the City of Francistown in the north-east. Other regions, particularly some parts of the central, western and northern districts display lesser network coverage across the operators. Such regions tend to have lower population densities, more so along the desert areas. Mascom has shown a wider overall mobile network coverage, followed by Orange and BTC respectively. By March 2016, the regulator recorded a total of 1 360 236 mobile broadband consumers, compared to 14 680 and 109 138 for fixed wireless and ADSL subscribers respectively (BOCRA, 2016).

VANS join the supply-chain at the last mile and end user connection stages, connecting both households and businesses with leased lines for dedicated bandwidth, and mainly reselling BoFiNet and BTC broadband products. Larger VANS such as Global Broadband Solutions (Pty) Ltd and Microteck (Pty) Ltd are able to compete with PTOs at mobile broadband level, having acquired WiMax spectrum in 2013 (BOCRA, 2014; Lancaster & Lange, 2015). While the regulator has recorded increasing number of VANS entrants over the years, they are mostly found in the urban centres where the take-up of broadband services is considerable (BOCRA, 2014). The regulator has often decried lack of technological innovation in broadband service provision by VANS, proven mostly by their tendency to resell wholesale products (BOCRA, 2016). The VANS licensees have also shown interest in ownership to TV whitespace and FWA spectrum (BOCRA, 2016).

1.6. Statement of the research problem

In exploring Botswana's telecommunications environment, primarily the broadband segment, we note that policy and regulatory interventions toward stimulation of service provision have been substantial, as found in different documents such as the NBS, the CRA Act, industry reports and academic studies. The supply-oriented frameworks mostly emphasise the need for competition in the market, achievement of which is believed to benefit service providers in terms of return to investment, and consumers in the form of reduced prices, product/service differentiation and better quality of service. As indicated in prior sub-sections, the 2013 separation of the incumbent into retail and wholesale entities was premised on the need to trigger competition across the supply-chain, a goal similar to that of other interventions such as open market entry, a technology-flexible licensing regime, mandatory roll-out obligations in spectrum allocation, regulation of wholesale tariffs and establishment of the UASF.

While these frameworks that exist to reflect coordinated efforts of BOCRA and the MTC have been recorded and are accessible to different stakeholders, their ultimate effect on competition in the provision of broadband Internet has not been explored to produce analysed findings. This gap in knowledge is the basis for this research work. The problem of lack of detailed and research-based information on the manner in which the adopted interventions have influenced competition in broadband service provision has prompted the researcher to conduct the study.

1.7 Research purpose

The purpose of the study is to examine and reveal the effects that Botswana's key policy and regulatory frameworks have had on competition in the provision of broadband Internet. To realise such purpose, the study seeks to;

a. Acquire detail and enable further understanding of the research area through exploring its context as captured in previous work (literature review),
b. Collect and present data on the views, observations or experiences of industry representatives across policy, regulation, service provision and other areas such as the academia, on the research topic,
c. Explore and present data on the research focus as captured in a number of related documentation,
d. Analyse the research findings to draw interpretation and understanding of collected data, and
e. Draw conclusions and recommendations on the way forward.

The study contributes to industry discussions and body of knowledge through drawing a conceptual framework that calls for a multi-faceted approach to stimulation of competition in the provision of broadband Internet. It pays way for informed improvements in Botswana's broadband environment through a set

of recommendations for the consideration of policy makers, the regulator and broadband service providers. The study is therefore beneficial to policy makers, regulators, local and foreign investors, academia, consumers and any other stakeholders interested in broadband policy and regulation, particularly with regards to competition issues.

1.8 Research questions

The following set of research questions was developed to guide the investigation in addressing the identified problem and realising the intended research purpose.

1.8.1 Main research question:

How have Botswana's policy and regulatory frameworks influenced competition in the provision of broadband Internet?

1.8.2 Subsidiary questions:

i. Which are the main policies and regulatory frameworks adopted in line with competition in broadband service provision in the Botswana?
ii. What has been the effects of the adopted policies and regulatory frameworks on competition in the provision of broadband Internet?
iii. Which other factors have significant effect on competition in the provision of broadband Internet apart from policy and regulation?
iv. What has been the effect of other factors apart from policy and regulation on competition in the supply of broadband Internet in Botswana?

To familiarise with the focus area and ensure a coherent approach to the research questions, the body of knowledge that exists in relation to the investigation has been explored under Chapter 2 below.

CHAPTER 2: BODY OF KNOWLEDGE ON POLICY AND REGULATORY INTERVENTIONS TOWARDS COMPETITION IN THE PROVISION OF BROADBAND INTERNET

In taking account of the knowledge that exists on the research area, this chapter reviews observations, studies, and theories on the effects of supply-oriented broadband policy and regulatory frameworks across countries. As signified by Babbie and Mouton (2001, p. 565), researchers should update their audience on previously captured views, to reveal the picture into which the investigation fits relative to the context of prevailing literature. The need for literature review has also been expressed by Fink (2005, pp. 3-7), who notes its demonstration of trends within the area of study, and that it gives the researcher an opportunity to identify and evaluate recorded information, in the process acquiring knowledge from different scholars and practitioners.

The chapter scrutinises a number of documents for evidence of changes (increases or decreases) in competition in the provision of broadband, identifying policies and regulatory processes believed to have led to such scenarios across a number of countries. In addition to exploring such cause-and-effect relationships, the review incorporates the researcher's interpretation and reactions to the arguments, pointing out supported views, weaknesses or gaps in the body of knowledge. Concluding with a framework that assembles key concepts to reveal that competition in broadband markets requires a multifaceted approach by policy makers and regulators, the literature review chapter covers several themes as sectioned below. The chapter therefore enables the researcher to provide detail and further understanding of the research area as stipulated under the research purpose above.

2.0 Frameworks toward competition in the provision of broadband Internet and experiences across countries

Picot and Wernick (2007, pp. 663-664), Falch (2007, p. 255) and Mugeni et al (2012, p. 753) have shown that supply-oriented policies and regulatory processes, often captured in development plans such as national broadband strategies, are mostly aligned with stimulation of competition amongst service providers. Adopted interventions may include removal of barriers to market entry; promotion of fair access to infrastructure networks and spectrum resources; tariff regulation; and facilitation of service delivery to high-cost and low-income regions through universal service obligations and project funding mechanisms (Picot & Wernick, 2007, pp. 663-664; Falch, 2007, p. 255; Mugeni et al,2012, p. 753).

2.1 Liberalisation of telecommunications markets

Reforms in communications markets have involved a change of regimes from traditional monopoly to frameworks that support open market entry, enabling competition between entrants and incumbent operators (Biggs & Kelly, 2006, p. 5; World Bank, 2012, p. 37; Christodoulou & Vlahos, 2001, p. 744). The concept of technology and service neutrality that calls for operators to be allowed to choose any type of technology to deliver any type of communication services is considered a fundamental aspect of liberalised markets, particularly in today's digitised environment where broadband networks are capable of delivering similar services or substitutes under voice, data and video (World Bank, 2012, pp. 93 & 118; Benkler, 2006, pp. 2-3).

In this regard, unified licensing frameworks (ULFs) that allow for provision of converged services are generally encouraged, to enable increased competition with fewer or no restrictions to specific categories of service provision (World Bank, 2012, pp. 91-92; Benkler, 2006, p. 2; a4ai, 2015, p. 32). Adoption of ULFs is becoming common across many markets, being seen in

countries such as South Africa, Kenya, Mauritius, Turkey, Finland, South Korea and Malaysia (a4ai, 2015, p. 32). In Malaysia for instance, the ability for an operator to provide fixed and mobile broadband services, pay television, and other Internet based services under a single licence has significantly increased operator competition and broadband penetration levels across the country (a4ai, 2015, p. 16).

According to Msimang (2011, p. 6), unrestricted investment for Kenyan operators in areas such as terrestrial backbone networks and undersea cable systems improved competition and access to broadband Internet across the east African country. Msimang (2011, p. 6) indicated that the government also found it necessary to invest in companies such as Safaricom, Telkom Kenya and the National Optical Fibre Backbone Infrastructure (NOFBI), to ensure direct participation in the race to deliver broadband Internet. This approach, while common in many developing countries, has been discouraged by the World Bank (2012, p. 39), which calls for governments to focus on facilitation of operator competition, accountability and transparency, and leave the rollout of services to the private sector.

In a paper that examined determinants of high broadband penetration in South Korea, Lau, Kim, and Atkin (2005, p. 354) identified as crucial to service based competition, the high number of Internet companies in the country. South Korea boasted around 102 service providers as far back as 2002, many competing with their own infrastructure against incumbents in a market with "friendly regulation for latecomers" (Lau et al., 2005, p.354).

While multiple operators in a single market are perceived as ideal for competition, Huigen and Cave (2008, p. 718) argue that not a large number of countries have taken this route for fixed telecommunication networks. The authors cite Belgium and Netherlands as some of the few European countries that had two fixed line operators by the year 2008. In South Africa, where, despite the existence of Telkom and Neotel as major competitors in the fixed network

market, fixed broadband subscriptions remained low with only 18% of residential homes reported to have a working telephone line in 2008 (Research ICT Africa, 2008, p. 1). RIA (2008 pp. 1 & 4) further claimed that for African countries with privatised incumbents and multiple fixed line operators, expansion of data and voice services has targeted the corporate sector, where returns to investment are known to be more certain.

In considering these observations across a number of countries, the researcher arrived at an inference that market liberalisation raises competition in the supply of broadband Internet as the number of operators increases. However, some countries with open-entry regimes, particularly in developing regions still record lower levels of investment in infrastructure networks. This reveals that market liberalisation has been a tool for SBC across developing countries, a scenario different to that of developed countries such as South Korea, where according to the literature, FBC has been significantly achieved.

Having observed considerable state investment in the analysis of broadband Internet in Kenya, Msimang (2011)'s study fell short of assessing the impact of such a public policy decision on the market behaviour of existing operators and potential entrants. In this regard, similar to the opposing sentiments of the World Bank (2012), I argue that state investment may reduce operators' incentives to provide similar services and directly compete with a large investor like government, therefore the approach may negatively affect broadband competition.

2.1.1 Optimisation of access to spectrum resources

The rapid development of mobile and wireless technologies and increasing consumer demand for data-intensive services have caused authorities to consider ways of alleviating spectrum scarcity to attain its efficient and intensive use (Feijoo, Gomez-Barroso & Mochon, 2009, p. 33; a4ai, 2015, p.33; World Bank, 2012, pp. 96-98). There is need for flexibility in the use of radio spectrum, with

proponents calling for modification of traditional command-and-control spectrum management methods, which are believed to hinder the widening of access to broadband Internet (Valletti, 2001, p. 665; World Bank, 2012, p. 97). The traditional methods, which may be imposed by governments or designated spectrum agencies are largely characterised by a set of restrictions in technologies that operators can use, services to be provided, and geographical areas that can be covered (Feijoo et al, 2009, p.42; Xavier, 2006, p. 34).

Non-discriminatory and transparent methods of awarding spectrum are ideal for effective supply of services, including additional allocations on television (TV) whitespace and digital dividend bands (Feijoo et al, 2009, p.33; World Bank, 2010, p. 77; a4ai, 2015, p. 33). Spectrum managers should also be considerate that modern technologies and innovations are capable of supporting provision of multiple services over the same spectrum (World Bank, 2012, p. 96).

2.1.2 Spectrum allocation mechanisms: Auctions versus beauty contests

From the work of Klemperer (2002), Anderson, Hulten and Valiente (2005), and Cave and Valletti (2000) we learn that spectrum managers commonly employ auctions and administrative processes or 'beauty contests' in allocating the resource. Auctions, which are believed to maximise public revenues and ensure that licences are awarded to operators that could best use the spectrum, seem to take the lead, particularly across developed regions and some of the developing countries such as Nigeria (Cave & Valletti, 2000, p. 348; Feijoo et al., 2009, p. 41, Gruber, 2001, p. 69).

Despite being transparent, auctions are labelled as discriminatory since they present the opportunity of spectrum licence ownership to operators that are capable of bidding very highly (Gruber, 2002, p.56). Gruber (2002) argues that in reacting to high spectrum spending, auction winners may aim for increased industry profits by concentrating network deployment in regions that are more profitable, hence delaying widespread of broadband services and hiking prices

(p56). Auctions may also result in few operational firms and abuse of market power particularly in that high licence application fees reduce the chances for smaller firms who cannot afford to deploy extensive networks to enter the market (Anderson et al, 2005, p.579; Cave & Valletti, 2000, p. 348). Feijoo et al (2009, p.41) disagrees with the notion that auction winners may delay infrastructure rollout as a result of targeting profitable areas, stating that the sunk costs incurred by the firms are a good incentive to expand networks and recover expenses. Feijoo et al (2009) argues that spectrum agents usually aim for technological and social efficiency to realise returns to their investments.

Beauty contests on the other hand, which involve evaluation of spectrum application bids against pre-set criteria with applicants that best meet the requirements becoming successful (Cave & Valletti, 2000, p. 348; Feijoo et al, 2009, p. 41), are believed to bring greater market efficiency as they attract a larger number of firms that are willing to abide by the set licence conditions (Feijoo et al, 2009, p.41; Gruber, 2001, p. 68). The method is also hailed for its collusion prevention as it guards against dominant firms conspiring to keep rivals out of competition (Klemperer, 2002, p. 831, Gruber, 2001, p. 70). However, the credibility of beauty contests is questionable due to possibilities for biasness, favouritism and corruption during evaluation of spectrum bids (Cave & Valletti, 2000, pp. 348-349; Anderson et al, 2005, pp. 579-580; Feijoo et al, 2009, p. 40). Further, the beauty contests have been abandoned in some of the EU countries such as Ireland, because of their high risk of contentious litigation (Binmore & Klemperer, 2002).

One may conclude that proper application of either form of allocation, with modifications to address associated demerits can be appealing to existing operators and prospective entrants hence increase the levels of both SBC and FBC. It is for spectrum managers to carry out market assessments, benchmark against other countries and conduct public consultations to reach informed decisions on the method of assignment best suited for their environment. Hybrid

systems may be adopted, as was seen when France used beauty contests for selection of firms but set high licence fees often associated with auctions, during the award of UMTS spectrum (Cave & Valletti, 2000, p. 350).

The use of hybrids could therefore facilitate spectrum access to many applicants while collecting a lot of revenues from licence fees. Some countries such as India have chosen to mix different allocation methods, auctioning spectrum for mobile cellular services and using first-come-first-serve approach with rollout obligations for licensed wireless services (Jain, 2001, p. 676). This approach by India supports both SBC and FBC in that large mobile operators may focus on the auctions with the aim to deploy their own efficient networks and return their spectrum revenue losses through radical competition measures, while smaller firms would go the SBC route with the easily availed wireless Internet licences.

2.1.3 The need for lower spectrum licences fees

Gruber (2001, p. 61) questions the limit at which managing agencies should set spectrum fees, warning that artificial barriers to market entry may be experienced if licences are awarded at high costs. Firms may reach a state of bankruptcy following payment of high spectrum fees, an instance experienced by some USA operators in 1998, which negatively affected the level of competition that prevailed as most firms ceased operation (Gruber, 2001, p. 61). It has also been argued that stable economies do not have to rely on spectrum revenues at the disadvantage of broadband markets (Yan, 2004, p. 218). Hong Kong as one example, decided not to auction spectrum for 3G technology, justifying that the funds would have been a once off occurrence with no continued contribution to government revenues (Yan, 2004, p. 219).

While both Gruber (2001) and Yan (2004) fail to allow for administration expenses for spectrum managers in their advocacy for low spectrum fees, their sentiments are similar to that of the researcher, that countries need not see

spectrum fees as the 'cash-cow' for their public coffers, and rather support operator affordability of spectrum resources to increase market competition and realise significant economic contribution of competitive communications sectors.

A case in which reduced spectrum prices increased broadband service provision through raising the number of market players was found in Kenya, where Msimang (2011, p. 24) indicated that in 2011, the Communications Commission of Kenya (CCK) lowered prices for 3G licences to 60% less the amount paid by Safaricom in 2007. According to Msimang, this decision saw the introduction of two additional 3G spectrum licensees (Airtel and Orange) within the same year (p. 24). Msimang (2011) further notes that the CCK also allowed for all operators to upgrade their networks to 4G services without further charges until their 3G licences expired. While these decisions appeared unfair to Safaricom, the Commission aimed to promote market competition and technological neutrality for increased supply of broadband services (Msimang, 2011, p. 24).

2.1.4 Additional broadband access through television (tv) whitespace and digital dividend bands

Mwangoka, Marques and Rodriquez (2013), describe TV whitespace bands as "spectrum frequency bands unused by the Digital Video Broadcasting-Terrestrial (DVB-T) systems, interleaved in both frequency and space" and call for governments to make the idle bands available for the provision of wireless broadband Internet (p. 116). Such spectrum would increase new operators' incentives to enter the markets and compete with existing firms, contributing to increased competition in the wireless Internet space, which is generally assumed to be efficient considering the nature of TV whitespace bands (Mwangoka et al, 2016).

However, the use of TV whitespace has not taken off satisfactorily across the world, except in the United States of America (USA) where markets are fully

developed (Mwangoka et al, 2013, 116). In advocating for creation of incentives for the use of TV whitespaces on the one hand, and protection of incumbent firms on the other, Ghosh, Roy and Cavalcanti (2011, pp. 22-25) state that policy makers should promote easier access to the bands, while ensuring operator accountability through development of dispute resolution frameworks to handle issues such as harmful frequency interference and failure to abide by parameters of operation.

Broadcaster transition from analogue spectrum (700 MHz or 800 MHz) to Digital Terrestrial Television (DTT) frees the bands and gives way for wireless broadband network connectivity (Mugeni et al, 2012, p. 756; World Bank, 2012, p. 103; a4ai, 2015, p. 33). The World Bank (2012, p. 103) indicated that the freed spectrum, commonly referred to as "digital dividend" is ideal for broadband markets as it offers the wide coverage needed particularly for sparsely populated rural areas and in-building connections in urban centres. By 2015, most African countries were said to be lagging behind in meeting digital migration timelines with an exception of Tanzania and Rwanda, which respectively migrated to digital television spectrum in March 2014 and July 2014 (Kamau, 2015, para. 1-2). According to the World Bank (2012, p. 103), most developed countries including Germany, Netherlands and USA have long accomplished their analogue-switch-off (ASO) target dates, and are experiencing increased access to wireless broadband made possible by assignment of digital dividend bands.

While noting the importance of TV white space and digital dividend bands as resources that could lure in stiff competition amongst operators, it becomes clear that national mandates to release and authorise usage of such bands have not been satisfactory across the developing world. The extra spectrum could benefit broadband markets in two folds: attracting new entrants and allowing existing players to improve their services and increase their footprint. It is therefore the researcher's view that frameworks for enabling additional access to broadband Internet through TV whitespace and digital dividend spectrum in

developing regions have not reached a stage at which their effect on competition in broadband markets could be gauged. Developing countries need to make close observations and learn from approaches adopted by technologically advanced nations, including where applicable, requests for aid in the form of expertise and funding.

2.1.5 Spectrum secondary markets vital

In addition to calls for adjustments of traditional spectrum management mechanisms discussed above, there is another school of thought that involves market-based approaches to spectrum efficiency. Reassignment of underutilised bands to other operators, either under sharing, resale or leasing out agreements, which is commonly referred to as spectrum sharing, has been identified as a significant way of increasing access to broadband Internet (Valletti, 2006, pp. 663-665; Xavier & Ypsilanti, 2006, p. 34; Durantini & Martino, 2013, pp. 87-88).

Countries that have implemented spectrum trading and stimulated competition in broadband markets include Australia, New Zealand and the USA (Xavier & Ypsilanti; 2006, pp. 40 & 44; World Bank, 2012, p. 100). Subject to approval by the Federal Communications Commission (FCC), licensees in the USA are able to transfer their spectrum in whole or in part to other operators showing interest in trading (Xavier &Ypsilanti, 2006, p. 44). Instances of spectrum resale or leasing are also evident in USA markets, with third parties using spectrum initially awarded to other firms without the need for transfer of rights (Xavier & Ypsilanti, 2006, p. 44). Xavier and Ypsilanti (2006) show that amongst other benefits, spectrum trading enables faster acquisition of the resource at lower transaction costs; technological innovation, quality of service and increased network coverage fuelled by competition; including business opportunities for related firms such as equipment developers and radio dealers (p. 42).

Policies for spectrum trading should incorporate user rights to protect against harmful interference (Valletti, 2006, pp. 659-659; Xavier & Ypsilanti, 2006, p. 53). While Durantini and Martino (2013) support secondary markets, they caution against degradation of quality of service, which may occur in cases where network technologies do not effectively support simultaneous sharing of spectrum. The World Bank (2012, p. 100) has also warned of the possibility of abuse of dominance with bigger operators buying large amounts of high-value spectrum and closing out smaller firms. While labelled by some as detrimental to the spread of broadband and services, preventive measures to such negative behaviour by dominant firms include introduction of spectrum caps and reservation of blocks for new entrants (World Bank, 2012, p. 100).

We learn of the various approaches to spectrum management that authorities may adopt to meet the demand of operators, promoting competitive markets with increased supply of broadband Internet. While supportive literature is quite limited for developing countries, disparities in spectrum management and its market outcomes between the smaller economies and the developed world seem to be of high level. It is the researcher's view that nations with poor economies and political instability for instance, would not easily achieve digital migration targets to release the digital dividend, while environments with excessive corruption in the public service may fail to set low spectrum fees and uphold transparency in the awarding of spectrum licences. In this regard, spectrum efficiency and flexibility in some developing countries may take long to achieve, particularly for nations facing some of the challenges given as examples above. The key observation is that general investment in broadband Internet may be slower for countries with radio spectrum uncertainties.

2.2 Access regulation and network infrastructure sharing

Infrastructure sharing amongst operators can be encouraged through several policy and regulatory approaches. It is believed to reduce the sunk costs

associated with network deployment, enabling increased operator investment in broadband service provision (a4ai, 2015, p. 34). Many countries have opted to expand their national networks through establishment of Special Purpose Vehicles (SPVs), with governments collaborating with the private operators to invest in, and share backbone infrastructure under an open access principle (a4ai, 2015, p. 34). Arguments have been made that:

> If new market players can gain access to existing infrastructure at competitive rates, entry barriers will be minimised, promoting competition that can result in reduced prices. Infrastructure sharing occurs at different levels - through opening up access to the existing copper network, through joint building and operation of shared backbone infrastructure, or through coordination among linear infrastructure providers, like power lines, gas pipelines, or roads (A4AI, 2015, p. 34).

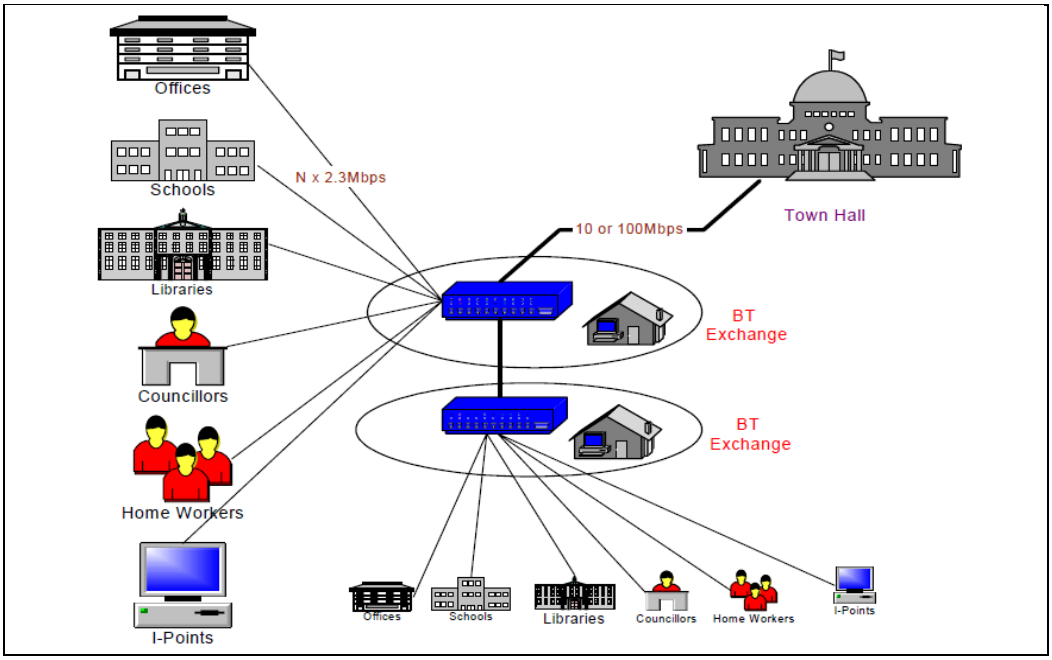
For the sharing of passive infrastructure such as towers, power supply and air conditioning systems, markets are often left to commercial dealings between operators, with light regulation to discourage bigger operators from closing out smaller entrants (Beckman & Smith, 2005, pp. 78-80).

2.2.1 Mandated local loop unbundling and authorisation of mobile virtual network operators

Local loop unbundling (LLU), a process through which incumbent operators are mandated to lease out access to their last mile infrastructure under regulated terms (Picot & Wernick, 2007, p 664; Distaso, Lupi & Manenti, 2009, p. 2), is another mechanism through which expansion of broadband services can be approached. According to Distaso et al. (2009, pp. 62-63), LLU may involve either resale of services; shared access with the incumbent using the leased lines for other services such as voice; or fully unbundled access with competitor gaining total use and control of the copper lines. The process is commonly seen in developed regions such as the OECD countries, where unbundling regulations are seen as a means of promoting competition through providing opportunities for new firms that cannot afford to deploy their own networks (Wallsten, 2006,

p.4, Fletcher, 2006, pp. 1-3). In providing an example of networks for the public sector in the United Kingdom (UK), Fletcher (2006, p. 4) uses Figure 2 below to demonstrate a typical LLU network.

Figure 8: Illustration of a Typical LLU Network



Source: Fletcher (2006)

As illustrated, the network circuits spreading to the premises of different customers are owned by the incumbent operator (British Telecom), which leases them out to other service providers. Fletcher (2006, p. 3) explains that competing firms would then unbundle the exchanges and provide broadband services to multiples business, school and resdential customers, while others install their own equipment on the network and sell broadband offerings. Regulators are encouraged to monitor access prices set by incumbents and other larger network operators to ensure cost-oriented wholesale pricing of loops as a means of ensuring fair market operations and continued investment (Janevski, 2015, pp. 58 & 60). Attesting to this view, Bourreau and Dogan (2009) state that "a price too

low may deter investment in alternative networks, and a price too high would discourage entrants from joining service-based competition" (p. 181). Janevski (2015, pp. 60) further notes that effective regulation of LLU pricing minimises the need for regulatory intervention at retail level.

LLU has however been criticised for having the ability to erode the incentive to invest by both incumbents and competing firms (Distaso et al 2009, p. 3; Jorde, Sidak & Teece, 2000, pp. 1-4). From the perspectives of these authors, LLU may reduce profits made by incumbents and negatively affect their level of investment in new technologies and innovations. As it enables trading without incurring the heavy expenses of infrastructure deployment, competitors may prefer to continue leasing existing networks and less likely deploy their own (Distaso et al 2009, p. 3; Jorde et al, 2000, pp. 1-4).

In investigating the effects of LLU on new entrants, Friederiszick, Grajek & Roller (2008) conducted a study of 180 service providers across 25 European countries between 1996 and 2007, which revealed a reduction in incentives for the firms to deploy their own infrastructure. The study discovered no significant effects on investment decisions by incumbents. In Finland, a study of broadband markets by Distaso et al. (2009) reported increased infrastructure investments by proprietary networks between 2005 and 2007, while the firms initially depended on shared access and full LLU for service provision (p.12).

Service-based competition may also be introduced through opening markets for Mobile Virtual Network Operators (MVNOs) (World Bank, 2012, p.119). These are as described by Kim, Kim, Gaston, Lestage, Kim and Flacher (2011, p. 916) and World Bank (2012, p.119), mobile operators that do not own any network facilities but lease infrastructure and frequency spectrum from bigger firms to provide services under their own brand. In a study of 58 incumbent mobile operators in 21 OECD countries, between 2000 to 2008, Kim et al (2011, p. 916) found ~~out~~ that mandatory provision of access to MVNOs negatively affected revenue generation by incumbents, and reduced their incentive to expand

network investments. On the other hand, positive outcomes are often anticipated for environments with MVNO participation as noted by Kim et al. (2011) that "mandatory access provision to services-based downstream rivals may result in more intense competition in the retail market" (p. 909).

The study by Kim et al (2011) confirms the views of Kotakorpi (2006, p. 1013-1015) and Woroch (2004, p. 222) that similar to LLU, the introduction of MVNOs may present a trade-off between promotion of competition to bring down market prices and provision of incentives for infrastructure investment. Sutherland (2011, p. 33) has observed low service-based competition through LLU and MVNOs in the African region, indicating that only in Morocco had local loops been substantially used by Inwi telecommunications company.

For South Africa, Sutherland (2011, p. 33) noted delays in implementation of LLU, despite existence of legal provisions in the Electronic Communications Act of 2005.In addition to limited capacity at both policy and regulatory levels to oversee LLU processes, the author cites other limitations for most Africa countries including few loops, uncertainty with regards to quality and that the infrastructure is often deployed in locations that are less profitable for broadband retailers. The World Bank (2012, p.119) has also indicated that the MVNO model is not largely practised and therefore has not shown any globally recognisable success.

2.2.2 Access regulation and the ladder of investment theory

The market effects of regulatory processes such as mandated LLU and MVNOs authorisation are often considered in terms of the ladder of investment theory, a model through which Cave and Vogelsang sought to show that essential facilities such as infrastructure networks may lose their indispensable status and proliferate over time (Distaso et al, 2009, p.3). According to Cave and Vogelsang (2003, pp. 717-720), regulators are capable of stimulating infrastructure investment by new entrants through periodically increasing prices for the leased

incumbent access, getting the firms to reach decisions to deploy their own networks.

Through this theory, Cave and Vogelsang (2003) recommend regulators to encourage market entry in the initial stages by setting low prices for accessing incumbent networks, and increasing them at later stages when the competitors are ready to make their own investments. The mandatory increase in access prices would be based on the assumption that after a particular period, entrants gain necessary market experience, large customer base and increasing revenues that enable private infrastructure investment (climbing up the ladder) (Cave & Vogelsang, p. 2003, pp. 724-726).

We realise that studies and views that reflect the negative impact of mandatory LLU and market participation of MVNOs go against the ladder of investment theory, while findings that attest to the regulatory processes as necessary for competitive markets can be seen as supportive of the theory. In the researcher's view, the theory is limited in assessing broadband infrastructure investment in its entirety as it does not address the manner in which the leasing out of access affects incumbent operators. Policy makers and regulators would have to apply the theory for analysis of investment by market entrants only, as it excludes approaches to triggering investment growth by incumbents. As reflected through the aforementioned studies on the effects of both LLU and MVNOs, one realises that access regulation does not always bring positive results as often anticipated by authorities.

2.3 Approaches to universal access for broadband internet

Whereas stiff competition amongst network operators and service providers is known to fuel wider access to broadband services, gaps in connectivity generally exist between urban centres and the less profitable rural areas (World Bank, 2012, p. 166; Broadband Commission, 2013, p. 54). It is further stated that "private, competitive market provision does not always provide

last mile access to every subscriber, mainly due to the higher marginal costs of providing access to remote users" (Broadband Commission, 2013, p.54).

To address market gaps that occur due to the high marginal costs associated with deployment of networks and service provision in low population density areas, policy often reduces the economic burden through public investment and funding initiatives through Universal Access and Service Funds (UASFs) (ITU, 2014; Choudrie & Lee 2004; Picot & Wernick,2007). Universal access initiatives therefore ease deployment of infrastructure networks in areas that would otherwise be avoided by the operators, promoting facility-based competition (World Bank, 2012, Broadband Commission, 2013).

Implementation of universal access policy is widely seen across both developed and developing regions. In the UK for example, Ofcom (2013) reported that the government targeted to increase national superfast broadband coverage to 90% by the year 2016, funding the rollout of broadband services to rural and sparsely populated areas with a total of GBP 540 Million (USD 658.8 Million). Similar decisions have been reached in South Korea, where it has been reported that:

> Recognising that the high costs of deploying new local access networks may also hinder broadband roll-out, the government provided pump-priming funding to facility-based service providers through the provision of loans at preferential rates worth USD 77 million in 1999 and a further USD77 million in 2000 (Picot & Wernick, 2007, p. 668).

Rwanda is one of the African countries that have shown commitment to universalising access to broadband Internet. In 2013, the Rwandan government announced its plan to invest USD 140 Million in a partnership with Korea Telecom Corporation (KT), for expansion of ICT infrastructure to rural areas that were not covered by the national fibre optic backbone (a4ai, 2015, p. 20). While this investment was estimated to connect about 95% of the population to high-speed mobile broadband, it also brought the fear of possible deterrence to

competition at retail levels (a4ai, 2015, p. 20). The UASF for Nigeria has also aimed to connect 200 communities and 2000 government schools by 2017, collaborating with other institutions and the private sector to provide computers and bandwidth (ITU, 2012, p. 18).

Other approaches to ensuring service delivery in underserved areas have included rollout obligations as licence conditions for network operators or service providers (Cave & Valletti, 2000, p. 349; Picot & Wernick, 2007, p. 661; Bourreau & Dogan, 2009, pp.170 & 172). Xavier (2006, p. 43) gives an example that national carriers authorised to spread coverage to rural areas may, where spectrum trading is permitted, choose to lease or sell part of their spectrum to other operators existing in those areas at lower transactional charges, enabling existence of networks best suited for, and managed by carriers in the rural areas. This example by Xavier (2006) speaks to the possibility of increased broadband competition triggered by leasing or selling of spectrum to other firm to comply with roll-out obligations.

2.4 Other factors affecting competition in the provision of broadband Internet

In addition to policy and regulatory processes, diverse socio-economic, demographic and geographic factors may have a significant bearing on a country's broadband achievements (Lau et al, 2005, pp. 350 & 357; Cava-Ferreruela & Alabau-Munoz, 2006, p.453; Fransman, 2006, p. 89). While mindful of the research scope, the researcher briefly acknowledged some of the views on factors that may have an effect on competition in the provision of other than policy and regulation.

2.4.1 Socio-economic factors

Fransman (2006, p. 89) and Lau et al. (2005, pp. 350 & 357) indicate that multiple broadband operators often target urban centres with high population density where they are sure of returns to their investments, and may set tariffs

below cost recovery in the short run, to stimulate the take up of services. Operators would then maximise profits in the long run due to economies of scale and scope, enabling further network expansion (Fransman, 2006, pp 89-91). This is supported by Eisenach (2012), who explains that as firms in highly populated areas grow in size and service output, venturing into different broadband technologies and other offerings, their cost of production declines and enables improved service provision at lower prices. In defining these concepts, Bloach, Madden & Savage (2001) state that; "economies of scale exist when the marginal costs of production are less than average costs over the relevant output range" and "economies of scope exist when common facilities make the production of a combination of goods less expensive than producing them separately (p. 1)."

In the case of South Korea, the world's leader in broadband adoption, both Fransman (2006, p. 92) and Lau et al (2005, pp. 351) argued that the country's large population and high percentage of households living in apartment complexes enabled lower operator capital costs, making market entry a reasonable decision. The authors also show that the large number of South Koreans staying in close proximity to telephone exchanges in the cities simplified extension of broadband networks to customer premises.

In Africa, a good example of a highly populated country with improving broadband penetration is Nigeria, where one of the reasons attributed to high active subscription for mobile broadband was the multiple number of service providers at both SBC and FBC levels. The country's active mobile broadband penetration was recorded at 10.1 % of the population in 2013 (Broadband Commission, 2014, p. 98), rising to 11.7 % by 2014 (Broadband Commission, 2015, p 88). Nigeria's broadband market was dominated by Glo and MTN by the year 2016. The country was ranked Africa's largest economy by the year 2015 (by means of nominal GDP), a status considered to have supported its increased

ICT investment (ITU, 2015, p. 68), which may be attributed to its large oil market that attracts investors.

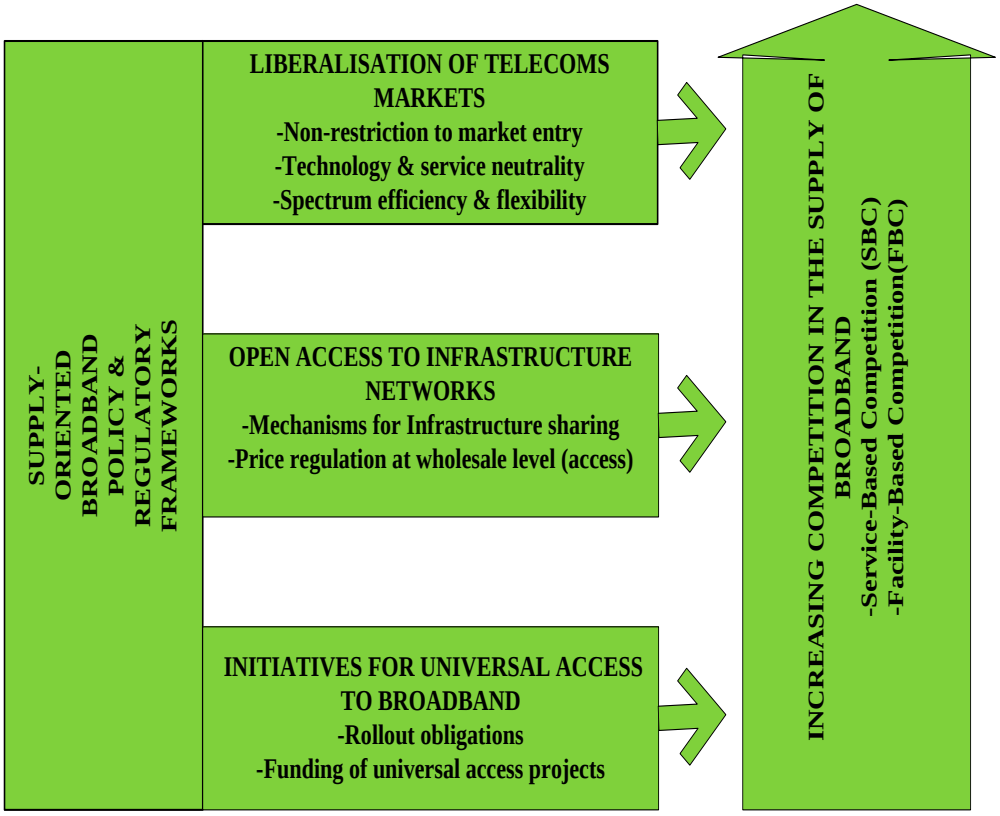
2.4.2 Geographical factors

With reference to geographical advantages bestowed on some countries, it is often narrated as seen in Sutherland (2011, p. 32) and Msimang (2011, p. 15), that some east and west African countries, which historically relied on expensive satellite technology for international connectivity have experienced increased investment in broadband network infrastructure and services following the landing of undersea cables on their coastlines. According to Esselaar, Gillwald & Sutherland (2007, p. 6), the geographical locations of some islands such as Reunion and Mauritius have also enabled easy landing of undersea cables in their coasts, improving markets for local and international connectivity to broadband services.

2.5 Conceptual analytical framework

Having drawn key concepts that from the reviewed literature, the researcher uses Figure 3 below to illustrate the manner in which policy and regulatory interventions may influence competition in the supply of broadband Internet.

Figure 9: Analytical framework; the impact of policy and regulatory frameworks on competition in the provision of broadband Internet



Design: Author

The conceptual framework brings together the three key areas of intervention; market liberalisation, open access to infrastructure, and initiatives for universal access to broadband Internet to create a multi-faced approach for achievement of both service-based and facility-based competition. Licensing regimes that support open market entry and technology-and-service neutrality would enable provision of a variety of broadband offerings as a high number of firms compete in the market. Effective regulation of access to infrastructure enables other operators to gain access to networks owned by incumbents, increasing competition in supply of services. Similarly, a positive effect would be exerted by the regulation of wholesale prices to prevent predatory pricing that may disadvantage the business of smaller firms. Adoption of universal access

initiatives such as rollout obligations for licensed operators and funding of connectivity projects for underserved and unserved areas would be appealing for operators willing to expand their networks through leveraging on funding schemes.

The positive effect these interventions may have on competition in the provision of broadband is depicted by way of upward pointing arrow. While each would have its own level of impact, increased competition can be anticipated for markets with jointly enforcing policy and regulatory frameworks. Naturally, the number of firms competing at both service and infrastructure levels would be expected to show a negative response in markets comprising weaker or lack of such key policy and regulatory interventions.

2.6 Chapter summary

authors have shown a common point of departure with regards to the stimulation of broadband service provision, stressing the need for policy and regulation to aim for increased competition to attain market efficiency. Observations take note of the transition from traditional monopoly to liberalised markets under which open entry and technology-and-services neutrality are key to obtaining competitive markets. Management of spectrum for broadband access is seen as essential. Amid innovation and technological advances, spectrum managers are faced with the challenge of balancing the mechanisms for efficient use of the resource with licensee and consumer protection from problems such as harmful frequency interference and abuse of market power by dominant operators.

The principle of open access to infrastructure networks, which can be upheld through a number of approaches to access regulation such as LLU and establishment of MVNOs, has proven necessary in the expansion of broadband networks. While an often debated subject, Governments can also play a more direct role through retaining shares in some of the network operators. The role of

public policy also involves funding of broadband projects through UASFs and setting up universal access obligations to encourage operators to deliver services to economically unviable markets. The regulation of wholesale broadband prices to prevent unfavourable market dominance by incumbents and larger network operators is also necessary for increased competition.

While the effects of policy and regulatory frameworks would vary across nations, such interventions are generally believed to facilitate competitive markets with unrestricted market entry, network expansion, new technologies and innovations, differentiated products and services, and increased access to broadband Internet. However, some argue that competition in the supply of broadband Internet does not always respond positively to the interventions of policy and regulation. In the end, we note that policy and regulatory frameworks bringing competition success in one country may not yield similar outcomes in other markets.

Apart from policy and regulation, other factors such as population density, economic status and geographical positions of some countries have also been acknowledged to have influence on broadband competition. Of the reviewed literature, studies on developing countries are limited in comparison with materials making reference to developed regions. This may be attributed to limited research and publications in the effects of policy and regulatory frameworks adopted in developing countries.

CHAPTER 3: METHODOLOGIES TOWARD UNDERSTANDING THE EFFECTS OF BOTSWANA'S POLICY AND REGULATORY FRAMEWORKS ON COMPETITION IN THE PROVISION OF BROADBAND INTERNET

This chapter presents the research design and methodology adopted in employing techniques for data collection, presentation and analysis. It therefore explains the steps followed in addressing specific research aims b, c, d, and e stipulated under Chapter 1.

3.0 Qualitative research methods

From Hennink, Hutter and Bailey (2011), we learn that qualitative research is usually conducted when researchers are faced with the task of exploring relatively new topics, to describe and interpret views and experiences of different individuals about a particular theme, often reaching analysed outcomes that may not need to be disentangled quantitatively. While studies have been conducted on the roles of policy and regulation towards competition in telecommunications markets, the direction taken by this investigation has not been initially explored in the context of Botswana. To the knowledge of the researcher, the specific relevance of the study as depicted through the stipulated research problem, objectives and purpose, has not been previously investigated or published. This has prompted, as relayed by Hennick et al (2011) above, a qualitative research method that explores the views and experiences of key stakeholders to describe and provide insights into the new angle of investigation.

Further in line with the research purpose, an explanation to the place of qualitative techniques in research indicates that the method is:

> …mainly concerned with the properties, the state and the character (i.e., the nature, of phenomena). The word *qualitative* implies an emphasis on processes and meanings that are rigorously examined, but not measured in terms of quantity, amount or frequency…Qualitative data provide depth and detail through direct quotation and

> careful description of situations, events, interactions and observed behaviours (Labuschagne, 2003, p. 100).

Similarly, Leedy and Ormrod (2013) advise that qualitative data is presented in the form of words, other than numerical demonstrations that are often associated with quantitative studies. The authors indicate however that historical statistics may be used where there is need to support particular findings of qualitative research. From the views of Labuschagne (2003) and Leedy & Ormrod (2013), we establish a direct link between the features of qualitative research methods and the study objectives as captured in the previous chapter. The study has provided insights into existing policy/regulatory processes and their apparent effects as opposed to tallying emerged views against the number of research participants. This aligns with the views of the authors in their description of qualitative research methods.

3.1 An interpretive and analytical case study

Case studies are described by Bromley (1990) as systematic inquiries of an event or a set of related activities that aim to interpret, analyse and describe a phenomenon of interest. It is further stated by Yin, 2003, p.1 that:

> In general, case studies are the preferred strategy when "how" or "why" questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context (Yin, 2003, p.1).

These descriptions by Bromley (1990) and Yin (2003) have informed the researcher's choice of the case study method. A closer look into the authors' description of case studies establishes an alignment with the explorative and interpretive purpose of the research earlier discussed. As noted by Yin (2003) above, the case study approach was relevant for the drawing of answers to the "*how"* aspect of the main research question, exploring different policy and regulatory interventions to provide an insight into their effects on broadband competition. In addition, the researcher remained solely dependent on the views

of the research participants and industry related documentation to derive the research results, hence had no control over events surrounding the chosen area of study.

3.2 Data collection

3.2.1 Purposive sampling

A purposive sampling method has been adopted for this study, which according to Welman, Kruger and Mitchell (2005), involves selection of research participants to represent a studied population without the use of probability techniques, depending rather on a researcher's experience and knowledge of the study area. The researcher has experience in the field of communications regulation and was in the employ of BOCRA at the time of conducting the study. The researcher was therefore aware of categories of stakeholders to consider when sampling participants. This familiarity with the area within which the research scope falls provided a good basis for adopting the purposive sampling method explained above by Welman et al. (2005).

The sample comprised of individuals at senior and junior management level from the ministry responsible for communications, the regulator, the Universal Access and Service Fund (UASF), telecommunications network operators, Internet service providers, and academia. The researcher's assumption was that such individuals would be equipped with extensive and historical knowledge on issues of broadband service provision, policy and regulation due to their work experiences, enabling them to share information that is relevant to the study.

As opposed to quantitative studies, which often require larger samples to argue numerical relationships, qualitative investigations involve the use of smaller sample sizes as their aim is to explore, explain and derive detailed understanding of key concepts (Labuschagne, 2003, p. 100; Teddlie & Tashakkori, 2009, p. 174; Hennink et al, 2011, pp.16-17). In this regard, a total

of fifteen participants were sampled from the different categories. Due to decisions not to participate in the study by some sampled participants, twelve out of the fifteen participants were interviewed by the end of the data collection period. See Table 1 below.

Table 2: Sample Size and Interviewed Participants (more detail in Annexure 1)

Participant Category	**Institution/Participant**	**Sampled Participants**	**Interviewed Participants (Abbreviated Identification)**
Policy	Ministry for communications Universal Access and Service Fund	1 1	MTC-1 UAS-1
Regulation	BOCRA	2	Reg-1, Reg-2
Service Provision	Facility Based Operator Telecoms Network Operators Internet Service Providers	1 3 4	FBO-1 TBO-1, TNO-2 ISP-1, ISP-2, ISP -3
Research institutions/ Academia	ICT Research and Consultancy Agency Innovation Agency University Lecturer and Researcher	1 1 1	ICT-Res-1 - Uni-1
TOTAL		**15**	**12**

At policy level, one participant represented the telecommunications department at the Ministry of Transport and Communications (MTC), while another sat in for the Universal Access and Service Fund (UASF). Two participants were selected from the regulator (BOCRA), one mostly involved in general regulation and development of communications markets including broadband Internet, while the other was largely responsible for technical

engagements of the regulator. Under the service provision category, one representative was from the fibre company, three from telecommunications operators and four from Internet service providers. Under this category, only two operators and three ISPs agreed to participate.

The final sample category was made up of researchers from academia, consisting of one participant from a company that conducts ICT related research and consultancies, one lecturer from the University of Botswana whose work has covered ICT related research and a public agency with a mandate to facilitate and implement innovation efforts across different sectors of the economy. The researcher managed to interview an ICT-based research company and a university lecturer under this category. The researcher therefore collected data from a total of twelve out of the fifteen sampled communications industry stakeholders. In respecting the wishes of the interviewees, whom almost all opted for their full names not be shown in the final report, abbreviated identifications were used as shown on Table 1 above.

3.2.2 Semi-structured interviews

Data was collected through the use of open-ended semi-structured interviews, which as explained by Hennink et al. (2011, p. 109), involve one-on-one conversations in which a research participant provides answers to an investigator's set of predetermined questions. Unlike other methods of data collection such as close-ended-questionnaires and email/post based surveys, semi-structured interviews rule out the shortfall of time delay and ensure spontaneous responses by participants (Opdenakker, 2006, p.8). They give the participant the liberty to elaborate their views and even ask questions to understand clearly what is expected from them, and equally enable the researcher to probe for more detail where necessary (Nieuwenhuis, 2010, pp. 87-89). Based on these advantages, semi-structured interviews were seen as relevant for

collection of data that would effectively address the key questions and breed satisfactory solutions to the research problem.

3.2.3 Data collection tool and interview techniques

Opdenakker (2006, p. 3) explains that the use of interview protocols is necessary for keeping both the researcher and respondent within focus, without one directing the other towards views that may be irrelevant for the study. Several open-ended questions were developed under each of the key areas of policy and regulatory intervention (market liberalisation, operator access to infrastructure networks, price regulation and universal access to broadband Internet) as drawn from the literature review and reflected in the conceptual framework. The researcher developed questions that would enable collection of data on these key themes in the context of Botswana, having appreciated what literature has revealed for different other countries. The questions were used to guide the course of the interview sessions, taking less than an hour to complete for each research participant. A copy of the interview guide makes Annexure 2 of this research report.

For adherence to ethical considerations, participants were asked to read and sign upon agreement, an informed consent form that assured them of their right to confidentiality during the study process and in the final research report. Emphasis was made to their voluntary participation in the study, and that they could withdraw from the interview at any point if they saw the need. As indicated above, to ensure confidentiality of participants as advised by Babbie and Mouton (2001, p. 523), short abbreviations have been used in the report instead of the actual names of participants. Copies of an information sheet that introduced the researcher and stipulated the terms of participation in the study, and the consent form are included in the report as Annexure 3. With the permission of participants, the researcher used audio recording as a means of minimising the risk of missing important points, which could have been possible if interviews

were only recorded through written notes. The research was further cleared and permitted by the Ethics Committee. The Ethic clearance certificate is attached as Annexure 4.

The researcher was conscious of Nieuwenhuis (2010, p.87)'s sentiment that interviews may deviate from the main focus of the research if respondents extend their views outside of the topic under investigation. While being cautious not to lead their answers, or inject subjective views on the interviewees, the researcher steadily guided the sessions into the main focus in cases were issues not relating to the research topic surfaced. Questions were therefore addressed without stretching much beyond the estimated one-hour interview sessions. This has often been encouraged in the use of interviews that:

> You must be both listening to the informant's responses to understand what he or she is trying to get at and, at the same time you must be bearing in mind your needs to ensure that all your questions are liable to get answered within the fixed time at the level of depth and detail that you need (Wengraf, 2001, p. 194).

Where answers seemed unclear and unsatisfactorily short, the researcher probed for details by asking for examples and explanation of terms and phrases which she felt needed further clarification. As indicated earlier from the views of Nieuwenhuis (2010) and Yin (2003), probing for clarity in this manner is necessary to exhaust and understand a given answer in the pursuit for solutions to the research problem. At the end of each interview, the researcher briefly outlined the key areas covered and asked if participants had any other information they found relevant and worth sharing. This marked the end of the interviews and enabled sharing of views that may have been omitted. All audio recorded interview data was then transcribed into text in preparation for categorisation and analysis.

3.2.4 Data collected from documents

Several documents that would naturally consist of information relevant to broadband Internet in Botswana were assessed to complement data gathered through semi-structured interviews. Gathering data from documents, which is generally termed "document analysis", is a common aspect of qualitative research. In his definition, Bowen (2009, p. 27), states that "document analysis is a systematic procedure for reviewing or evaluating documents - both printed and electronic (computer-based and Internet-transmitted) material". He further indicates that the method is carried to elicit an understanding of the research area from existing sources and may be used as a stand-alone or a complement to other research methods.

The importance of evaluating documents in research is also discussed in the work of Denzin (1970), Corbin and Strauss (2008) and Yin (2003), who also acknowledge its common usage with other qualitative research methods to provide clarity to, and confirm a given phenomenon. Such a combination with other methods is known as 'triangulation' (Denzin, 1970, p. 271), a technique that Eisner (1991) stresses as giving research increased credibility. Nieuwenhuis (2010) and Mogalakwe (2006) have shown that both published and unpublished documents are often used as reliable sources of data.

Similar to the choice of participants for interviews, the purposive sampling method was applied to select a number of documents in the categories of policy, regulation and Internet service provision. Passages, quotations and phrases relevant to the scope of study, particularly those most answerable to the research questions were highlighted for analysis. It has been advised that researchers should desist form mere stacking of extracts from data sources into the final reports, but rather carry out systematic evaluation of documents to derive an understanding of what the study seeks to reveal (Bowen, 2009; Corbin & Strauss, 2008). Having appreciated the importance of document analysis from the

arguments of the authors, the researcher gathered data from documents that included the following;

i) National Broadband Strategy (NBS, 2014)
ii) Communications Regulatory Authority Act (CRA Act of 2012)
iii) 2008 Regulatory Guidelines on Infrastructure Sharing
iv) UASF strategy (2015-2018)
v) Selected BOCRA Annual reports

3.3 Data presentation

The chapter on research findings outlines the views of the interviewees and data drawn from assessed documents as per the research questions. It assumes a simple and direct approach, using text paragraphs, tables and figures to organise and convey the research findings. Interpretation of collected data is entirely avoided under this stage.

3.4 Data analysis

3.4.1 Thematic analysis

The researcher elicited meaning and understanding of the research findings through exploiting themes or patterns evident across the collected data. This was appraised numerous times for familiarisation with coding of different emerging perspectives, categorised or similar ideas (themes) to enable analysis. Such an approach is known as thematic analysis (Leedy, 1997; Braun & Clarke, 2006; Bowen, 2009). Coding has been described by Wengraf (2001, p. 227) as "simply a little retrieval-tag attached to one or more segments of text to enable you to think of them as related in some useful way". Analysis of data under Chapter 5 provides interpretation and a better understanding of the study findings, using themes common in the data to address the research questions and provide solution to the research problem. The themes found are as follows;

i) Botswana's policy and regulatory frameworks have led to a significant increase in SBC in the provision of broadband Internet

ii) FBC is at minimal level in Botswana's broadband supply market

iii) The LoI theory commonly adopted in broadband markets is non-applicable for Botswana**.**

iv) Competition in the provision of broadband Internet can be reactive to other factors apart from policy and regulation

3.5 Challenges and limitations to the research

Complications encountered during the research process included lack of willingness to participate by one of the sampled network operators and two Internet service providers, an experience that came as a shortfall considering that such stakeholders make significant players in the country's broadband market. The competitive nature of the communications industry in which firms become protective of materials that could benefit their rivals may have attributed to the companies' decisions to decline requests to participate in the study. Some may have preferred for their views or opinions on the roles of policy makers and the regulator not to be analysed and made public through academic reports. However, detailed opinions from firms that agreed to be interviewed and data from existing documents proved helpful in exploring and comprehending the research area.

As in line with ethical considerations, interviews had to be conducted at the convenience of participants, which resulted in the data collection process taking longer than anticipated. Most participants had cited constricting business schedules, postponing interview dates and resulting in a longer research period than anticipated.

To some, the non-probabilistic and small-size features of the samples used in this research may be viewed as less representative of the country's entire broadband environment. It should be noted however that these are common features of qualitative research techniques, meant to explore aspects of the studied

phenomenon and interpret related opinions and views without having to prove their quantitative or numeric interdependencies. In this regard, large sample sizes that are often used in quantitative sampling methods were not suitable for the chosen line of research.

3.6 Chapter summary

The research purpose, which sought to provide insights into the effects of policy and regulatory frameworks on competition in Botswana's broadband market has informed the overarching qualitative nature of the research. As the angle of study is considered new in the context of Botswana, qualitative research methods that focus on explorative, analytical and interpretive approaches to investigation were seen as the most relevant. The researcher opted for an analytic and interpretive case study that focused on the key themes emerging from the reviewed literature, and narrowed the investigation to Botswana as the country under study.

Aided by her work experience and familiarity with the telecommunications industry, the researcher adopted the purposive sampling method to select a total of fifteen interviewees from the categories of policy, regulation, service provision and academia, twelve of whom responded to a set of open-ended semi-structured interview questions. Several documents relevant to issues of broadband Internet in Botswana were also sampled to complement interview data. Data was then categorised into emerging patterns/themes and interpreted (thematic analysis) to find answers to the research questions and subsequently produce solutions for the research problem.

Limitations and challenges to the study included lack of participation by some of the network operators and Internet service providers; postponement of interview dates, which stalled the data collection period; and that the selected sample may seem less representative of the entire broadband market, owing to its small size and non-probabilistic features.

CHAPTER 4: INSIGHTS INTO THE IMPACT OF POLICY AND REGULATORY FRAMEWORKS ON COMPETITION IN THE PROVISION OF BROADBAND INTERNET

Data from both interviews and assessed documents is presented in accordance with the identified key policy and regulatory frameworks, liberalisation of telecommunications markets; open access to communications infrastructure networks; and initiatives for universal access to broadband Internet. Making key elements of the conceptual framework under the Chapter 2, the three areas duly guided crafting of questions in the interview guide (Annexure B), and identification of areas to assess in selected documentation.

Documents such as the NBS of 2014, the 2015 UASF Strategy Document, Regulatory Directive on Cost Based Pricing by PTOs, No.1 of 2011, and the 2015 and 2016 Regulator Annual Reports were assessed to complement interview data. Some of the assessed documents guided the researcher in identifying policy and regulatory frameworks adopted for stimulation of competition in the provision of broadband Internet, while others were useful in finding the actual effect that occurred on competition in the provision of broadband Internet.

Data from both forms of collection are blended to produce overall findings under each of the identified policy and regulatory frameworks. Findings on the effects of other factors apart from policy and regulation are also presented.

4. Liberalisation of telecommunications markets

4.1 Firms market entry, service neutrality and spectrum efficiency and flexibility

All interviewees showed positive reactions towards market reforms that have occurred in the country's communications market, indicating that the first liberalisation decision to end the 1990s monopoly status of BTC through introducing Mascom and Orange, was a step in the right direction. While

broadband Internet was a very uncommon service in a small market such as Botswana at that time, the interviewees shared similar sentiments that the arrival of the mobile operators stirred competition and introduced the nation to the benefits of technological innovations. PTO-2 in particular argued that the presence of the two PTOs in the market increased BTC's incentive to extend its network coverage across the country in order to contest the competition, and to enable servicing such competitors with access infrastructure as they built their own coverage networks. PTO-2 stresses his argument that "the expansion of copper lines and telecommunications masts by the incumbent operator that occurred immediately after the arrival of private mobile operators remain very critical to the availability of broadband access networks today".

While agreeable to the views of PTO-2 and other interviewees that the first stage of liberalisation that brought in mobile telephony services was important to today's broadband market, PTO-1, FBO-1, ISP-1, ISP-2 and ISP-3 pointed out that the reform also came with limitations that exerted a negative effect on the market. The five interviewees stated that the PTOs were not allowed to establish their own international gateways and deploy their own backhaul transmission links, while smaller ISPs were restricted from providing Voice over Internet Protocol (VoIP) services. These restrictions were also noted by MTC-1 and ICT-Res-1, who contended that while the policy decisions were meant to protect the incumbent's revenue for a specified period, they negatively affected competition in the provision of Internet, particularly that most customers would have preferred VoIP services as substitute for traditional voice telephony.

Most interviewees praised reforms that followed the introduction of mobile telephone operators in the market, which included; the lifting of restrictions on VoIP; the 2004 authorisation of ownership of transmission links by private operators, and the 2007 call for service-neutrality by fixed and mobile network operators. All interviewees noted that these reforms stimulated market

competition at both service and facility levels. They further noted that even though Mascom and Orange avoided entering the fixed network telephony market, their ability to deploy their own transmission links and acquire international gateways brought confidence in their decisions to make further investments, hence expanded their network coverage and explored advanced technologies such as 3G and other LTE networks that enable broadband connectivity. PTO-1 and PTO-2 were clear on the investment confidence triggered by further market liberalisation, mentioning that had the market remained fully dependent on the incumbent's access network, the current competition visible amongst operators may have not existed.

MTC-1, UAS-1, PTO-1, PTO-2, FBO-1, Reg-1, Reg-2 and Uni-1 were the most vocal on the effects of the arrival of both BeMobile and BoFiNet, which they labelled as demonstration that the open-entry status of the communications market had paved way for both service-based and facility-based competition. BeMobile entered the market in 2008 as a mobile wing of the incumbent BTC, competing against Mascom and Orange in the provision of telephone and Internet services (BOCRA, 2015). The state-owned BoFiNet is an infrastructure oriented company that provides international and local wholesale access networks to registered service providers (BoFiNet, 2015).

MTC-1, UAS-1, PTO-1 and Reg 2 however noted that the regulator's decision to keep the number of PTOs at three for an extended period of time have had an adverse effect on facility-based competition. The restriction on the number of operators, was informed by a 2012 study on Mobile Number Portability (MNO), which concluded that Botswana's telecommunications market had not grown fully to require introduction of more PTOs (BOCRA, 2015).

Interviewees representing service providers indicated that the regulator's spectrum management strategies had not brought any significant challenges to the provision of broadband Internet, except for delays in releasing LTE and FWA

bands that occurred in 2015. FBO-1, PTO-1, PTO-2, ISP-1, ISP-2, ISP-3 were quick to link such presumed delays with the need for the Regulator to finalise spectrum demand assessments and connectivity trials, procedures that MTC-1, BOCRA-1, BOCRA-2, UAS-1 also pointed out as essential. MTC-1, BOCRA-1, BOCRA-2, PTO-1 and ISP-1 further showed that while only a few ISPs obtained mobile broadband spectrum to enable direct competition against mobile operators, such spectrum allocation was subject to competitive bidding.

ISP-1 further warned that "the spectrum manager cannot keep releasing and awarding frequency bands without taking into consideration the size of the market, otherwise there will be problems in achieving economies of scale for those operators that cannot make large investments to match the over abundant spectrum". This comment on the cautiousness of the spectrum manager by ISP-1 followed his view that other ISPs may complain that broadband spectrum was awarded to only a few providers.

Most interviewees were also optimistic about the newly introduced Unified Licensing Framework (ULF), that while not many changes had been seen in the market with relation to the framework, particularly licence migration by larger operators, its positive intensions were a welcome development. ISP-1, MTC-1 and Reg-1 added that the overall aim of the new framework was to develop the market without separations between infrastructure and service operators, that any willing and able operator could enter any level of broadband provision or operate at both categories. The three interviewees noted that the new framework added to the supportive and forward-looking features of Botswana's policy and regulatory authorities, more so in consideration of the importance of infrastructure ownership in the diversity of broadband competition. Through these views, the interviewees displayed a collective perspective that the new framework is necessary for both service-based and facility-based competition. ISP-3 made his support for the ULF clear, but noted the need for more education, particularly to

service providers as their migration would bring different licence conditions and regulations.

ISP-3 decried the high licence fees associated with the new licensing framework, noting that the fees would become a barrier to market entry, unless authorities came up with a set grace period during which operators could grow their subscription base and reach a state of affording such fees. He noted that licence fees for the framework that was being phased out had not been of much concern, considering increased numbers of VANS entrants and expansion of business by the telecoms companies and existing VANS. ISP-1 also shared his concerns about the new ULF, that the basis for its introduction was not clear as no market failure or any needs for change had not been proven. He lamented that the ULF would give the state-owned BoFiNet that uses public funds, a chance to compete at retail level with private PTOs and VANS. ISP-1 said such a move would decrease PTOs and VANS' incentive to invest in their own networks, leading to smaller firms opting to resell existing broadband product and services. The interviewee stressed that such a scenario would be pose a serious threat to facility-based competition.

In referring to the three characteristics of market liberalisation; market entry, service neutrality and spectrum efficiency, ISP-1 remained adamant that overall, the market is being pushed towards increased competition, stating that "if you compare the number of service providers to the market size of below 3.5 million people, you will find that competition is high, thanks to forward looking stages of market liberalisation with clear policy and regulatory expectations". The increase in the number of Internet services providers over the years has been captured in the regulatory annual reports, with 64 licensees recorded in March of 2014 (BOCRA, 2014, p.22), 71 in March 2015 (BOCRA, 2015, p. 14) and 81 in March 2016 (BOCRA, 2016, p.21).

4.2 Open access to communications infrastructure networks

4.2.1 Infrastructure sharing and wholesale broadband price regulation

Botswana's policy and regulation frameworks on the principle of open access to infrastructure networks include establishment of infrastructure sharing guidelines of 2008, which call for operators to share essential facilities in a manner that is transparent, non-discriminatory, fair and timeous, making sure that such sharing terms are cost-oriented (BTA, 2008, pp. 1-4). Further, the Regulator ensures fair and cost-oriented access to existing broadband networks through regulating wholesale prices (BOCRA, 2016, p.31). One of the commonly quoted regulatory actions that ensured fairness in the market was the establishment of the 2011 regulatory directive on cost oriented pricing by PTOs. With regards to broadband access, the directive specifically called for a reduction in wholesale tariffs for local and international Internet leased lines, following a 2010 market study that discovered irregularities and unreasonably high prices (BTA, 2011). When addressing questions on the effects of these frameworks on competition in the provision of broadband Internet, the interviewees' opinions were divided, one group noting positive effects while the other focused on shortfalls of the frameworks.

MTC-1, BOCRA-1, BOCRA-2, UAS-1 and FBO-1 have referred to interventions for open access to infrastructure as necessary for achieving service-based competition, noting that most entrants and existing service providers are able to reach many localities around the country through sharing passive infrastructure such as towers. However, ISP-1, ISP-2 and ISP-3 noted that despite the existence of the 2008 infrastructure sharing guidelines, smaller operators often experience difficulties such as delays and rejection of their requests for sharing some of the network elements of the PTOs, particularly with interconnection for VoIP services. ISP-1 and ISP-2 held the same opinion that since the policy only existed at guideline level, there was not much smaller

operators could do legally to force large operators to share their infrastructure. ISP-1 and ISP-2 further called for a review of the policy to make it more enforceable and applicable in the courts of law. ISP-3 shared his experiences on the issue, that he had to find ways of providing VoIP services without interconnection with local PTOs, which were reluctant to make business agreements with his VANS company. He explained that his company switched VoIP on the network of some wholesalers in the neighbouring South Africa, and further transmitted most of its data traffic through the same country where it has even established a point of presence (POP).

In advocating for infrastructure sharing, ISP-1, ISP-2, ISP-3, PTO-1, PTO-2, Reg-2 and Uni-1 have indicated that the approach is a key requirement for an efficient roll-out of broadband services, hence the guidelines and other policy measures are necessary for increased competition in broadband markets. ISP-I and ISP-2, noted that while they realise less reluctance from other operators compared to past scenarios, some operators have charged prices that are not reasonable for sharing of towers. Relating on the experiences of his company, ISP-1 said in comparison with PTOs, the infrastructure sharing quotation they received from the FBO indicated reasonable and affordable tower prices that he assumed would not vary for other smaller firms.ISP-1 stated that:

> BTC prices for tower sharing are four times higher than those of BoFiNet, but BTC controls most of the towers, while sharing of Mascom towers is priced three times higher than that of BoFiNet, and Mascom controls the second largest number of towers in this country. This kind of pricing kills service-based competition, so the Regulator should not stop at regulating prices for leased lines and other services alone, but also consider monitoring prices for passive infrastructure sharing(ISP-2).

In making reference to open access to national backbone infrastructure, which is under deployment and management of BoFiNet, FBO-1, MTC-1, BOCRA-1, BOCRA-2, Reg-1, Reg-2, UAS-1 and Uni-1 put across similar sentiments that PTOs and VANS have benefitted extensively from the policy

intervention. The interviewees stressed that an opportunity has been extended to service providers through the FBO's deployment of fibre backbone across the country, on which such service providers connect through building last mile links at reduced costs. This view was similar for PTO-1, PTO-2, ISP-1 and ISP-2, who confirmed that leasing BoFiNet's backbone infrastructure made it cheaper for them to deploy last mile networks. The interviewees representing services providers all admitted that they are able to reach villages and rural areas furthest from the towns and cities due to the policy decisions that directed BoFiNet to spread fibre around the country and avail it to other companies in transparency. ISP-1 confidently noted that:

> BoFiNet has really come as a game changer to Botswana's broadband market, with lower leasing prices for access networks, hence countrywide availability. I for one could not easily go out of the capital Gaborone to find customers because BTC prices were very high and unaffordable. That is a thing of the past because I currently have more than twenty POPs connected to BoFiNet's network around the country, including in the villages. I am able to serve bigger clients that include banks and private schools (ISP-3).

While ISP-1 acknowledged his benefit as a VANS licensee from cheaper and abundant BoFiNet infrastructure, he lamented that BOCRA had been very weak in approving the wholesale prices. He noted that the prices were not cost-oriented and were not sustainable even under government subsidisation, which BoFiNet continued to enjoy. The interviewee continued to say that while retailers dropped prices to please end-users in the short term, anticipated long run challenges would leave consumers with problems such as degraded quality of service and high broadband prices. When asked to explain this view further, ISP-1 gave an example of BoFiNet FTTx offerings, noting that such services are deployed only at designated parts of urban centres, and should a consumer based a few kilometres away seek service and the FBO shows no interest in extending

to the unplanned location, extra costs would lie with the retailer wishing to connect such a consumer. ISP-2 continued that:

> It would be uneconomic for the retailer who may choose to drop the client or find cheaper alternative ways of bringing such a client broadband connection, which may not be of good standard compared to FTTx supported connections. However, if the regulator mandated cost oriented and sustainable prices, the FBO would be in a position to take FTTx to many places besides government and private business centres that we see the infrastructure reaching today. It would afford expanding networks and reduce its tendency to cross-subsidise services in response to the unprofitable networks.

ISP-2 further explained that the FBO had kept prices for international bandwidth capacity unchanged despite the 2016 wholesale price reductions that were realised when the undersea cable WACS doubled capacity at initial charges for its clients. He challenged the regulator to investigate and confirm if the FBO was not cross-subsidising services to cater for the unreasonably low-priced access networks. ISP-2 concluded that while the low prices by BoFiNet are necessary for service-base competition, they may adversely affect it in future when the fibre company fails to keep up with network expansion.

Most interviewees were generally pleased with the regulation of prices for wholesale broadband services, showing a collective view that regulation prevents unfairness by bigger operators and blocking of new entrants through exorbitant prices. They noted that in addition to enabling ease of market entry, regulating wholesale prices benefits consumers as retailers are expected to trickle the reasonable pricing down to the end user. In confirming the positive effect that wholesale price reductions have had on retail pricing, particularly the packages that followed since the 2013 introduction of BoFiNet, the 2016 BOCRA annual report cited an example from one of the mobile operators, that;

> BOCRA approved, in July 2015, a proposal by Orange to modify both prepaid and postpaid Internet plans to cause a significant price reduction of about 68%. A 10 GB prepaid offer for a month costs P1,399 compared to the old price of P4,850 for the same amount of data, implying a price reduction of about 71%, BOCRA (2016, p28).

4.3 Approaches for universal access to broadband Internet

Botswana's National Broadband Strategy (NBS) of 2014 calls for universal access to broadband services, stipulating several recommendations for achievement of the national objective, which include establishment of a Universal Access and Service Fund (UASF) for specific broadband projects (Botswana Government, 2014). The Regulator also aspires to achieve universal access to all communications services including broadband Internet (BOCRA, 2016). In 2014, the Ministry, in close partnership with the Regulator, established the UASF, which seeks to promote delivery of broadband Internet to underserved and unserved communities amongst other services (UASF, 2015). The regulator has encouraged universal access to broadband Internet through imposing mandatory roll-out obligations on service providers that have been awarded spectrum for broadband supportive networks (BOCRA, 2016).

4.3.1 Funding of universal access projects

UAS-1, MTC-1 and BOCRA-1 noted that the role of Botswana's UASF was to enable deployment of broadband networks in areas considered commercially unviable by service providers, through providing subsidies. This, according to the interviewees, promoted both service-based and facility-based competition. They noted that UASF subsidies encouraged less costly and wide spread deployment of wholesale infrastructure while smaller firms often take the advantage of connecting to such networks, which would have been deployed in partnership with the Fund. MTC-1, BOCRA-1, BOCRA-2, UAS-1, and FBO-1 referred to a 2015 project in which the UASF subsidised BoFiNet to deploy 31 wholesale Wi-Fi hotspots in seven locations across the country, which increased service-based competition as it enabled several VANS to connect and offer retail Wi-Fi at low prices. The increase in the number of retailers benefiting from the funded project is set out in the BoFiNet website and BOCRA 2016 annual report, that ISPs are gradually showing interest in the hotspots, and most of them have

expanded sale of their Wi-Fi vouchers to grocery shops such as Spar and Sefalana stores, where they can be purchased by many customers.

ISP-1 and ISP-3 raised concerns about the operations of the UASF, noting that the seven locations covered in the wholesale Wi-Fi hotspot project are not necessarily underserved, as they already had service providers offering broadband packages. The interviewees further showed disappointment in the decision of the UASF to award the subsidy to BoFiNet, which is a government owned operator. ISP-3 said the government should provide access networks on which VANS could get subsidies to connect and service communities in rural villages, not including urban centres as it was the case with the said project.

PTO-1 noted that BoFiNet violated the conditions of its wholesale licence with the Wi-Fi hotspot project, as it provided subscribing retailers with bandwidth and Wi-Fi vouchers, indirectly playing in the retail space. This concern was also raised by ISP-3, who indicated that well established VANS would not settle for such business agreements. He said his company would only join the project at a time when BoFiNet only provides access network to retailers, leaving them to manage their own traffic and billing operations. The interviewees that showed concern about the Wi-Fi hotspot project noted that it reduced the incentive for VANS to spread their footprint, as they would naturally want to avoid being pushed out of the market by the large government investor. This according to the interviewees, brought an adverse effect on service-based competition.

ISP-3 has observed that the UASF seems to focus its projects on the western parts of the country including the desert areas of Kgalagadi and Ghanzi, citing the intended schools' broadband connectivity project stipulated the UASF strategic plan 2015-2018. He suggested for the UASF align its projects with the recommendations of the 2014 NBS, that called for non-discrimination in deployment of universal access services across needy communities. In making reference to identification of communities that qualify for subsidised UASF

projects, UAS-1 referred the researcher to a number of information resources on the UASF, such as its Manual of Operating Procedures, 2015-2018 Strategy documents, and the website, noting that the Fund is transparent and does not operate in a discriminatory manner. He further said benefiting communities are identified through market studies and communications needs surveys that are conducted across the country. UAS-1 noted that the schools' broadband connectivity programme outlined in the UASF's three-year strategic plan was meant to expand to other unprivileged parts of the country, with subsequent phases planned for the northern parts of Botswana.

Linking the projects to competition in the broadband market, UAS-1 said service providers that tend to concentrate in the urban centres will find the need to spread to rural areas through competing in the UASF tenders. He further noted that the business community and other individuals in locations identified for funding may even establish new companies to focus on broadband provision in these centres, an action that would promote service-based competition.

4.3.2 Mandatory roll-out obligations for broadband Internet

PTO-1, PTO-2, ISP-1, ISP-2 and ISP-3 noted that the BOCRA seemed to have ignored market factors such as availability of backbone infrastructure, infrastructure sharing prices and other difficulties faced by operators prior to mandating roll-out obligations. ISP-1 gave an example of his company, that it faced uncompetitive prices for access to existing towers and fibre from the incumbent operator, but the regulator failed to address such matters in a timeous manner. He noted that most of the time the obligations include areas where one of the larger PTOs, mostly the incumbent operator already has presence, making it difficult to lease its facilities and remain competitive in the market. PTO-1, PTO-2, ISP-1, ISP-2 and ISP-3 indicated that unattended market limitations block the ability of roll-out obligations to influence broadband competition positively. They noted however that the situation improved significantly after the arrival of

BoFiNet, which enabled companies liable for roll-out obligations to comply within the set periods of time and even trigger the interest of competitors who would join in to benefit from established markets. MTC-1, UAS-1, BOCRA-1, BOCRA-2 and FBO-1 praised the use of roll-out obligations to achieve the universal access to broadband Internet, noting that where challenges are experienced, the Ministry and the Regulator work hand in hand to find solutions relevant and beneficial to the entire market.

4.4 The effects of other factors on competition in the supply of broadband Internet

4.4.1 Low population density and land locked position of Botswana

Most of the interviewees mentioned Botswana's low population density as one of the factors that may have influenced competition in the provision of broadband Internet, particularly the low number of operators competing at infrastructure level. UASF-1, MTC-1, BOCRA-1 and BOCRA-2 noted that while operators continue to make considerable returns, as often reported, international investors found in other countries may be reluctant to open shop in a country with only a few million people. Botswana's population was recorded at approximately 3.4 million during the census of 2011 (Statistics Botswana, 2012). Both FBO-1 and PTO-2 added to this view, noting that the vast land mass with sparsely distributed and small number of inhabitants tend to be quite costly in terms of infrastructure deployment.

These were also the sentiments of ISP-1, ISP-2 and ISP-3, who noted that despite making profits at their respective firms, a higher population would be more beneficial, enabling them to deploy their own infrastructure networks and lease them out to even more market entrants. With regards to the landlocked position of Botswana, the interviewees indicated that investing in international leased lines and bringing bandwidth capacity inside the boarders were quite expensive, particularly prior to government investment in undersea cables of

EASSy and WACS. PTO-1, PTO-2, FBO-2 and UASF-1 cited such costly investments as some of the reasons behind a limited number of operators competing at FBC level in Botswana.

However, ICT-Res-1 and Uni-1 held a different view to the ideas that low population density was an obstacle to broadband investment, stating that network operators and Internet service providers often find their way into low populated countries, including those with civil conflicts and wars. The participant gave an example of Mali and Burkina Faso, where he noted that many broadband service providers were present despite continued cases of unrest in these countries.

4.4.2 Choice of business models

Uni-1 and ICT-Res-1 indicated that investors often tailor-make their businesses to specific models of operation, particularly where they have skills and the confidence of running such businesses. ICT-Res-1 gave an example that an Internet service provider that is acquainted in wireless networks may enter the market and focus only on that segment, spreading to many areas. When such a scenario occurs, according to ICT-Res-1, the market realises an increase in either service-based or facility-based competition, not as a result of policy or regulatory interventions, but due to the choice of business of companies. Uni-1 and ICT-Res-1 therefore concluded that apart from policy and regulatory frameworks, the choice of business model may have an effect the levels of service-based and facility-based competition in broadband markets.

MTC-1 said that one of the PTOs chose not to participate for a rural telecom programme in the nineties, while others collaborated with the government and deployed infrastructure and services to rural areas across the country. Today, observed MTC-1, such an operator lags in terms of network coverage and infrastructure ownership, and depends largely on its competitors to grow its broadband customer base outside cities and towns. With this example, MTC-1 showed that business decisions may negatively affect broadband

competition even where decisions or interventions of the regulator and policy makers are not involved.

4.4.3 Chapter summary

Chapter four has brought together the findings from interviews and assessed documents, presenting data collected across the three policy and regulatory frameworks earlier identified. It covered opinions and observations of interviewees and complemented them where applicable, with information from relevant documents across the sub-themes of liberalisation of telecommunications markets; open access to communications infrastructure; and approaches to universal access to broadband Internet.

The interviewees held different opinions on several areas while some areas reflected their collective thoughts. Those representing the Ministry and the Regulator seemed to focus mostly on the positive effects that policy and regulatory frameworks have had on broadband competition, with a few pointers on delays and shortfalls. Representatives for the service providers on the other hand, were not hesitant to share the challenges they have experienced due to some policy and regulatory decisions, stating in detail, areas where they felt adopted frameworks failed to support or increase both service-based and facility-based competition. The service providers were however grateful for some of the areas where policy and regulatory frameworks were supportive to competition.

CHAPTER 5: UNDERSTANDING THE EFFECTS OF BOTSWANA'S POLICY AND REGULATORY FRAMEWORKS ON COMPETITION IN THE PROVISION OF BROADBAND INTERNET

The research findings have been analysed using the thematic analysis method. As outlined in Chapter 3, this has been described by several authors including Leedy (1997), Braun and Clarke (2006) and Bowen (2009), as a way of eliciting meaning from collected data through identifying patterns or themes evident across such data. In identifying useful patterns in data collected through both semi-structured interviews and document analysis, the researcher derived several themes that collectively address the key research question, which is repeated below:

How have Botswana's policies and regulatory frameworks influenced competition in the provision of broadband Internet?

Where applicable, the research findings were further compared with the theoretical perspectives identified from the literature review in Chapter 2. This gave a clear picture of how the reality of broadband competition in Botswana compares with what is carried in the existing body of knowledge.

5.0 Significant service-based competition is evident in the supply of broadband Internet

5.1 Liberalisation of the telecommunications market

The different aspects of market liberalisation, such as ease of market entry, service neutrality and efficient spectrum allocation strategies have emerged as good approaches for an increase in services-based competition in Botswana's broadband supply market.

5.1.1 Ease of market entry and expansion of footprint for VANS and PTOs

The broadband market has experienced an increasing number of entrants and expansion of footprint in the VANS category, while PTOs have improved

their offerings and expanded their network coverage. By March 2016, when the market had been further liberalised from a service-neutral regime to a unified licensing framework, the number of VANS had increased to 81 from the 61 licences recorded in 2013 under a service-specific (BOCRA, 2014). As captured from document analysis and the interviewees representing the regulator, about 20% of the 81 VANS licensees have shown active participation in the broadband market, providing a variety of services that include resale of ADSL and WDSL offerings, and tailor-made Internet connections for different customers.

While most VANS are found in the cities and towns, many have reported footprints that reach villages and businesses in the outskirts of urban centres such as tourism facilities and commercial farming areas. For PTOs, a national mobile network coverage was estimated at 95% of the population as at March 2016, with considerable investment in broadband supportive networks such as 3G and other LTE networks (BOCRA, 2014).

In linking this finding on an increasing service-based competition as a result of ease of market entry with the reviewed literature, the researcher is taken back to key points raised by the World Bank (2012) and Blenker (2006), that countries with fewer restrictions to both market entry and specified categories of service provision tend to realise increased broadband competition. A4ai (2015) has noted that such countries include South Africa, Kenya, Mauritius, South Korea and Malaysia, where open market entry frameworks feature service-neutrality, enabling firms to offer different services under one licence. According to the authors, such markets with reduced barriers to market entry comprise of multiple service providers with considerable expansion to different geographical locations. We note in this regard that the researcher's analysis presents a positive correlation to existing literature, that open market entry found in Botswana's broadband market is key for increased competition.

5.1.2 Efficient spectrum management strategies

Service-based competition is further supported by the regulator's roles on spectrum related engagements such as frequency allocation, monitoring and research. BOCRA has used a competitive process (beauty contests) to release 1800 MHZ and 3400 MHZ bands in 2015 for the licensing of LTE and FWA networks respectively. The regulator has reported that many service providers are showing interest in acquiring the broadband supportive spectrum, to expand their coverage networks and service high numbers of consumers. VANS and PTOs have also requested for frequencies in the 700-800 MHZ range for purposes of connecting their mobile customers through the digital dividend that is expected once the country has completed its digital-switch over.

In terms of spectrum based research, BOCRA has in 2015 authorised two research based agencies; Botswana Innovation Hub (BIH) and the Botswana Institute of Technology, Research and Innovation (BITRI) to carry out trials on TV White Space technology such that the findings can be used in improving the broadband market. While reports on the trials have not been finalised, stakeholders remain optimistic that allocation of TV White Space bands would improve their levels of broadband service provision. Both the regulator and service providers are further optimistic about market developments in the area of broadband spectrum, which are anticipated at the end of the country's digital switch-over that will yield the necessary digital dividend.

BOCRA's efforts towards improving the broadband market through effective spectrum management is necessary for service-based competition, as many licenses have shown interest through putting forward applications for broadband supportive frequency bands. In allocating the necessary spectrum, BOCRA also takes note of the need for alleviation of its scarcity to attain efficient usage, particularly in today's rapid technology development and consumer demand for data-intensive services. These align with the views of Feijoo et al

(2009), Xavier (2006) and World Bank (2012) who have called for modification of traditional command-and-control methods of spectrum management that involve allocation with restrictions on technologies, services provided and geographical areas that operators can cover. A4ai (2015), Feijoo et al (2009) and World Bank (2010) are some of the authors that identify additional spectrum allocations on television white space and digital dividend bands as key to improving broadband competition in response to increased consumer demand, a directly similar view of BOCRA as the spectrum manager for Botswana.

5.1.3 Open access to infrastructure networks

5.1.3.1 Transparency and fairness in infrastructure sharing

The dominance of service-based competition can be further attributed to the willingness of service providers to lease out their access network to other operators at reduced and affordable rates. This was triggered particularly by the 2011 regulatory directive that imposed a glide-path reduction in wholesale prices for local and international Internet leased lines, including open access to the infrastructure network. In addition to implementation of infrastructure-sharing guidelines that are used in monitoring market operations to ensure that large firms do not block smaller ones, the Ministry directed all operators to produce their reference offers in 2014, to keep track of their network roll-out plans and quality of services targets.

While some of the interviewed VANS decried high and non-consistent PTO pricing for shared infrastructure, they indicated that the regulator intervenes to their satisfaction when queries are filed. Both the VANS and PTO categories hailed the open access principle mandated by policy and regulation with regards to accessing BoFiNet wholesale infrastructure and the undersea cables, that the approach has reduced the challenges they used to face prior to establishment of the FBO. BoFiNet had in 2015 announced about 70% price reduction for its wholesale infrastructure to enable affordable access for local retailers. This would

mean increased interest for new firms to enter the market and for existing ones to expand to areas with presence of BoFiNet infrastructure to benefit from the reduced wholesale prices and ease of acquiring the FBO's access networks.

As depicted by the research findings on the role of policy and regulation around infrastructure sharing, existing body of knowledge has also recognised the importance of infrastructure sharing in service-based competition, pointing out its ability to reduce the sunk costs associated with network deployment. This as noted by authors such as a4ai (2015), encourages firms to expand their investments and improve service provision. It has therefore been stressed that;

> If new market players can gain access to existing infrastructure at competitive rates, entry barriers will be minimised, promoting competition that can result in reduced prices. Infrastructure sharing occurs at different levels - through opening up access to the existing copper network, through joint building and operation of shared backbone infrastructure, or through coordination among linear infrastructure providers, like power lines, gas pipelines, or roads (A4AI, 2015, p. 34).

5.1.3.2 Price reduction and product differentiation for broadband services

The increase in services-based competition has also been shown through price reduction for broadband services, with firms announcing discounted prices for different services at both VANS and PTO levels. Competition through reduction of prices and a choice of broadband services equips consumers with a chance to compare service providers and settle for preferred and affordable choices.

In 2015, BoFiNet announced price reductions of about 70% for wholesale broadband services, enabling many VANS to afford its access networks and expand their services to different areas where its wholesale infrastructure existed. While the service providers were not in a position to open up about their actual price reductions during the interview sessions, all of them indicated that retail prices were revised down following wholesale price reductions by BoFiNet. The retailers further indicated that the reduced wholesale prices further enabled

packaging of different solutions to their consumers with respect to preferred packages and levels of affordability.

Reductions in the prices for mobile broadband have also been recorded for PTOs, with the regulator reporting to have approved several price reviews of the operators over 2015 and 2016. The operators further introduced new bandwidth offerings for both prepaid and post-paid categories of subscription, including value-add services such as mobile money services and video-on-demand. Such improvements in the types of services different consumers are able to acquire at affordable prices indicate a market with significant service-based competition.

5.1.4 Initiatives for universal access to broadband Internet:

5.1.4.1 Universal Access and Service Fund

Another policy decision that has shown support for service-based competition was the 2014 establishment of the Universal Access and Service Fund (UASF), which has identified several broadband oriented objectives under its 2015-2018 strategic plan. The objectives include provision of broadband Internet to rural schools and their host communities; Expansion of broadband coverage through deployment of public Wi-Fi sites to address existing gaps in identified centres; and encouraging innovative development of local applications and local content.

By the second year of its existence, the UASF subsidised a wholesale Wi-Fi hotspot project by BoFiNet, which enabled retailers to access cheaper infrastructure deployed in seven locations across the country. Access to the wholesale Wi-Fi hotspots further enable reduced end-user prices and give retailers and opportunity to become innovative in packaging Wi-Fi services and ensuring better quality of service. While only below 10 retailers had shown interest in connecting to the wholesale Wi-Fi hotspots at the time of data collection, more were expected to subscribe in future as reflected by the research participant representing the wholesale provider.

The UASF strategic plan also promised encouragement of service-based competition through providing incentives for upgrade of mobile operator base stations from 2G to 3G network or better. Through this strategic objective, the Fund communicated its aim of bridging the digital gap that exists between rural and urban communities through introducing the latter to Internet usage. Similarly, the UASF had not commenced any preparations or work on its objective of promoting local content production and development of applications at the time of investigation. This objective is key to the support of service-based competition in the provision of broadband Internet as service providers would be keen to offer affordable and good quality packages that would enable increased consumption of local content through local applications.

Subsidy offers for the intended UASF projects are expected to see service providers coming up with competitive solutions for selected rural areas, in the bid to expand their subscription levels and reach areas that would otherwise be unviable for their businesses.

Literature reviewed by the researcher has acknowledged the role of policy in addressing communications market gaps that arise due to the high marginal costs associated with network deployment and service provision in non-profitable areas. Picot and Wernick (2007) and Broadband Commission (2013) have noted that policy often addresses market gaps through public investment and funding initiatives through universal access funds, an approach that has been adopted in Botswana. ITU (2012) gave an example of Nigeria as one of the countries that have embraced the use of universal access funds, noting that the west African country had targeted to connect hundreds of communities and thousands of public schools with broadband Internet by 2017, making use of private sector partnerships to acquire computers and broadband connectivity. As indicated above, similar initiatives are expected for Botswana as captured in the strategic plan for the country's UASF.

5.1.4.2 Mandatory roll-out obligations for broadband Internet

While most of the interviewed service providers decried the regulator's ignorance of difficulties that come with mandatory roll-out obligations for broadband Internet, improvements in coverage of areas identified for such obligations have been recorded. At the time of data collection, the regulator had indicated that more than 65% of locations with more than 5000 inhabitants had benefited from the roll-out of both fixed and mobile networks within the first two years of licensing and spectrum acquisition as per the roll-out obligations.

The regulatory intervention on roll-out obligations has therefore influenced expansion of broadband services across the country, even to areas which would otherwise be ignored by the service providers. As noted by the interviewees, such roll-out of services relies mostly on leasing out available BTC and BoFiNet fixed network, with minimal erection of own base stations. This leads to the conclusion that obligations for the roll-out of broadband Internet have largely increased service-based competition amongst service providers compared to facility-based competition, particularly in that the infrastructure for both BTC and BoFiNet has a large geographical presence.

BOCRA's regulatory decision to mandate roll-out obligations for broadband Internet aligns with the collective view of Cave and Valletti (2000), Xavier (2006), Bourreau and Dogan (2009), that imposing roll-out obligations as licence conditions for network operators is essential in ensuring that communication services are delivered to underserved areas. The presence of such operators in identified localities is essential for service-based competition.

5.2 Botswana's broadband supply market depicts minimal levels of facility-based competition

5.2.1 Service-specific licences and barriers to market entry in the PTO licence category

Prior to 2007, telecommunications licences awarded to Mascom and Orange by the then Botswana Telecommunications Authority (BTA) confined the two operators to provision of mobile services, while the incumbent BTC was allowed to offer fixed telephony services only. The policy decision to shield the incumbent from private sector competition resulted in Mascom and Orange resorting to leasing BTC's fixed network facilities as they were not permitted to invest in their own. Similarly, the incumbent had no basis to invest in mobile broadband networks during the said period as it would have violated the set conditions. We note here that the service-specific approach to licensing of the PTO category had an adverse effect on facility-based competition, where only one fixed line operator and two mobile operators were allowed in the market.

The regulator relaxed the service-specific policy in 2007 through introducing a service-neutral licensing framework that allowed the PTOs to provide both fixed and mobile services, meaning that Mascom and Orange could enter the fixed market to compete against BTC, while the latter could similarly compete in the mobile market. Mascom and Orange decided to not to enter the fixed market and continued providing mobile telephone and Internet services only. BTC on the other hand developed a mobile wing named beMobile, and competed directly with the two companies from 2013.

The regulator's decision to introduce the service-neutral licensing framework brought no change in the number of entrants for fixed network market, while the mobile market saw only one entrant. It is noted here that these regulatory changes were not permissive of new companies entering the market to establish business from the start, rather, were introduced to be observed by

existing PTO licensees. The regulator, based on market research such as the 2013 study on mobile number portability, continued to keep the number of the PTOs at three, with justifications that the market was not ready for more entrants. This regulatory move restricted the number of network infrastructure investors in the market and limited the rate of facility-based competition.

Literature has largely showed not support for regulatory decisions to limit the number of operators in the market. While many authors including World Bank (2012) and Msimang (2011) have called for reduced or no excessive government participation in broadband markets, and rather for policy to focus on facilitation of operator competition, accountability and transparency, Botswana seems to have taken a different approach. This has been evident through the regulator's decision to keep the number of operators at three for extended periods of time. In this regard, the incumbent can be said to enjoy government protection from facility-based competitors as market entry at PTO level has been restricted up to the recent introduction of the unified licensing framework.

5.2.2 Barriers to market entry under the FBO licence category

The 2013 policy decision to introduce a state-owned fibre company (BoFiNet), with a special regulatory protection to be the sole FBO licensee has adversely affected facility-based competition. By March 2016, the country had a single FBO licensee, which had managed to deploy wholesale infrastructure across the country without any direct competition.

The FBO has been assigned the entire management role of EASSy and WACS, including other international and national fibre links that were initially under BTC. While BoFiNet offers access to its infrastructure on an open access principle, the market restriction to a single licence under this category meant that other operators could only lease out its facilities and not trade in similar wholesale services. VANS and PTOs acquire BoFiNet's network infrastructure to deliver broadband services to their retail customers, with a few deploying their own fibre

links in cities and major towns. The presence of foreign investors in the network infrastructure market has been minimal, with companies such as SEACOM seeking partnerships with a few local service providers to achieve some level of local presence. Direct foreign investment has been limited by protection of the state owned BoFiNet as indicated above.

The three network operators (BTC, Mascom and Orange), which at the time of conducting the study, could not compete directly with BoFiNet, have portrayed different status in terms of infrastructure ownership. BTC solely owns nation-wide copper loops, most of which were deployed during its historical monopoly years, and dominates in the number of telecommunication masts erected across regions. While BoFiNet has inherited most of the incumbent's networks, it does not own any part of the copper cables taking fixed telephony and xDSL services to consumers across the country, as it is confined by the 'wholesale-only' conditions of the FBO licence. In this regard, BTC has no competition in the provision of broadband services through technologies carried via the copper infrastructure, and has seen almost all VANS reselling its broadband packages to homes and businesses at retail level.

Mascom, which is second to BTC in terms of tower ownership, has deployed some fibre lines particularly between the country's two main cities of Gaborone and Francistown, while Orange Botswana is reported to have the least number of towers and national fibre links, making it more inclined to leasing out from BoFiNet, Mascom and BTC. BTC, Mascom and Orange have a strong hold in wireless broadband access, having acquired in addition to GSM spectrum, LTE and FWA frequency bands in the recent years.

The above analysis on operator networks seeks to show that other service providers may be willing and capable of operating at the level of BoFiNet, considering their investment efforts in both broadband infrastructure and services. However, the possibility of such business operations is defeated by the

mentioned barriers to market entry at the FBO level. Similar to the sub-section above, reviewed literature goes against the identified barriers.

5.3 The LoI theory commonly applied in broadband competition is non-applicable for Botswana

While literature review had directed the researcher towards several interventions often adopted at infrastructure level in broadband markets, particularly Cave's ladder of Investment (LoI) theory, interactions with the interviews and assessment of documents yielded no application of the theory in the case of Botswana. While data surfaced on approaches to open access to infrastructure in Botswana, such as passive infrastructure sharing and the regulation of wholesale broadband prices, no discoveries were made on policy or regulatory decisions meant to trigger facility-based competition through the use of mandated LLU, bitstream access, and authorisation of MNVOs. This therefore meant that Cave's LoI theory cannot hold in Botswana's broadband market since its key assumptions are non-applicable for the country. One can note therefore that Botswana's broadband market has assumed a different path to facility-based competition other than the application of the LOI theory. Having discovered low levels of facility-based competition in the country, it remains questionable the extent at which policy and regulation would make improvements in this type of broadband competition if they were to apply LOI in the market.

5.4 Competition in the provision of broadband Internet in Botswana has been reactive to other factors apart from policy and regulation

5.4.1 Low population density

Other factors apart from policy and regulation may have also shaped the broadband supply market towards dominance of service-based competition. The country's small population of 3.4 million has been identified by many interviewees as one of the factors that may have led to most service providers

avoiding larger infrastructure network investment in an environment that does not naturally promise high returns.

Fransman (2006) and Lau et al (2005) note that investors prefer areas with high population density to be able to maximise profits in the long run through economies of scale and scope. The authors give an example of South Korea, that its large population density and high percentage of households living in apartment complexes enabled lower capital costs for operators, hence their decision to enter the market. We note the existing difference in the case of Botswana and infer that low population density may have disadvantaged the country in terms of facility-based competition in broadband markets.

5.4.2 Historic high cost of international bandwidth

The expensive act of bringing international bandwidth capacity into the landlocked country was also seen as a contributing factor to reduced facility-based competition, particularly prior to government investment in undersea cables and the regulation of international leased lines that began in 2004. Service providers had therefore found it optimal to compete at a service-level, leveraging on exciting networks to deliver services to their clients.

5.4.3 Choice of business models

Some of the interviewees argued that companies may opt to focus on a specific market based on the skills and knowledge of their founders or management, or prevailing business opportunities without necessarily avoiding constraints that exist in a different market. The choice to explore a particular business model may therefore contribute to an increase or decrease in either service-based competition or facility-based competition. In the case of Botswana, analysis bears an inconclusive position on whether licensed broadband service providers have been entirely influenced by policy and regulation to assume their current categories or they opted for their business models based on their skills and preferred choices.

One supporting example to this conclusion is the choice by Mascom and Orange to remain operating in the mobile telephone space despite the regulator's decision to introduce a service-neutral licensing framework in 2007. While fixed networks such as copper and fibre links are known to make vital transmission networks for broadband Internet, the two private companies focused more on mobile broadband networks, supporting their service provision through a few self-owned fibre links and leasing most of BTC's fixed network, and later that of BoFiNet. While this may have been independent business choices, the service-specific licensing framework that the regulator had in place prior to 2007, which confined the operators to the mobile sector may have influenced their business decisions towards avoiding the fixed telephone market. The incumbent had already deployed fixed networks nationwide, therefore large-scale deployment of fixed networks to compete directly with BTC may have resulted in unnecessary duplication of resources, hence leasing the existing fixed networks became a preferred option.

5.5 Relationship between researcher's analytical framework and the research findings/analysis

The research findings and analysis show a positive correlation with the researcher's analytical framework that was drawn from existing body of knowledge in Chapter 2. The framework identified several areas of intervention under market liberalisation; open access to infrastructure networks; and initiatives for universal access to broadband Internet. It showed that each of these key policy and regulatory frameworks would have an increasing effect on competition in the provision of broadband Internet. Similarly, a market with weaker or lack of such interventions would show decreased levels of competition. The framework further showed that while each policy and regulatory intervention would have its own effects, increased levels of service-based or facility-based competition would be expected in an environment with jointly enforcing interventions.

In looking at collected data and the outcome of the analysis, it is noted that policy and regulatory frameworks identified in the reviewed literature have been adopted in Botswana's broadband supply market. Similarly, the frameworks are implemented to achieve competitiveness amongst operators and service providers. However, several decisions in the same market with liberalisation; open access to infrastructure; and initiatives for universal access to broadband Internet have led to minimal facility-based competition as compared to service-based competition.

Such decisions include the 2013 introduction of a single licence for the FBO category by the regulator, which paved way for the sole existence and operation of the state-owned fibre company with no competition. This has been seen as a clear indication of policy decisions that compromise facility-based competition. As reflected in the analytical framework, such a scenario shows that interventions that go against market liberalisation would result in negative effects on competition.

The studied policy and regulatory frameworks have in general depicted increased support for service-based competition, notwithstanding a number of queries and challenges outlined by the interviewed participants. It is also noted that collective implementation of the three frameworks brings greater strength to the levels of service-based competition than when applied individually. As earlier noted, this observation has been captured in the analytical framework that brings the three interventions together for a favourable outcome.

Policy and regulatory frameworks in Botswana should therefore promote both service-based and facility-based competition to enable the broadband market to benefit from the advantages of both type of competition. The advantages are believed to include product differentiation, lower prices, improved quality of service and higher levels of network security. Achievement of these benefits are believed to be less efficient and short lived for service based competition, while

facility-based competition enables efficiency and prolonged benefits in the long run.

CHAPTER 6: THE OVERALL EFFECTS OF POLICY AND REGULATORY INTERVENTIONS ON BROADBAND COMPETITION AND THE WAY FORWARD

Based on the research findings and data analysis, this study concludes that the coordinated roles of MTC and BOCRA in stimulating competition in the provision of broadband Internet have led to a significant increase in service-based competition, while facility-based competition has remained minimal. The three explored interventions namely; market liberalisation; open access to infrastructure networks; and initiatives for universal access to broadband Internet have all shown existing and anticipated increase in service-based competition. This finding answers the over-arching research question that sought to understand how policy and regulation had influenced competition in the provision of broadband Internet.

Service-based competition has been achieved in the short run and continues to experience a supportive environment, while few cases of broadband infrastructure developments indicate that the country may only achieve facility-based competition in long term. Such an achievement would be realised upon introduction of some changes to existing policy and regulatory frameworks. The researcher proposes such changes in the form of recommendations, which are outlined under the section below.

6.0 Recommendations

In considering the different stages of the study, particularly the research findings and data analysis, the researcher proposes improvements through drawing a set of the recommendations as outline below.

6.1 Market liberalisation in the wake of the unified licensing framework

The relaxation of restrictions on the number of FBO licences allowed in the market. This is nonetheless an expected regulatory approach in the sense that

the regulator introduced a unified licensing framework in 2015, which goes against such barriers to market entry. The new licensing framework is expected to enable easier market entry by regional and international investors, key of which would compete at infrastructure level to improve facility-based competition in Botswana. Infrastructure investors in this regard may include international companies such as Liquid Telecom and SEACOM, which have already shown interest in expanding their high-speed undersea and terrestrial fibre-optic networks to the southern parts of Africa, having successfully landed in the continent's east and west coasts in the past years.

Policy makers and the regulator should further speed up the migration of licensees to the new unified licensing framework, which has been praised for its focus on infrastructure and service investment without restrictions to operators, to promote both facility-based and service-based competition in the broadband market. Delays in the migration process caused by financial problems may be addressed by giving operators a few years of free operation to build their customer base and gain financial strength before paying licence fees.

6.2 Strengthening the legality of policies for open access to infrastructure networks

All broadband policies that are at a guideline status, such as the 2008 guidelines on infrastructure sharing need to be revised and given statutory features that would allow them to be recognised as law. This would deter operators that tend to be difficult in sharing their infrastructure from continuing with such decisions, while putting competitors in a position to request legal assistance with confidence.

6.3 Recognising the place of TV white space technology and digital dividend in spectrum management

In light of spectrum efficiency, the Regulator should speed up processes on trials of TV whitespace bands for broadband connectivity. While the Botswana market is generally considered small for excessive release of spectrum frequency, the use of TV whitespace technology would benefit the broadband market to a great extent, considering that the country has a large land mass with dispersed populations, features for which TV White Space spectrum is known to be suitable. BOCRA should therefore engage the research agencies it had authorised to conduct trials on the use of TV White Space spectrum to release the findings such that market developments around the areas can be explored. Speeding of processing is also important on the issue of digital migration to release the digital dividend that is expected to have a positive effect on broadband competition and service provision.

6.4 UASF non-discriminative incentives with respect to service-based and facility-based competition

As a development agency within the communications sector, the UASF should take note of the two types of competition in broadband markets and strive towards supporting both of them with no grounds for discrimination. While the Fund subsidised deployment of wholesale infrastructure through BoFiNet's Wi-Fi hotspot project, its key aim seemed to focus directly on service-based competition as it enabled several VANS to acquire cheaper access networks for retail service provision. One notes here that the subsidy was not necessarily for increasing the levels of facility-based competition as it benefited an operator that was already providing the same wholesale services.

It is important to note however that the subsidised wholesale Wi-Fi hotspots were the first project of the Fund, and that more projects are anticipated in line with its 2015-2018 strategic plan. Such projects may be organised to

benefit both forms of broadband competition, ensuring that their benefits are extended to underserved and unserved areas which the Fund seeks to assist.

6.5 Adequate stakeholder consultation

In adopting multifaceted frameworks for the stimulation of competition in broadband markets, policy and regulation should engage all relevant stakeholders from conceptual stages of such frameworks and reduce working in silos as this has been labelled as a drawback on achievements of objectives. Some service providers have indicated that limited information on policy and regulatory decisions limit their ability to compete satisfactorily. They noted that operators who tend to be favoured in terms of access to intended developments are always ahead with preparations for opportunities in the market.

6.6 Area for Further Research

The researcher has in the introductory chapter, stipulated the perceived benefits of both service-based and facility-based competition, noting that broadband markets with the former are said to be efficient only in the short run. Facility-based competition on the other hand, comes out as the most preferred form, believed to have advantages that included product differentiation, low and affordable prices and network security.

The researcher has through this work investigated and found out the effects of policy and regulatory frameworks on both forms of competition in Botswana, identified the most dominant form and drawn recommendations for improvement. Future research may find it necessary to carry out investigations on the actual benefits of these forms of competition on the broadband market, which the researcher could not explore. Investigation and research findings on such benefits would complement those of the researcher in trying to achieve a more detailed approach to understanding broadband policy and regulation in Botswana.

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Annexures 1 :Interviewee Descriptions

Table 1 compiles brief descriptions of the interviewed individuals, revealing the authenticity of collected data as gauged by the interviewees' involvement and years of experience in broadband issues. Table 1 therefore directly addresses the first question on the interview guide, which requested participants to describe their involvement and experience with issues of broadband Internet in Botswana.

Table 3: Interviewee Descriptions

PARTICIPANT	INSTITUTION REPRESENTED	DESCRIPTION OF INTERVIEWEES/ REPRESENTED BODY
MTC-1	Ministry of Transport and Communications (MTC)	MTC-1 has extensive experience working for the Ministry. MTC as the industry overseer, plays a critical role in broadband policy formulation and facilitates implementation of set objectives.
UAS-1	Universal Access and Service Fund (UASF)	Part of the team that is responsible for universal access and services initiatives across the four sectors of telecoms, Internet, broadcasting and postal services.
Reg-1	Communications Regulator (BOCRA)	Has a background in telecommunications engineering, with extensive industry experience and often provides technical expertise on different industry areas.
Reg-2	BOCRA	Has been involved with broadband issues since 2011, mostly covering licensing of service providers, market research and tariff regulation.
FBO-1	Facility Based Operator (Fibre Company)	Has worked in topic-related industry and government institutions. The FBO services PTOs and VANS.
PTO-1	Public Telecommunications Operators (PTO)	PTO-1 has worked for the operator for many years and is conversant with its different areas of service provision. The PTO owns and operates mobile and fixed wireless broadband networks that cover the country widely. The PTO contributes towards formulation of broadband policies and regulatory interventions through consultative participation and providing expertise in different areas.
PTO-2	PTO	PTO-2 has extensive experience at the Operator.
ISP-1	Internet Service Providers (ISPs) also known as VANS	Owns and operates VANS licence since 2004. Company provides wireless broadband services to households and businesses under the ISM band (since 2009). Resells BTC ADSL services since 2005. Has acquired its own WiMAX network and offers broadband services under 4G technology.
ISP-2	ISPs	VANS licensee that focuses mainly on wireless broadband connections. Contributes towards formulation and implementation of policy and regulatory decisions through consultation platforms.
ISP-3	ISPs	Wireless broadband service provider since 2012. Has more than 20 points of presence across the country, serving mostly corporate customers. Contributes towards policy development through consultative participation. Have had the opportunity of penetrating regional markets. Exploring content production for home use mostly, which will guarantee increased uptake of broadband services.
ICT-Res-1	ICT Research and Consultancy Company (private)	Carried technical responsibilities at both the incumbent and the regulator. Contributes towards development of policy and regulation at consultancy level, with the NBS as one of the examples.
Uni-1	University Lecturer and Researcher	Has worked as a researcher for more than 10 years, including ICT research. Such research work has included supply and demand sites of ICTs, and their benefits to households, government.

Compiled by Author

All participants had more than 10 years of engagement with telecommunications issues and proved to have considerable knowledge on broadband Internet segment. This gave the researcher the satisfaction that the interview questions would be understood and answered satisfactorily.

Annexures 2: Data Collection Tool (Interview Guide)



Faculty of Humanities

University of the Witwatersrand, Johannesburg

P O Box 601, Wits, 2050

INTERVIEW GUIDE

The Effects of Botswana's Policy and Regulatory Frameworks on Competition in the Provision of Broadband

1. Please provide a brief explanation of your involvement or that of your organisation /company in issues related to the supply of broadband in Botswana.
2. What are your brief views on the newly (2015) adopted Unified Licensing Framework (ULF) and what influence do you think it will have on competition in the supply of broadband Internet in the country?
3. In your view, what has been the effects of the previous regime that separated service providers into Public Telecommunications Operators (PTOs), Facility Based Operator (FBO) and Internet Service Providers/ VANS licence categories, on broadband competition across the country?
4. With regards to network infrastructure, a special purpose vehicle (Botswana Fibre Networks) was introduced to the market in 2013; in your view, how relevant was this introduction and what have been its effects on the provision of broadband in the country? Please elaborate with a few examples where applicable.
5. Policy has in 2014 established the Universal Access and Services Fund (UASF). What are your views on the effects of the UASF on competition in the rollout of broadband services?
6. What have been the effects of the adopted spectrum management processes on broadband supply? Please comment with reference to non-discrimination and

transparency in spectrum allocation, and measures towards optimisation of the resource such as the use of TV whitespace and digital divided bands. What have been the experiences of your company/organisation in this regard?

7. Broadband tariff regulation in Botswana has involved the control of access / wholesale broadband tariffs. What have been the effects if any, of this regulatory move on competition in the supply of services? Please relate Botswana's tariff regulation to the ladder of Investment, and clarify the stance of the country with regards to the concept.
8. Non-regulation of retail broadband prices is generally believed to promote competition and differentiated offerings. What are your thoughts on non-regulation of retail broadband prices? Has this benefited or disadvantaged broadband service provision in the country?
9. Could mandated infrastructure sharing including Local Loop Unbundling (LLU) and authorisation of Mobile Virtual Networks (MVNOs) benefit competition in the provision of broadband internet in Botswana? Please provide examples where applicable.
10. Which other policy and regulatory processes / interventions (apart from those discussed above) do you find significant to issues of broadband competition in Botswana and what have been their observed impact?
11. What other factors apart from policy and regulation have significant influence on competition in the provision of broadband Internet in Botswana? Please elaborate on the impacts of such factors.

THANK YOU

Annexures 3: Participant Information Sheet



Faculty of Humanities

University of the Witwatersrand, Johannesburg

P O Box 601, Wits, 2050

The Effects of Botswana's Policy and Regulatory Frameworks on

Competition in the Provision of Broadband

Participant Information Sheet

Dear Sir/Madam

My name is Kenaope Pelaelo and I am studying for a Masters of Arts (ICT Policy and Regulation) at the University of the Witwatersrand in Johannesburg, South Africa. In part fulfilment of the masters' programme, I am conducting research on the effects of policy and regulatory frameworks on competition in the provision of broadband Internet. I wish to invite you to take part in the study through responding to a set of interview questions. You have been selected as a potential key informant in the study because you are considered to be familiar with broadband issues due to your position and experience in relation to the communications sector. Before you decide whether or not to take part, please read the following information carefully;

The decision on participation

Taking part in the research is completely voluntary and you may withdraw your consent and participation at any time without giving reasons. There will be no penalties or loss of benefits should you decide not to participate in the research.

If you decide to participate, this Information Sheet and a Consent Form will be given to you to sign. You will be asked to take part in an interview during the months of November or

December 2015, to answer a set of questions and share your views in relation to the research topic. The interview will take an approximate time of one hour, at a place most comfortable for you as the participant and for me as the interviewer. You may decline to answer questions that you feel are uncomfortable during the interview. With your permission, the interview may be recorded. There are no direct risks in participating in the interview and there will be no payment to you for participating.

Anonymity and confidentiality

All personal information collected from you will be kept strictly confidential. The final report will not include any identifiers as they will be removed during consolidation of data. Upon completion of the study, the report will be kept securely in an electronic form to be used for further research and analysis where necessary. It may also be published in paper format. A copy of the report would be made available for you upon request.

Request for information

Please contact me should you have questions on the study. You can also contact the supervisor should you have concerns about the research or your rights as a participant. See my contact details and those of the supervisor below;

Researcher: Kenaope Pelaelo

email: kenaopepelaelo@gmail.com

Mobile: +27 1885782 / +267 71485269

Supervisor: Lucienne Abrahams

email: luciennesa@gmail.com

Mobile: +27 825697675

Informed Consent Form

Please initial box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. ☐
3. I understand that the researcher will not identify me by name in any reports using information obtained from this interview and that the views I express will remain confidential; **OR** ☐
4. I agree to my name being listed as a participant in this study in the annexure to the report, but not to be referenced in the main body of the report. ☐
5. I agree to the interview being audio recorded. ☐
6. I agree to the use of anonymised quotes in the dissertation. ☐
7. I agree that data gathered from me in this study may be stored (after it has been anonymised) and may be used for future research. ☐

Participant: Date: Signature:

Researcher: KENAOPE PELAELO Date: Signature**:**

THANK YOU

Annexures 4: Ethics Clearance Certificate

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Pelaelo

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H15/11/25**
PROJECT TITLE	The impact of Botswana's policy and regulatory frameworks on competition in the provision of broadband internet
INVESTIGATOR(S)	Ms K Pelaelo
SCHOOL/DEPARTMENT	Sociology/
DATE CONSIDERED	20 November 2015
DECISION OF THE COMMITTEE	Approved
EXPIRY DATE	26 January 2019

DATE 27 January 2016 **CHAIRPERSON** _____
(Professor J Knight)

cc: Supervisor : Professor C Lewis

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

_____ _____/_____/_____
Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES