Innovation-based competitive differentiation amongst South African fibre to the home (FTTH) operators

Andiswa Ntsandeni

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ABSTRACT

Fibre-to-the-home (FTTH) as an access technology is viewed as vital for economic growth and competitiveness. The deployment of high speed networks and advanced access technologies is essential for continuous development of broadband in South Africa. FTTH is an access technology that has recently been deployed and adopted by different network providers in South Africa. South Africa is one of the developing countries attracting investments in the deployment of infrastructure where industry players are deploying fibre at a high rate with acquisition of smaller players.

FTTH operators and service providers are challenged with competitive pressures within the market where competitiveness relies on the capacity to continually develop and implement unique innovative initiatives that will drive competitive advantage over its competitors. Competitive advantage is needed to achieve the organisation's objectives. These innovative initiatives are required due to intense competition within the market which results in reduction of prices and margins.

The purpose of this study is the exploration of innovation-based competitive differentiation from a South African FTTH provider perspective. The study aims to look at potential innovation differentiation amongst South African FTTH providers and how it can be applied in order to obtain a competitive advantage by looking at the factors that influence competitive advantage and barriers for innovation within the market. The study will provide knowledge and insights to develop an understanding of innovation for FTTH providers in a developing country such as South Africa.

In this study, realistic data from the different network providers and service providers has been collected utilising a qualitative research method to investigate and conduct an in-depth analysis based on interviews with subject matter experts and managers from FTTH operators and service providers. Some propositions have been suggested as a validation for the proposed framework. The sample for the study has been drawn from the active FTTH network infrastructure operators and service providers based in Gauteng.

The research findings indicate that the fibre-to-the-home market is a highly competitive environment with network providers and service providers offering various products and services to customers in order to meet customer needs. However, there are challenges with innovation based competitive differentiation since, currently,

competition is primarily based on the price of the broadband product. As a result, prices have been plummeting, leading to some service providers operating and selling their FTTH products with no margins or negative margins.

KEYWORDS: Fibre-to-the-Home, FTTH, Innovation, Differentiation, Competition, Network Operators, Competitive Advantage.

DECLARATION

I, Andiswa Ntsandeni, declare that this research proposal is my own unaided work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Innovation Studies at the Wits Business School in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other University.

Signature: ……..

On this …… day of ……20 ……..

Name

DEDICATION

I dedicate this study to the Sovereign Lord, the heavenly Father for His love and faithfulness. To my husband Rendani Justice Ntsandeni for his patience and understanding while working on this study as well as my eight siblings for motivating me to pursue this course.

"This hope [this confident assurance] we have as an anchor of the soul [it cannot slip and it cannot break down under whatever pressure bears upon it]—a safe and steadfast hope that enters within the veil [of the heavenly temple, that most Holy Place in which the very presence of God dwells]" Hebrews 6:19 Amplified Bible (AMP)

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"Education is the most powerful weapon which you can use to change the world"
Nelson Mandela

"I am an African. I owe my being to the hills and the valleys, the mountains and the glades, the rivers, the deserts, the trees, the flowers, the seas and the ever-changing seasons that define the face of our native land" ***Thabo Mbeki***

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LIST OF ABBREVIATIONS & ACRONYMS

5G	5th Generation wireless system
ATL	Above The Line
ADSL	Asymmetric Digital Subscriber Line
ARPU	Average Revenue Per User
BOS	Blue Ocean Strategy
BTL	Below The Line
CAPEX	Capital Expenditure
DSL	Digital Subscriber Line
CoBIT	Control Objectives for Information and Related Technologies
CPE	Customer Premises Equipment
ECNS	Electronic Communication Network Services
FTTB	Fibre To The Business or Building
FTTC	Fibre To The Curb
FTTH	Fibre To The Home
FTTN	Fibre To The Node
FTTP	Fibre To The Premises
FTTT	Fibre To The Tower
FTTX	FTTB / FTTC / FTTH / FTTN / FTTP / FTTT
FUP	Fair Use Policy
GEPON	Gigabit Ethernet Passive Optic Network
GSM	Global System for Mobile communications
HDTV	High Definition Television
ICASA	Independent Communications Authority of South Africa
IoT	Internet of Things
IP	Internet Protocol
IPC	IP Connect

IS	Information Systems
ISP	Internet Service Provider
ISP	Inside Plant Provider
ISO 9002	International Organization for Standardization 9002
ITIL	Information Technology Infrastructure Library
IT	Information Technology
LSM	Living Standards Measure
LTE	Long Term Evolution
LTE-A	Long Term Evolution Advanced
M2M	Machine to Machine
MDU	Multiple Dwelling Unit
Mbps	Megabits per second
MPLS	Multiprotocol Label Switching
NGPON	Next-Generation Passive Optical Network
OPEX	Operating Expenditure
OSP	Outside Plant Provider
OTT	Over The Top
PON	Passive Optical Network
PTP	Point to Point
P2P	Point to Point
P2MP	Point to Multipoint
ROS	Red Ocean Strategy
SDU	Single Dwelling Unit
SDSL	Symmetric Digital Subscriber Line
SLA	Service Level Agreement
STB	Set-Top Box
USASSA	Universal Service and Access Agency of South Africa

VANS	Value Added Network Services
VDSL	Very high bit-rate Digital Subscriber Line
VoIP	Voice over IP
VPN	Virtual Private Network
WTTX	Wireless to the X

CHAPTER 1: INTRODUCTION

1.1 PURPOSE OF THE STUDY

This study focuses on innovation-based competitive differentiation specifically for the fibre-to-the-home (FTTH) access technology by looking at the factors that influence competitive advantage and barriers to innovation within the industry. The demand for FTTH is driven by the corresponding high demand for bandwidth in applications that require a minimum of 10Mbps. These applications include high definition video as the main driver of bandwidth usage (Scott, 2010; Laureles, 2016), high definition television (HDTV), peer to peer, video on demand and gaming applications (Pereira & Ferreira, 2012; Vilar, 2015).

FTTH is a cutting-edge access technology and more future proof (Casier, 2009) in comparison to Digital Subscriber Line (DSL) which uses copper fixed-line technology. DSL is limited by speed, distance and the cable quality of copper is threatened by environmental changes and factors that include rain, theft, and lighting and physical damage. Cochrane (2008) identified additional limitations to copper, including crosstalk, damage caused by water entering the cable strand, installation mismatches, and general poor quality of service which has made copper to be unsustainable. Fibre optic is a future proof technology which meets the demand of broadband that increases yearly. The process of replacing copper with fibre, especially for the last mile, has advantages from an economic perspective because the fibre cable per strand is cheaper in comparison to the copper and the lifetime cost of the fibre optic cable has dropped to comparable levels or less compared to copper (Green, 2006).

1.1.1. SOUTH AFRICAN FTTH INDUSTRY

According to Statistics South Africa (2016), South Africa has an estimated population of 55,91 million. The majority of the population of South Africa reside within 10 km of existing fibre access networks (Department of Communications, 2013). In 2006, the licensing framework for electronic communication network services (ECNS) was

updated by the Independent Communications Authority of South Africa (ICASA) to include a license class which enabled value added network services (VANS) providers to deploy fibre optic networks, which resulted in a growth of FTTH networks within urban areas (Sutherland, 2014). According to Parle (2015), South Africa has considered different delivery mechanisms for broadband, including copper, fibre, wireless and satellite. The South African FTTH market has over 20 Layer 2 providers and over 200 Internet service providers (ISPs). Layer 2 providers refers to organisations that lay and build fibre infrastructure up to the customer's premises. There has been an increase in the number of open access networks in the FTTH market. These role players include Vumatel, Waterfall Access Network (WAN), Century City Connect, Octotel and others. Open access refers to organisations that open up their fibre network infrastructure to be used by other organisations to provide a service to their own customers. These open access networks lease their network infrastructure to different ISPs. The different ISPs offer bundled allocations of data with symmetrical bandwidth where the upload speed is equal to the download speed and asymmetrical bandwidth where the upload speed is less than the download speed, with speeds ranging from 4 Mbps up to 1 Gbps.

Open access layering includes the following layers as discussed by Gruber & Koutroumpis (2011), Lehr, Sirbu, & Gillett (2008):

- **Open access at Layer 0:** This applies when the provider or municipality leases or provides the conduit and colocation facilities while the competition facilitates the installation of optic fibre cable.
- **Open access at Layer 1:** This is referred to as the physical layer. This applies when the provider or organisation leases dark fibre infrastructure that has not been used and the fibre strand allow the competition to provide the capability to support service provisioning to the different service providers which enables some level of flexibility.
- **Open access at Layer 2:** The most commonly used open access layer where the network provider rolls out and deploys the fibre infrastructure up to the last mile. The service provider only provides services to retail customers.
- **Open access at Layer 3:** Open access is made available on the network layer. Multiprotocol Label Switching (MPLS) based Virtual Private Networks (VPNs)

or policy-based routers are utilised to distinguish between the different service providers.

The table below indicates the different network providers and service providers that are part of Layer 0, Layer 1, Layer 2 and Layer 3 providers in South Africa. The list of providers has been consolidated based on the information from South African network and service providers.

LAYER 0	LAYER 1	LAYER 2		LAYER 3	
Metropolitan Municipalities: City of Tswane (City of Tswane, 2017) City of Johannesburg(Van Zyl, 2015) City of Cape Town (Mzekandaba, 2016) Ethekwini (Municipality, 2008)	Link Africa (Link Africa, 2018) Dark Fibre Africa (DFA, 2018)	Vumatel/ Fibrehoods (Vumatel, 2018) Link Africa (Link Africa, 2018) Vodacom (Vodacom, 2018) MTN/SmartVillage (mybroadband, 2017) Metrofibre(Metrofibre Networx, 2018) SADV(SADV, 2016) WAN(WAN, 2018) Openserve (Openserve, 2017) Frogfoot(Frogfoot, 2018) Century City Connect(Century City Connect, 2018)	True Communication (True Communications, 2018) TT Connect (TTConnect, 2018) 123Net (123Net Fibre, 2018) Safricom (Safricom, 2015) Aenova360(Aenova, 2018) Octotel (Octotel, 2018)	CellC (Cellc, 2018) MWEB (Mweb, 2018) GreenCom (Greencom, 2018) Afrihost (Afrihost, 2018) Web Africa (Vumatel, 2018) Cool Ideas (Coolideas, 2018) Vodacom (Vodacom, 2018) Telkom (Telkom, 2018) Axxess(Axxess, 2018) CyberSmart (Vumatel, 2018) OpenWeb (Openweb, 2018) RocketNet (Vumatel, 2018) VOX Telecoms (Vox Telecoms, 2018) Accelerit (Vumatel, 2018) Adept(Adept, 2018) SAFibre (SAFibre, 2018) Snowball (Snowball, 2018) KAB Technologies (KAB Technologies, 2018)	Goturbo (Goturbo, 2018) ClearAccess (Clear Access, 2016) PacketSky (PacketSky, 2017) RSAWeb (RSAWeb, 2018) Active Fibre (Activefibre, 2018) Home Connect (Home Connect, 2018) Web Connection (Web Connection, 2017) Crystal Web (Crystalweb, 2017) Vanilla (Vanilla, 2018) Goturbo (Vumatel, 2018) BronbergWisp(Bronberg Connect, 2018) Infinity Fibre (Infinity Fibre, 2018) CapeConnect Internet (Cape Connect Internet, 2018) NexusNet (Nexus, 2018) ISP Africa (ISPAfrika, 2017) Sonic Telecoms (Vumatel, 2018) MTN (Smartvillage, 2018) Wirulink (Vumatel, 2018)

Table 1: FTTH providers in South Africa

The different products and services include capped and uncapped bundled data allocations, Wi-Fi enabled routers, fixed voice service, and different contract terms of subscription ranging from month-to-month, 12 months and 24 months.

Due to the large number of role players in this field, it is essential for South African operators to implement innovation-based competitive differentiation based on new products, services, processes and business models in order to create market demand to attract and retain customers.

There is limited empirical evidence in the literature with regards to innovation-based competitive differentiation amongst South African FTTH operators. Therefore, the aim of the study is to explore a holistic view of innovation-based competition differentiation for FTTH amongst South African operators. Furthermore, the study seeks to understand the drivers, supporting factors, limitations and the extent of the innovation-based differentiation to drive the competitive advantage amongst South African operators.

1.2 CONTEXT OF THE STUDY

An innovation management perspective will be utilised to conduct this study. Innovation management requires collaboration between technological know-how, management of projects and finance together with soft skills in managing individuals and creativity with an organisation (Goffin & Mitchell, 2017, p.27). Innovation management has also been explained as interconnectedness between technical innovation and organisational innovation (Freeman, 1995).

Lee, Marcu, & Lee (2011) postulated that there are factors that impact the acceptance of fixed-line communication from a consumer perspective. These factors include pay, location, the level of education and the price of broadband, which are essential aspects influencing the diffusion of fixed-line broadband adoption.

Innovation differentiation not only enables competitive advantage by providing offerings with more value but it also facilitates continuous innovation that can be achieved through continual analysis of customer needs (Zhou, Brown, & Dev, 2009).

1.3 PROBLEM STATEMENT

Preliminary investigation has shown that there is limited information regarding innovation-based competitive differentiation for FTTH. Other studies have looked at the role of FTTH in Africa (Stork, Calandro, & Gamage, 2013) and FTTH as a

recommended access technology for South Africa (Naidoo, 2012). The vast majority of the studies have focused on the deployment of FTTH (Randeep & Nitika, 2013), in other parts of the world, such as Slovenia (Batagelj, 2009), or on future network architectures like point-to-point (P2P) and point-to-multipoint (P2MP) that supports multiple providers (Batagelj, 2014). Although these have been the research focus areas, there are competitive pressures amongst operators and a decline in consumer pricing (Reding, 2008; Meade & Islam, 2015). Therefore it is essential for operators within the telecommunication industry to differentiate their service and product offerings from competitors to reduce the high level of competitive pressure and increase their market share (Hersh & Abusaleem, 2016). Competitive advantage determines the success and future of the operator. Consequently, there is a need to apply innovative differentiations in order to drive this competitive advantage and combat competition in telecommunications industry.

1.4 SIGNIFICANCE OF THE STUDY

FTTH is key in managing the growing demand for broadband (Ezeh & Diala, 2014). This study will contribute to an increasing knowledge of FTTH in the context of South African operators. The substantial increase in the demand for broadband with high bandwidth, speed and capacity validates the need to create innovation-based competitive differentiation and increase competitive advantage amongst FTTH operators. This study will enable the following:

- Informed decisions by FTTH operators and service providers regarding innovation differentiation options available that can be explored and implemented;
- Increased value for customers based on innovation-based differentiation and availability of information to select appropriate offers that are suitable for consumers;
- Identification and creation of new revenue streams for service providers and operators based on the new value that can be created for customers.

1.5 RESEARCH QUESTIONS

This study plans to answer the following identified questions and associated propositions (P1, P2, P3, P4):

- What is the current level of innovation-based competitive differentiation for FTTH?
    - P1: There is a low level of innovation-based competitive differentiation for FTTH in South Africa.
    - P2: FTTH providers tend to focus on more on incremental innovation using products and services.
- How can innovation-based competitive differentiation be further utilised as a competitive advantage amongst FTTH operators?
    - P3: South African operators and service providers can make use of customer needs in the market in order to differentiate themselves from the competition.
    - P4: The high level of available resources and capabilities can be used to differentiate operators from their rivals and enable competitive advantage.

1.6 DELIMITATIONS OF THE STUDY

The study will determine the ways in which FTTH network operators and service providers can potentially make use of innovation- based differentiation in order to drive competitive advantage and improve their competitive position within the industry. The study is limited to South African firms that are currently operating in FTTH, specifically facility-based network and Internet services providers. Due to time constraints and financial limitations, the study will concentrate on selected operators that are based in the Gauteng Province of South Africa.

1.7 ASSUMPTIONS

The study assumes the following:

- Responses from the different individuals that will be interviewed will be authentic and truthful.
- Similar results would be obtained from another geographical location or province within South Africa.
- Innovation is beneficial for economic growth (Rosenberg, 1996) and excludes scenarios where innovation is not always economically good as discussed by Soete (2013).
- Innovation is beneficial to everyone in society and excludes scenarios where innovation benefits only few at the expense of many in the society (Fagerberg, Martin, & Andersen, 2013)

1.8 DEFINITION OF KEY TERMS

The study utilises the following words and phrases which are defined below to better understand the content:

1. **Connected Home.** A connected home refers to a home that has a connection to the FTTH network. The benefit of a connected home using fibre is the substantial increase in the value of the property, up to eight percent (Fleming, 2017). It provides virtually limitless possibilities of services that can be implemented on fibre, these include but are not limited to security, entertainment, Voice over IP (VoIP), and home automation. With regard to IPTV, Battier & Girieud (1966) argue that fibre provides a better quality of service in terms of speed and consistency that enables the use of multiple TV applications within the same home and it fast-tracks the use of interactive services.

2. **Fibre-to-the-Home (FTTH).** FTTH refers to the connection of residential homes to optical fibre technology. The home is usually connected with an optical network termination (ONT) point which is used to connect to the FTTH network.

FTTH is a technology which uses an optical fibre cable to connect the home to a high speed network in order to deliver data, voice and video services (Ab-Rahman, Ng, & Jumari, 2009) and it is considered as the broadband of choice due to the capability to increase bandwidth to the residential home and because it is a future-proof technology with increased network reliability as well as the benefit to enhance the openness of the network to enable customer satisfaction (Kunigonis, 2009).

3. **Homes Passed.** This is the total number of homes that have a capability to be connected to the FTTH network by the service provider. The connection of these homes normally belongs to a specific network provider. When a customer requests a FTTH service for these homes, a fibre connection from a boundary box to the actual home of the customer gets implemented.

4. **Internet Service Provider (ISP).** ISPs are the organisations that provide Internet or broadband service to customers after the network infrastructure has been installed.

5. **Innovation.** Innovation is defined based on the five components detailed by Schumpeter, (1934) and cited by (Goffin & Mitchell, 2017): (a) It is the introduction of a new product (good) which is not yet known by the end users or one that increases the quality of the good that already exists. (b) A new method of production which is new to a specific branch of industry. This does not have to be based on scientific discovery but may exist in other sectors. (c) Creation of new markets – which the specific organisation has not entered. (d) New sources of supply whether the source is new or existing. (e) New industry which involves restructuring of the competitive environment and industry.

6. **Network provider or provider or operator.** These terms are used interchangeably to refer to the organisation that implements FTTH infrastructure rollout to residential communities. The communities include gated and non-gated communities.

7. **Open Access Network.** This is a business model where the network infrastructure owner has separated the network infrastructure from the services

that have been offered to customers. The owner of the infrastructure may not be the same as the service provider of the service within the network.

8. **Optical Fibre.** This is a physical medium that is used to transmit data. It is a thin flexible fibre with a glass core. It replaces copper wire for last mile connectivity. It is able to transmit data over a long distance.

9. **Layer 1.** This is also referred to as the physical layer. This applies when the provider or organisation leases dark fibre infrastructure that has not been used and the fibre strand allows the competition to provide the capability to support service provisioning to different service providers, which enables some level of flexibility.

10. **Layer 2.** The is the most commonly used open access layer where the network provider rolls out and deploys the fibre infrastructure up to the last mile. The service provider only provides services to retail customers (Gruber & Koutroumpis, 2011).

11. **Layer 3.** This is when open access is made available at the network layer. Multiprotocol Label Switching (MPLS) based Virtual Private Networks (VPNs) or policy-based routers are utilised to distinguish between the different service providers.

12. **FTTX** is a shortened abbreviation for different optical access technologies with X referring to the location where the technology is made available (Martin, 2008) i.e. fibre to the home (FTTH), fibre to the business/building (FTTB), fibre to the curb (FTTC), fibre to the node (FTTN) or fibre to the premises (FTTP). FTTX has two architectures that are usually implemented across different networks i.e. point to point (P2P) as well as point to multiple point which is also known as passive optical networks (PON).

13. **Competitive advantage** is the key driver for the relative performance of organisations in a competitive environment. It is achieved when the organisation provides a similar proposition as the competition at a lower price

in comparison to its counterparts, or provides a proposition with more value at a higher price. Competitive advantage is recognized through mapping the organisation's capabilities, target market and the customer needs better than competitors (Hersh & Abusaleem, 2016). Within an organisation, competitive advantage enables the organisation to offer innovative products and services that are unique to the organisation in comparison to its competitors.

1.9 OUTLINE AND STRUCTURE OF THE REPORT

Chapter 1: Introduction

This chapter details the understanding of optical fibre in the context of innovation. FTTH is positioned as a disruptive technology to the existing fixed-line access technologies. It looks at the rationale for the study, challenges and limitations of copper in comparison to optical fibre, and also highlights the context for innovation-based differentiation amongst FTTH operators.

Chapter 2: Literature Review

This chapter details the definition of innovation and the role of FTTH and will be followed by an in-depth analysis of relevant research discussions, namely on differentiation, competitive advantage, models of competition, FTTH competitive views from a South African perspective, as well as factors being implemented by network providers to have a competitive advantage. It also provides a comparison between the objectives of this study and the literature on the stated research discussions.

Chapter 3: Research Methodology

This chapter outline the research method that has been applied for this study including the process and the way the study is undertaken and details the proposed research approach that has been followed.

Chapter 4: Presentation of Findings and Results

The chapter details the data collected as part of the research using semi-structured interviews with staff from the different FTTH network operators, service providers as well as expert commentators.

Chapter 5: Analysis and Discussion of the Research

This chapter details the findings of the presented data available in chapter 4 and it aims to analyse and synthesise the findings based on the literature reviewed in Chapter two.

Chapter 6: Conclusions and Recommendations

This chapter summarises the findings of the study based on the semi-structured interviews as well as the outcomes of based on the literature review.

CHAPTER 2: LITERATURE REVIEW

The purpose for this chapter is to review the literature and global perspectives on innovation-based differentiation and competitive advantage. It will interrogate, integrate and synthesise the current body of knowledge relevant to this study and integrate the information into a systematic view.

2.1. FIBRE TO THE HOME (FTTH)

FTTH makes use of optical fibre cable to transport and transmit data (Casier, 2009) over a long distance (Effenberger, 2017). FTTH is a technology which uses an optical fibre cable to connect the home to a high speed network in order to deliver data, voice and video services (Shibghatullah, Mohammed, Doheir, & Majed, 2017) and it is considered as the broadband of choice due to the capability to increase bandwidth to the residential home and because it is a future-proof technology with increased network reliability as well as the benefit to enhance the openness of the network to enable customer satisfaction (Kunigonis, 2009). Network operators within the telecommunication industry are rolling out fibre in the access network (Effenberger, 2016). The rollout includes deploying two different types of network architecture i.e. passive optical network (PON) architecture which makes use of splitters to distribute bandwidth to each home and point to point (PTP) architecture which connects each home using a dedicated optic fibre (Kunigonis, 2009). The PON architecture can connect multiple users via the splitter, up to 32 users on each fibre strand, and can cover a limited distance of 20 km in comparison to the PTP architecture which support a distance of 10 km (Nowak & Murphy, 2005). More network providers tend to use the PON architecture due to its pay as you use approach where the architecture enable to spread the total cost of fibre infrastructure over a large number of customers (Nowak & Murphy, 2005) and this has been confirmed by (Bouchat et al., 2014). Walczyk & Gravey (2012) compared the outside plant for the PON and PTP architectures using the techno-economic analysis method and the results indicate the superior cost benefit of the PON in comparison to the PTP.

Azodolmolky & Tomkos (2008) examined the use of active Ethernet deployment architecture for FTTH in Athens. The authors presented a techno-economic analysis

model to evaluate triple play: voice, video and data on an ARPU basis which enables the service providers and network planners to optimise the deployment and design of the network, while Casier et al. (2008) presented a techno-economic analysis model and the FTTH life cycle (i.e. planning, deployment, migration and provisioning, operational and cancellations) for Gigabit Passive Optical Network (GPON) deployment in Belgium. The results indicate an average cost per connection of 1 500 Euros per home. Walczyk & Gravey (2012) evaluated the cost of deploying optical fibre for the French telecommunications market using a techno-economic analysis model and suggest that the French market is unique due to the ARPU and take up rates. The results indicate that the payback period can take up to twenty (20) years for FTTH which is double the period in comparison to other fixed networks. According to Van der Wee et al. (2015), the fibre infrastructure on open access can be shared on three layers i.e. fibre, wavelength and bitstream. The fibre layer refers to different parallel fibre strands where each user is connected using a dedicated fibre. The wavelength refer to instance where the end user select the network provider based on different wavelength and bitstream identifies competition on Layer 2 and Layer 3 for network and service provider. Van der Wee et al. (2015) assessed the cost associated with fibre open access and service provider on bitstream open access network. The authors make use of a techno-economic analysis model to determine the cost associated with connecting a new service or network provider as well as connecting and disconnecting an end user. The results indicate that the cost of adding a new network provider is significantly higher for fibre open access in comparison to bitstream open access.

Azodolmolky & Tomkos (2008) argue that high bandwidth demanding applications are the main drivers for an FTTH deployment and Active Ethernet can either be deployed as a star architecture or a dedicated optical fibre-to-the-home. It is the demand that influences the decision on whether the organisation should chose the point to point or point to multiple point architecture for fibre (Shaik & Patil, 2005).

In France, there were three main operators that have been central in deployment and rollout of fibre on both FTTH and FTTB access networks using the point to point architecture as well as the point to multiple point architecture (Gauthey, 2007). The countries that have adopted FTTH, like in Asia, have seen significant growth with consistent savings as well as growing markets while countries that are still holding on

to copper continue to suffer with limited bandwidth as well as higher operating costs (Cochrane, 2008).

Due to the high demand for bandwidth, providers are challenged with providing networks that can support the high demand as well as the vast number of services; as a result, high demand capable networks as well as methods to manage quality of service are needed (Pereira & Ferreira, 2012). Biggs & Kelly (2006) postulate that the growth and development of the broadband market is driven by the adopted pricing strategies for broadband which are initiated by the network operators. The pricing is affected by the competition structure, regulatory environment, infrastructure, technology as well the indirect competition. Howell (2010) argues that flat rate pricing for broadband cannot be sustainable in the long term due to the option of offering different tariffs to attract low end customers. Van der Wee et al. (2015) argue that FTTH demand driven deployment strategies have less risks with sustainability while supply based deployments can be unsustainable if the expected penetration rate is not reached. There are three pricing strategies usually adopted by network operators, including flat rate pricing, time-based pricing, and volume-based pricing (Stork et al., 2013). Pricing is driven by the competition and the environmental landscape of the industry, therefore a pricing strategy is essential for the innovative differentiation of the organisation (Hall, 1980). Stork et al. (2013) states that broadband services are sold to customers as packages with mostly triple or quadruple play i.e. voice, data, video, and mobile or fixed. Although the costs have reduced over time, the costs remain a barrier to entry for telecommunication service due to the absence of competition in Africa (Stork et al., 2013), as has been confirmed by Chetty, Sundaresan, Muckaden, Feamster & Calandro (2013) in South Africa.

Biggs & Kelly (2006) suggest that providers can differentiate their services by offering broadband packages with installation charges, device charges, monthly subscriptions, thresholds based on time or megabytes as well as additional service charges like Internet access, virus checks, and email accounts. The operator may offer loyalty, and renewal discounts, sign-on discounts, VoIP and email addresses. Broadband can be bundled with other services in triple play i.e. VoIP and TV services. According to Gauthey (2007), the implementation of offerings that motivate customers include Internet access up to 100Mbps, due to its simplicity, and support of triple play (Internet, TV and VoIP) has created an interest towards multimedia content amongst

households in France (Fournier, 2007). According to Fournier (2007), there are certain focus areas needed in order to offer services and capabilities that are more than ADSL services and at the same time meet customer demand:

a) New services: The demand to offer symmetrical high end speeds, multi-stream television and high definition television.
b) Marketing: Customers are attracted to innovation through high end speeds, simplicity and triple play by means of products and service that offer fixed, mobile, content, customer support and quality.
c) Partnerships: Build relationships with property owners in order to drive efficiencies during deployment.
d) Service Delivery: Manage and reduce lead time to connect and install customers to a range of 4 to 12 hour for installation and service activation at customer premises.

Broadband availability of coverage, quality and price are the key components to improve the standard of the network competitiveness and social acceptance (Lyons & Coyne, 2017).

The competitive pressures in some markets like Spain have driven operators to generate propositions that support bundle rates in fixed and mobile on both broadband and voice. Even though the initiative had initial negative impact on ARPU, this has led to fundamental benefits of sustainability on the customer base (Frias & Pérez Martínez, 2016).

SUMMARY

Based on the literature, competitive differentiation can be achieved by the FTTH service provider based on:

1) Selected network architecture i.e. PON vs PTP (Kunigonis, 2009).
2) Deployment and operational cost associated with the network architecture on open access and bitstream networks (Azodolmolky & Tomkos, 2008).
3) Pricing strategy, which includes flat rate or unmetered pricing, time-based pricing, and volume-based pricing (Biggs & Kelly, 2006; Stork et al., 2013).

4) Innovative products and services which include packaging of products in either triple play or quadruple play packages (Biggs & Kelly, 2006; Stork et al., 2013).

2.2. MODELS FOR COMPETITION

Banerjee & Sirbu (2005) discussed the different models for competition within the telecommunications industry, including facilities-based competition which applies when the organisation provides services to the market using its own network infrastructure. In this instance, the operator builds, uses and manages its own network (Gruber & Koutroumpis, 2011). This has been evident in Spain, as discussed by Frias & Pérez Martínez (2016), where mobile networks operators deployed fixed networks to remain competitive. Facilities based providers and service providers have intense competition that often leads to price wars in a mission to build the customer base (Fuke, 1996). Non-facilities-based competition, or service level competition, applies when the service provider does not own the network infrastructure but shares the network to provide the services to its own customers, utilising third party owned network infrastructure.

The unbundled network elements based model for competition applies when the service provider leases unbundled network components which require the service provider to collocate its own equipment with a third party provider of network infrastructure in order to provide voice, data, and video services to customers. This has led to significant growth as discussed by Gruber & Koutroumpis (2011), Fuke (1996), Lundborg, Piepenbrock, & Consulting (2012).

The open access model for competition allows all service providers equal share to the third party network infrastructure in order to provide data, voice and video services to their own customers. Forzati, Mattsson, Wang, & Larsen (2011) discuss the different roles between the network provider and the service provider in comparison to instances where the same network operator provides services to customers on its own network. The open access model is truly open when all the services providers are treated the same without discrimination from a quality and cost perspective, including instances where the network operator also competes as a service provider but does

not obtain a competitive advantage on the basis of owning the network infrastructure (Lehr et al., 2008).

Regulatory influence to promote the open access model is essential to drive competition in the market to offer services in a non-discriminatory manner and also to ensure that the industry offers competitive prices which protect both the end user and the competition from substantial market power and monopoly. Policy makers may regulate open access or depend on network infrastructure providers to define the terms of engagement with regard to open access – this type of open access is referred to as the voluntary open access. There are three key elements for regulation within open access, these include price regulation, terms on providing open access and business restrictions and activities for network provider (Lehr et al., 2008).

Lebourges (2011) advocates that competition within the infrastructure environment drives efficient market structure, lower prices for consumers, increases in FTTH geographical coverage and strong innovation. Yoo (2014) postulated that the United States (US) abandoned service based competition due to limited competition and thin margins for service providers. Comparison of the US and Europe has shown that the US has benefited from driving infrastructure deployment through emphasising facility based competition in contrast to the European model of service based competition (Yoo, 2014), while Cave (2006) argues as cited by Gruber & Koutroumpis (2011) that the new entrants in the market are mostly likely going to start from service based competition before investing in their own infrastructure. Gerasymenko (2013) identified three different types of barriers to competition, including:

a) Barriers to entry, which refers to all the obstacles which bar or limit organisations from entering a market.
b) Barriers to competitive fringe expansion, which refers to limiting the growth of small coexisting organisations in an effort to preserve the market power of the dominant organisation.
c) Barriers to switching demand, which refers to the shrinkage of market boundaries in order to decrease competition from traditionally distant substitutes and thus enhance the market power of the dominant organisation.

SUMMARY

The literature on models for competition indicates that mobile operators can differentiate themselves through the deployment of fixed networks (Frias & Pérez Martínez, 2016). More broadly, differentiation can be on facility based or non-facility based deployment methods (Fuke, 1996). The competitive environment is driven by the regulator environment available for the specific market (Lehr et al., 2008). Lastly, the market can offer service based competition or infrastructure based competition (Yoo, 2014), or both, where new entrants typically start with service based competition (Cave, 2006).

2.3. INNOVATION AND INNOVATION MANAGEMENT

Innovation is defined based on the five components detailed by Schumpeter, (1934) and cited by (Goffin & Mitchell, 2017):

a) It is the introduction of a new product (good) which is not yet known by the end users or one that increases the quality of the good that already exists.
b) A new method of production which is new to a specific branch of industry. This does not have to be based on scientific discovery but may exist in other sectors.
c) Creation of new markets – which the specific organisation has not entered.
d) New sources of supply whether the source is new or existing.
e) New industry which involves restructuring of the competitive environment and industry.

Innovation is described as the interconnectedness of both technical innovation and organisational innovation (Freeman, 1995). There are five dimensions or types of innovation as discussed by Goffin & Mitchell, (2017, pp. 6-7), which include product innovation, process innovation, service innovation, business process innovation and business model innovation. Product innovation is the most commonly used dimension of innovation in organisations (Goffin & Mitchell, 2017, p. 6). The authors postulate that the dimensions have different degrees of innovations which differ based on novelty i.e incremental, breakthough and radical innovation. Haarla (2003) as part of

the doctoral dissertation argues that product differentiation within the paper products industry falls within the incremental innovation.

There are different approaches to modeling innovation including the linear model and the systematic view approach (Etzkowitz & Goktepe, 2005). The linear model of innovation is the initial framework which is known for its simplicity and is predominantly focused on science and technology within a single organisation. It follows a sequential process in its implementation with research and development (R&D) as the foundation of innovation (Mazzucato, 2011), whereas the systemic view approach emphasises more on the number of different influences and the degree of diffusion and productivity gains (Freeman, 1995). A number of models have been initiated after the linear model, including demand pull models, interactive models, integrated models, system integration and generation models (İzadi, Zarrabi, & Zarrabi, 2013). Innovation models are used to determine and analyse new patterns. İzadi et al. (2013) argue that innovation models should not be used to benchmark the historical trend of the organisation or to recommend an innovative behavior or to create policies for a particular innovation; however, the model can be adaptable for the specific organisation.

Sheth & Ram (1987) proposed drivers for innovation as cited by Goffin & Mitchell (2017, p. 49) which include four external factors: technological advances, changing customer, competition and the business environment, while there is one internal factor which is strategic intent. Goffin & Mitchell (2017, p. 50) discuss that technological changes have an influence on firms (Adams, 2003) with new technology that has the potential to create a new industry. The second driver for innovation is changes to consumer characteristics and requirements. The organisation needs to update its existing products and services in line with customer needs (Goffin & Mitchell, 2017, p. 51). The third driver of innovation is intense and growing competition; some of the competition may come from external industries (Adams, 2003). The fourth driver for innovation is the business environment, which may change over time or radically (Adams, 2003). This driver is affected by regulation, policy changes and the stability of the business cycle. The fifth and final driver that has been added by Goffin & Mitchell (2017, p. 52) is strategic intent which is driven by the ambition of the leaders in terms of the selecting the degree and the level innovation to be pursued by the organisation.

Innovation management is essential for firms that are exposed to highly competitive industries and the continually changing global economy (Janjira & Thawesaengskulthai, 2016). Birkinshaw, Hamel, & Mol (2008) defined innovation management as the creation and implementation of management practices, processes, structures or techniques that are new with the purpose of achieving the organisation's goals. Birkinshaw, Hamel & Mol (2008) proposed a non-linear sequence innovation management process framework with four interlinked phases namely: motivation, invention, implementation and theorisation and labeling. The authors postulate that the framework indicates the responsibilities of the internal and external change agents within the innovation management process. Birkinshaw, Hamel & Mol (2008) present the consequences associated with innovation management which include impact to a number of performance metrics within the firms, impact on quality adopters of innovation, and advantages to society with respect to productivity and quality. Mukerjee (2013) suggested a customer-oriented view of innovation suggesting that organisations need to understand what is valued by the customer, develop solutions suitable for that customer value, as well as reward and retain customers that are profitable. The author suggested steps to drive a customer-oriented approach, which include improving customer engagement, recording and managing ideas for innovation, measuring the organisation's competencies, differentiators and capability to change the firm's preference to that of the customer. Padayachee (2016) findings as part of a master's thesis, indicate that only 6% of innovation succeeds where the best practice frameworks are applied which include information technology infrastructure library (ITIL), control objectives for information and related technologies (CoBIT), and International Organization for Standardization (ISO) 9002. The author suggests a governance framework to integrate the project management, ICT governance and risk management frameworks.

The overall business strategy must include the innovation strategy (Haarla, 2003) which details what, where and when the innovative goals of the organisation will be achieved. The innovation strategy provides guidance on idea generation, idea selection, implementation, people, culture and organisation which are elements of the pentathlon framework (Goffin & Mitchell, 2017, p. 29). Innovation happens in many parts of the organisation therefore it is vital that the innovation strategy is communicated throughout the organisation (Haarla, 2003).

SUMMARY

Organisations can differentiate through the different dimensions of innovation which include product, process, service, business process and business model, as well as on the novelty of innovation i.e. incremental, breakthrough and radical innovation. Innovation is driven by advancements in technology, changing customer needs, evolving business or market environments and strategic intent (Goffin & Mitchell, 2017, p. 6-52). Innovation management is key for highly competitive environments (Janjira & Thawesaengskulthai, 2016) and organisation need to differentiate by developing customer-centric solutions based on deep engagement with customers, management of innovation ideas, measurement of organisational competencies, differences and the ability to change organisational priorities to focus on the customer (Mukerjee, 2013).

2.4. COMPETITIVE ADVANTAGE AND STRATEGIC COMPETITIVENESS

Competitive Advantage is a concept that has received considerable attention in the literature (Barney, 1991; Porter, 1985; Prasad & Sahoo, 2011; Peteraf, 1993; Brem, Maier, & Wimschneider, 2016). An organisation has a competitive advantage when the organisation has implemented a strategy which creates a new value that is not available within the industry. It becomes a sustainable competitive advantage when the value created is not easily duplicated. Technological changes affect competitive advantage when the technology is the driver for cost or differentiation (Porter, 1985). Porter (1990) argues that organisation's obtain competitive advantage against the world's best competitors due to competitive pressures and challenge. These organisation's benefit from having a strong domestic competitors, aggressive local supplies and demanding customer base. This competitive advantage is achieved through implementation of innovations utilising technology and creating new processes and a strategy that embraces innovation (Brem et al., 2016). The innovation can be a new or enhanced product, process, marketing approach, training (skills), or market. The information is vital for competitive advantage when it is not easily available for competitors; this information can be obtained through R&D, market research or through the ability to identify suitable information and be sustained through

continuous improvement (Porter, 1990). Mukerjee (2016) proposes factors that are essential to drive competitive advantage within the organisation, namely: macro environmental trends, alignment of diversification with core competencies, resource deployment to achieve a strategic goal, strategic renewal, capabilities that contribute towards competitive advantage, adoption of a customer-oriented approach, value chain decision and enforcement, culture of learning and innovation as well as change management. These factors are essential for firms to survive in a highly competitive industry.

The national government should take the responsibility of being a catalyst and driver to influence higher levels of competitiveness and create an environment for competitive advantage in the industry, as has been the case in countries like Japan (Porter, 1990).

The telecommunications industry is seen as an industry that has demonstrated successful regulatory reforms (Gruber & Koutroumpis, 2011) with United States (US) enabling facilities based competition (Yoo, 2014) while European regulation influences the industry towards bitstream access and unbundled models. However, this has not been the case in some nations that are hampered by limited or unsatisfactory regulation (Cave, 2009).

The resource-based view of the organisation determine how competitive advantage is achieved within an organisation and how it can be sustained over a period of time (Barney, Wright, & Ketchen Jr, 2001). Grant (1991) suggested a resource-based approach to strategy analysis where the creation of a long-term strategy is based on internal resources and capabilities to provide a guideline for the organisation's strategy and the means to generate profit. The guideline must be generated based on the fundamental mission of the organisation. The strategy should be based on the capabilities of the organisation which are rather durable instead of the continuously changing needs of the organisation or rather the needs the organisation plans to satisfy. These organisations find it easy to adjust internal capabilities in order to exploit external opportunities (Grant, 1991).

Resources as the basis for profitability provide the ability to generate profit within the organisation over and above the cost of capital, and should be based on the attractiveness of the industry and the organisation's competitive advantage over its

competitors (Grant, 1991). The organisation's resources include capital equipment, employee skills, patents, brand names, finance and others. The organisation's resources are the basis for the organisation's capability, and the organisation's capability is the source of its competitive advantage (Grant, 1991). The resources are classified into six categories, including financial, physical, human, technological, reputational and organisation resources (Grant, 1991). The resource based view model can be applied by managers and protected (Amit & Schoemaker, 1993) within the organisation in order to increase competitiveness and obtain competitive advantage. The implication of strategic effect on both business strategy and corporate strategy for the model is dependent on the organisation's specific resources. It ensures that each organisation efficiently utilises its own special resources. The theory is able to clarify and integrate all the areas of the strategy (Peteraf, 1993).

Durukan (2016) contends that marketing capability has a substantial influence on the innovative drive and sustainable competitive advantage of the organisation.

SUMMARY

Competitive advantage is achieved when there is/are:

1. A strategy that creates a new value that does not exist within the industry (Porter, 1985).
2. Competitive pressure and challenges (Porter, 1990).
3. Domestic partnerships, local supplies, demanding customer base and slow competition (Porter, 1990).
4. Technology based innovation process and strategy (Brem et al., 2016).

The resource based view of the strategy is based on organisational capabilities and resources (Grant, 1991b). The information that drives competitive advantage can be obtained from R&D and market research (Porter, 1990), including the factors that drive competitive advantage i.e. macro environment trends, core competencies, resource deployment, strategic renewal and capabilities, customer centricity, value chain decision and enforcement, learning culture and innovation (Mukerjee, 2016). The national government is essential in creating an environment for competitive advantage in the industry (Porter, 1990).

2.5. INNOVATION IN TELECOMMUNICATION

Dachyar, Eriyatno, Rusli & Zagloel (2013) postulate that the telecommunications industry in Indonesia has seen an increase in the number of connected customers for the past 10 years as well as a deterioration in the average revenue per user (ARPU) which impacts profits and margins. Oke (2007) examined different types of innovations using the framework that support product and service innovation indicates that UK firms emphasised more product innovation in the telecommunication and financial industries. Oke (2007) argued that the innovation performance of an organisation relates to radical and incremental innovation. Odhiambo (2015), in his master's thesis, argues that research and development as well as competition are the main drivers for innovation within the telecommunications industry in Kenya. Lundvall (2017) describes product innovation as the innovation intended for the needs of the customer while Utterback & Abernathy (1975) define product innovation as technology that is commercially made available to meet customer and industry needs.

According to Rahman, Taghizadeh, Ramayah & Ahmad (2015), service innovation drives performance in the telecommunication industry, as seen in developing countries such as Malaysia and Bangladesh. Rahman et al. (2015) argue that innovation management practices are unique per country due to the various resources that are being used in each economy. Evidence has been seen in organisational culture stimulating the innovation process and cross functional organisation in the Malaysian telecommunication industry, while the implementation of technology and tools in Bangladesh have been vital for competition informed pricing. Rahman et al. (2015) argue that the level of competition within the telecommunication industry is higher in comparison to other industries; since competition informed pricing plays a vital role, firms need to take into account the highly competitive environment as part of the innovation process (Goto, 2009). Barney (1991) argues that innovation applied at an organisation level can lead to competitive advantage and enhancement of performance, effectiveness and productivity, while those firms that focus on innovation to develop new products and services produce positive outcomes for the organisation (Eisingerich, Rubera, & Matthias, 2008).

According to Sutherland (2014), the South African telecommunication under the leadership of the African national Congress (ANC) has seen an increase in access to

telephony which has been enabled by the major mobile operators i.e MTN and Vodacom. However the performance of the regulatory has been unsatisfactory in terms of generating quality polices, regulation and collecting statistical information for the industry. Notwithstanding, the competition amongst the mobile network operators and FTTH providers which indicate a positive future for Internet service delivery (Sutherland, 2014).

SUMMARY

The literature demonstrates that the telecommunication industry has seen an increase in the number of customers that are connected and an evident decline in ARPU (Dachyar et al., 2013). Due to the highly competitive nature of the telecommunication industry, pricing strategy is informed by the competition (Goto, 2009) while organisational innovation can lead to competitive advantage and improve the performance, effectiveness and productivity through product and service innovation (Eisingerich et al., 2008).

2.6. FTTH COMPETITIVE VIEW IN SOUTH AFRICA

There are a number of challenges faced by Africa with regard to outside plant deployment of optic fibre, these include costs associated with building and maintaining the network, installation environment and network security (Knott, 2017).

There are different access technologies available in South Africa which include fibre-to-the-home (FTTH), fibre to the cabinet or curb (FTTC), fibre to the tower (FTTT), digital subscriber line (xDSL) and broadband wireless (Roux, 2015). According to Scheffer (2017), the addressable market in South Africa with regard to building the optical fibre infrastructure is limited to 2,3 million households, of which Vodacom plans to own one million homes passed. Scheffer (2017) argues that South African bitstream networks have 450 000 homes passed with optic fibre overlap across different providers. The cost of deploying the fibre infrastructure can range between R80 million and R800 million with significant amounts contributing towards the civil works (Roux, 2015). Jiya (2013) findings based on the master's thesis, indicated that fixed line

pricing is expensive in South Africa and therefore accessible to a limited number of customers. The implementation of fibre infrastructure is costly in the short term. However, it generates return on investment in the long term.

According to Stork, Calandro, & Gamage, (2013), South Africa has been a leading country with a high level of Internet penetration in comparison with other African countries, with 33% of individuals over 15 years old using the Internet. Chetty et al. (2013) implied that South African consumers are not obtaining the benefit offered by ISPs such as high bandwidth because mobile Internet services have higher throughput than fixed broadband (ADSL). However, this does not take into account FTTH bandwidth where the Gigabit Ethernet Passive Optic Network (GEPON) and Next-Generation Passive Optical Network (NGPON) architectures can offer bandwidths up to 200Mbps and 10Gbps respectively (Randeep & Nitika, 2013). Based on Hawthorne (2016), an analysis of the competition situation in the South African telecommunication industry, specifically within the prepaid mobile services, indicates that Vodacom and MTN customers are less price sensitive in comparison to the other networks, which partially explains the higher market share of these network operators. When these two largest network operators implement a price increase, only limited number of customers tend to move to other networks. Customers within the prepaid segment only experience price increases when their mobile number is moved to either Vodacom and MTN (Hawthorne, 2016).

SUMMARY

The addressable market for FTTH is estimated at 2,3 million households (Scheffer, 2017) and telecommunication as a highly competitive market has led to the deployment overlap of fibre optic from different providers (Scheffer, 2017). Mobile operators such as MTN and Vodacom have a competitive advantage in comparison to the competition due to having a customer base that is less price sensitive (Hawthorne, 2016).

2.7. CONCEPTUAL AND THEORETICAL FRAMEWORK

The framework for innovation-based competitive differentiation

This study will make use of the value innovation framework that was initiated by Kim & Mauborgne (1999). The rationale for selecting this framework in comparison to others is that value innovation exceeds competitive advantage and differentiation by making competitors irrelevant through providing new value in the market and creating a new market (Kim & Mauborgne, 1999) while the composite model of concurrent product development as discussed by Hull (2004) focuses on product development and is essential for innovation management which is not the main focus for this study. The techno-economic analysis model as discussed by Kantor et al. (2010) deals mainly with the economic viability of technology. The value added corporate Innovation Management Framework measures the innovation process by looking at the historical performance of the organisation and formulates the future plans (Cohn, 2013).

Value innovation is mainly intended to enhance the benefit of the customer (Dillon, Lee & Matheson, 2005) as well as creating value continuously while focusing on redesigning solutions to the problems in an industry. The fundamental basis for value innovation shares the same notion as the Schumpeter concept of creative destructive, which is also driven by creating new value (Kim & Mauborgne, 1999). Value innovation is not dependent on technological innovation in how it can happen, whereas technology innovation is defined as the establishment of new services and products to drive efficiency by reducing cost (Kim & Mauborgne, 1999). The cost reduction is achieved by eliminating and reducing aspects affecting the organisation's competition (Kim & Mauborgne, 2005b). Value innovation applies where innovation aligns with utility, price and cost position (Kim & Mauborgne, 2014).

Value innovation indicates the simultaneous pursuit of differentiation and low cost where the cost saving is attained through eliminating and reducing the areas the industry competes on and creates value for the buyer by introducing offerings not available from competitors in the industry and eventually reducing cost to economies of scale as discussed by (Kim & Mauborgne, 2014).

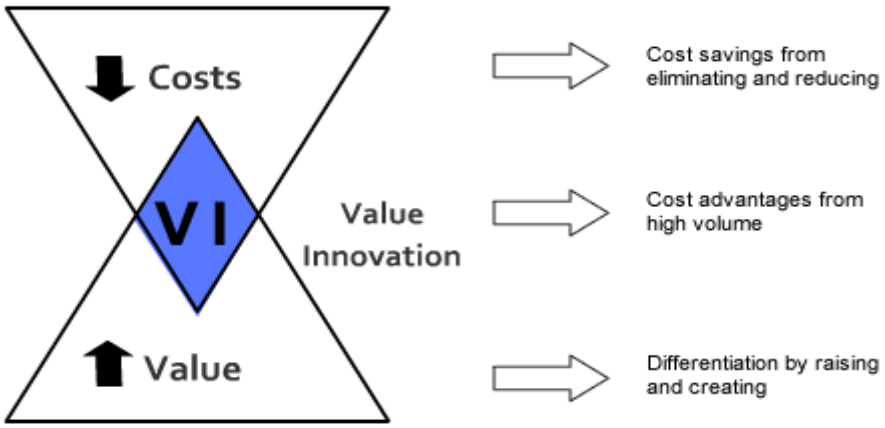

Figure 1: Value Innovation, Source: Kim & Mauborgne (2014)

Value innovation is more than innovation, rather it is a strategy that adopts the transformation of all the organisational activities (Kim & Mauborgne, 2014). The value creation is based on the Four Actions Framework which is to create, reduce, eliminate and raise. Figure 6 below depicts the Four Actions Framework as introduced by Kim & Mauborgne (2014):

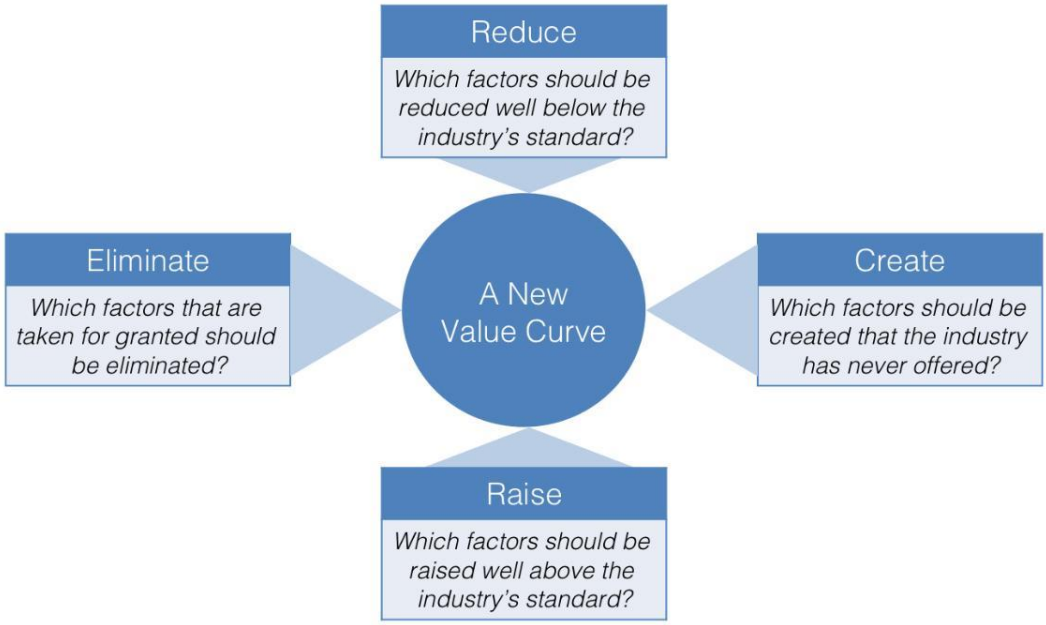

Figure 2: The Four Actions Framework, Source: Kim & Mauborgne (2014)

The framework was created in order to be able to balance between the decrease in price as well as the differentiation. The Four Actions Framework impacts the strategic logic and business model where the organisation determines the factors to be created, raised, reduced and eliminated in order to add value to the organisation (Kim & Mauborgne, 2014).

The main purpose of differentiation is to develop a new unique product brand or to modify an existing brand that will distinguish the organisation from the competition based on unique characteristics, such as design, usage and taste, just to mention a few. This differentiation would cause the organisation to be acknowledged as superior in the industry (Buble, Pucko, Pavic, & Dulcic, 2003). Meanwhile, Sharp & Dawes (2001) describe differentiation as the instance when the organisation outperforms its competitors on the basis of features which result in reduced sensitivity and cost saving for other features. The organisation benefits from reduced direct competition which gives the organisation an opportunity to capture value created. It is considered a feature of the modern market which is driven by the difference in distribution, awareness and in some instances design. The organisation can therefore apply one or more dimensions of innovation as a differentiator to drive the different types of innovation that can make the organisation to be a leader with most attractive innovative and quality initiatives amongst its competitors (Sharp & Dawes, 2001).

Innovation that is mostly implemented in the market or industry and competition on the same level is not the ultimate solution for organisations; therefore, the organisation needs to offer a different mix of products in order to be different from competitors (Goffin & Mitchell, 2017, pp. 72-73). The value innovation and ocean strategy of an organisation can be determined through value gap analysis which compares the value offered by competitors in the same market with opportunities that can be exploited by the organisation in order to identify the similarities to the competitor offers. The value gap analysis is based on the customer's perspective (Goffin & Mitchell, 2017, pp. 72-73).

- **Blue Ocean Strategy versus Red Ocean Strategy**

Blue ocean strategy refers to new markets that are currently not known by the organisation, while red ocean strategy refers to existing markets where the organisation and its rivals compete (Kim & Mauborgne, 2005). Value innovation is central to blue ocean strategy as it does not benchmark against competitors in the industry but rather creates a new value for the organisation with a purpose of making the competitors irrelevant by creating new markets. The table below indicates the difference between blue and red ocean strategies as discussed by Kim & Mauborgne, (2005a).

Table 2: Blue Ocean vs Red Ocean Strategy, Adapted from Blue Ocean Strategy by Kim & Mauborgne (2005a).

Blue Ocean Strategy	**Red Ocean Strategy**
Creation of new markets	Competes in existing market
Competition become irrelevant	Be ahead of the competition
New value and demand is created	Existing demand being exploited
Break the value / price compromise	Make the value/ cost compromise

Kim & Mauborgne (2005, 2014,) suggested the following Principles of Blue Ocean Strategy and have been confirmed as effective by Lee, Wang, & Chung (2017) **:**

- **Reconstruct market boundary** refers to breaking off the competition trend and creating new opportunities for the organisation.
- **Focus on the big picture, not the number** refers to alignment of the organisation strategy to blue ocean strategy.
- **Reach beyond the existing demand** is essential for value innovation by accumulating the need for new products and services.
- **Getting the strategy sequence right** refers to applying the blue strategy sequence to ensure that innovation is viable.
- **Overcome key organisational hurdles** refers to overcoming limitations such as employee/organisational alignment, limited resources and politics.
- **Build execution into strategy** looks at organisational alignment to implement and support the strategy.

Scholars have proposed frameworks and models for managing innovation within the telecommunication industry and these include the following:

- **Composite model of concurrent product development (Hull, 2004)**

Hull (2004) proposed a generic composite model which consists of four components namely: managerial practices, innovation process, cross functional teams and implementation tools. These components have an impact on the effectiveness of product development. Hull (2004) argues that the synergy across these elements is key in driving deployment of products to the market within a short period of time with effective cost efficiencies.

- **Techno-economic analysis model (Kantor et al., 2010)**

Kantor et al. (2010) argue that telecommunications projects need to be optimised by looking at the market analysis, economic and technical calculation, as well as the economic evaluation of the technology which focuses on investment and performance evaluations.

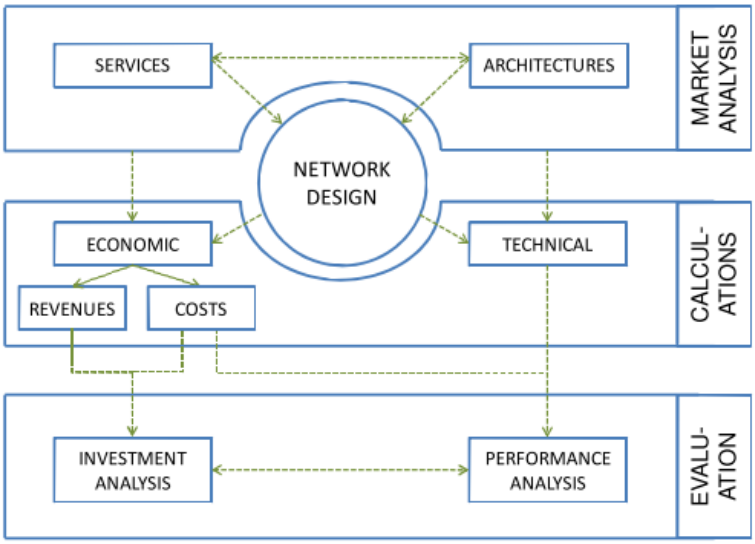

Figure 3: Techno-economic analysis model, Source: Kalerantes (2016)

This model take into account all costs associated with the deployment of the technology within the telecommunications market that can be evaluated to determine the most efficient deployment and viability of the implementation (Azodolmolky & Tomkos, 2008; Kantor et al., 2010; Walczyk & Gravey, 2012; Van der Wee et al. 2015).

- **Value added corporate Innovation Management Framework (Cohn, 2013)**

Cohn (2013) proposed the value added corporate innovation management framework and evaluation tool. The framework consists of five components:

business base, resources, will and culture, solution and value. This framework corresponds with the organisation's strategy and it allows evaluation of the organisation's past and future performance by evaluating the innovation management process as well as the capabilities for future innovation.

2.8. SUMMARY

The graphical presentation below designed by the author, indicates the proposed conceptual view for the study.

Based on the literature review, the drivers of innovation for Fibre-to-the-home (FTTH) include the demand of access technology which is driven by high bandwidth demanding applications. Additionally, the network must manage the quality of service for the customers.

Pricing is driven by competition and the environmental landscape of the industry. Therefore, a pricing strategy is essential for innovative differentiation within an organisation. Innovation is the main driver of differentiation and competitive advantage for the organisation. The source of differentated competitive advantage can be achieved through price reduction and innovation of products.

Value innovation is vital in identifying the problems and opportunities within the industry through generating new value and differentiation. This differentiation is achieved through generation of unique features and characteristics which will cause the organisation to be competitive in comparison to its counter parts. Value innovation requires gap analysis in order to measure and identify the opportunities that can be exploited in comparison to the competition. Value innovation generates products and services which subsequently lead to generating the market. The value innovation and the gap analysis is driven through meeting customer expectations.

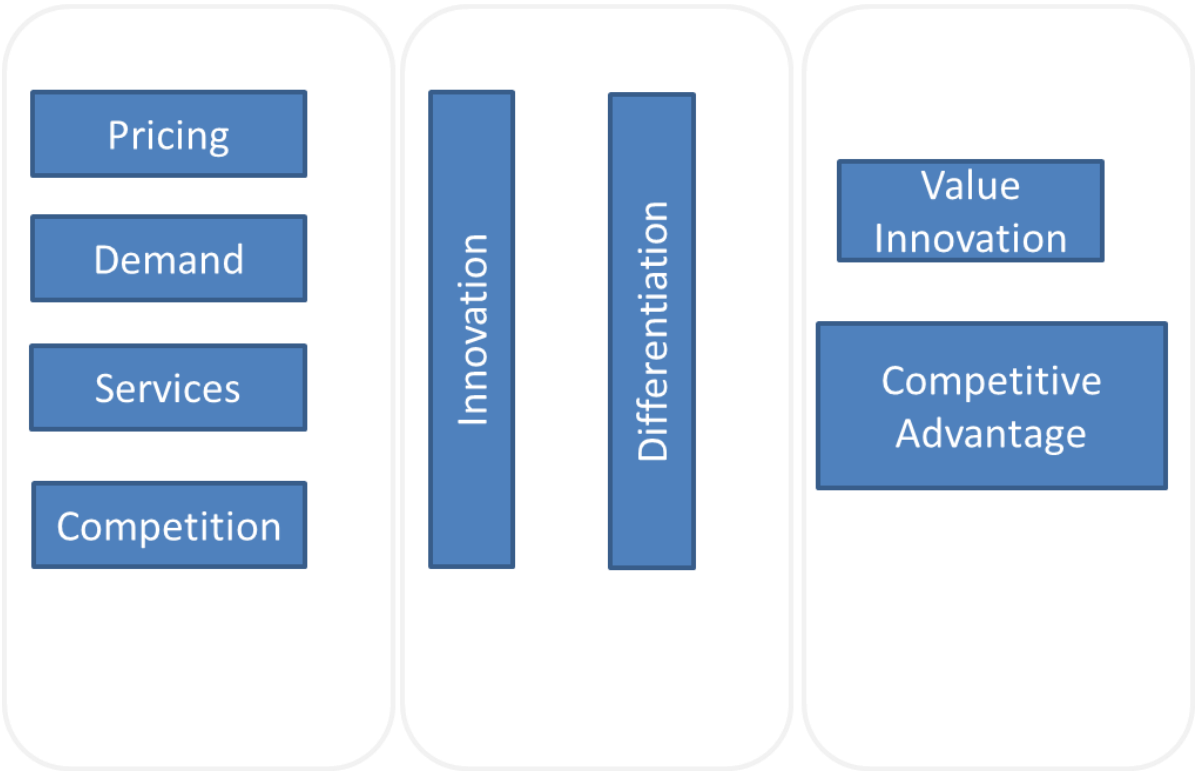

Figure 4: Proposed conceptual framework

CONCLUSION

In conclusion, based on the overall literature, the competitive differentiation and competitive advantage has been highlighted as follows :

FTTH service provider based on Innovative products and services which include packaging of products in either triple play or quadruple play packages (Biggs & Kelly, 2006; Stork et al., 2013). The mobile operators can differentiate themselves through the deployment of fixed networks (Frias & Pérez Martínez, 2016). More broadly, differentiation can be on facility based or non-facility based deployment methods (Fuke, 1996). The competitive environment is driven by the regulator environment available for the specific market (Lehr et al., 2008).

Organisations can differentiate through the different dimensions of innovation which include product, process, service, business process and business model, as well as on the novelty of innovation i.e. incremental, breakthrough and radical innovation. Innovation is driven by advancements in technology, changing customer needs, evolving business or market environments and strategic intent (Goffin & Mitchell, 2017,

p. 6-52). Innovation management is key for highly competitive environments (Janjira & Thawesaengskulthai, 2016) and organisation need to differentiate by developing customer-centric solutions based on deep engagement with customers, management of innovation ideas, measurement of organisational competencies, differences and the ability to change organisational priorities to focus on the customer (Mukerjee, 2013).

The information that drives competitive advantage can be obtained from R&D and market research (Porter, 1990), including the factors that drive competitive advantage i.e. macro environment trends, core competencies, resource deployment, strategic renewal and capabilities, customer centricity, value chain decision and enforcement, learning culture and innovation (Mukerjee, 2016). The national government is essential in creating an environment for competitive advantage in the industry (Porter, 1990).

Futhermore, The literature indicate that the telecommunication industry has seen an increase in the number of customers that are connected and an evident decline in ARPU (Dachyar et al., 2013). Due to the highly competitive nature of the telecommunication industry, pricing strategy is informed by the competition (Goto, 2009) while organisational innovation can lead to competitive advantage and improve the performance, effectiveness and productivity through product and service innovation (Eisingerich et al., 2008).

The addressable market for FTTH is estimated at 2,3 million households (Scheffer, 2017) and telecommunication as a highly competitive market has led to the deployment overlap of fibre optic from different providers (Scheffer, 2017). Mobile operators such as MTN and Vodacom have a competitive advantage in comparison to the competition due to having a customer base that is less price sensitive (Hawthorne, 2016).

2.9. STATEMENT OF PROPOSITIONS

Per Creswell (2009), the qualitative research method will be used to conduct an in-depth analysis of the study with relevant interviews. The aim of the study is to attempt to answer the questions detailed below:

- What is the current level of innovation-based competitive differentiation for FTTH?
- How can innovation-based competitive differentiation be further utilised as a competitive advantage amongst FTTH operators?

In addition to the above, qualitative research methods will be used in the following ways:

- Develop an instrument that will be used to perform validation for the proposed model;
- Utilise the instrument to validate the proposed model from a South African perspective.

The research propositions are based on the proposed model and literature review:

- P1: There is a low level of innovation-based competitive differentiation for FTTH in South Africa.
- P2: FTTH providers tend to focus on more on incremental innovation using products and services.
- P3: South African operators and service providers can make use of customer needs in the market in order to differentiate themselves from the competition.
- P4: The high level of available resources and capabilities can be used to differentiate operators from their rivals and enable competitive advantage.

CHAPTER 3: RESEARCH STRATEGY AND METHODOLOGY

This chapter details the systematic process that has been followed for the study and describes how the study has been done. It provides an explanation and information on the tools that has been used to conduct the study. The chapter is structured based on the following components:

1. Introduction
2. Research strategy and design
3. Selection of participants
4. Research methodology
5. Limitations of the study
6. Ethical considerations
7. Reliability and validity
8. Triangulation
9. Generalisation
10. Summary

The proposed framework is applied in order to respond to the following research questions, as described previously:

- What is the current level of innovation-based competitive differentiation for FTTH?
- How can the innovation-based competitive differentiation be further utilised as a competitive advantage amongst FTTH operators?

3.1. INTRODUCTION

The study makes use of the qualitative methodology which aims to discover and understand the meaning of the individual, group of people or human problem (Creswell, 2009). It focuses on network and service providers that are based in Gauteng.

3.2. RESEARCH STRATEGY AND DESIGN

The research methodology that has been used for the study is the qualitative research method. This methodology has been selected and applied in this study based on the

argument that qualitative research provides in-depth knowledge of participants' involvement, understanding, viewpoints and histories with regards to their current environment (Spencer, Ritchie, Jane, & Lucy, 2003). The qualitative research method is also considered a method that explores in detail in comparison to the quantitative research method (Moriarty, 2011).

Furthermore, the study makes use of semi-structured interviews (as indicated in Appendix A). The benefit of this collective approach is to allow the participant to divulge more information pertaining to the social and personal perspective (DiCicco-Bloom & Crabtree, 2006). The semi-structured interviews enabled the participants to voice their opinions and views as well as experience of innovation-based competitive differentiation amongst FTTH network and service providers.

Interviews have been conducted in order to understand innovation-based competitive innovation for FTTH in South Africa from a network and service provider perspective. The analysis of data has been used to structure the feedback from the interviews into themes and patterns that make up a framework.

The outcome of the study has been compared to the literature. The collected data included triangulation i.e. expert commentator interviews to evaluate the practicality of the information obtained from the semi-structured interviews. The approach is suitable to answer the research questions in the study.

3.3. SELECTION OF PARTICIPANTS

The population for the study are South African network operators and service providers that have deployed fibre or leased fibre from existing network operators. Due to time constraints and financial limitations, the study concentrates on selected operators that are based in Gauteng.

Neilson & Parle (2017) highlighted different network operators and ISPs that are role players within the industry. It is essential to study this population based on the understanding that the service and network provider is already active within the industry with customers on the respective network whether operating an open access model or a facility-based model or Internet service provider. This will help to determine

whether the South African service and network providers have the innovation-based competitive differentiation.

The purposive or judgement type of non-random sampling procedure has been used for this study mainly because the qualities required for the study (Tongco, 2007) are unique for specific characteristics or attributes of network operators within the South African context. Homogenous and criterion sampling strategy will be applied for the study to enable the participant of the sample to be selected based on specific characteristics, attributes and criteria to be met in order to be part of the sample.

There were twenty (20) respondents or participants that were interviewed as part of the study, seventeen (17) of whom were from network and service providers, and an additional three (3) of whom were expert commentators.

All participants that were interviewed are knowledgeable in terms of innovation-based competitive differentiation in their respective network and service provider organisations.

All the participants will be individuals in Gauteng province that are subject matter experts on FTTH. The selection criteria will be based on the roles, experience and involvement within the FTTH industry. The participants are individuals that are working for network and service providers in FTTH deployment and offering FTTH services to customers. Over and above the network and service providers, expert commentators that are knowledgeable about the industry will also be included for triangulation. These respondents are vital to meet the research objectives.

The table below indicate the number of proposed participants from network and service providers with their respective roles within the different organisations, including expert commentators that will participate in the study:

Table 3: Participants from Network Providers and Service Providers

Participant Type	**Role**	**Number of participants**
Service Provider and Network provider	Chief Executive Officer	2

Network Provider	Chief Operating Officer	1
Service Provider and Network provider	Managing Executive for FTTX	1
Service Provider	Director	1
Service provider and Network Provider	Head of Department for FTTX Projects	1
Service Provider	General Manager	1
Service Provider	Portfolio Manager	2
Service Provider and Network Provider	Managing Executive	1
Service Provider and Network provider	Executive Head of Department	2
Service Provider and Network provider	Head of Fibre Projects	1
Network Provider	Senior Product Manager	1
Network Provider	Internet Service Provider Manager	1
Service Provider	Product Manager	1
Service Provider and Network Provider	Account Manager	1

Table 4: Expert Commentators

Expert Commentator	Member of Parliament	1

Expert Commentator	Senior executive for FTTX Council Africa	1
Expert Commentator	Board Member for FTTX Council Africa	1

3.4. RESEARCH METHODOLOGY

The qualitative method defined by Creswell (2009) was used to undertake the study and ensure that all aspects of innovation-based competitive differentiation for the network operators are handled. This enabled the researcher to explore different factors and aspects of the study to obtain detailed information and knowledge from the participants of the study. Using the interpretivist perspective, the study enhances the model based on the literature when using the qualitative method which assists in detailing and understanding innovation based competitive differentiation amongst network operators.

3.4.1. DATA COLLECTION AND INSTRUMENT

There are two sources of data that were used as part of the data collection. The first source is a total of fifteen (15) face-to-face semi-structured interviews that were conducted in convenient locations such as offices and coffee shops, plus an additional five (5) telephone interviews. The selected areas were convenient areas for the participants which made them comfortable to respond freely to the research questionnaire in Appendix A. The second source is interviews with three external commentators. The expert commentators were selected based on their knowledge of the FTTH industry as well as prior experience with network and service providers. Consent was obtained from all the participants in the study. Some of the participants that have approved audio recording were recorded. To ensure confidentiality, the recordings will be kept in a secure environment protected with username and password and these recording will only be used for research purposes.

Using a qualitative method when collecting the data, a semi-structured interview has been used. A semi-structured interview is the process of obtaining information through a verbal discussion with the participant. The semi-structured interview includes a prepared list of questions and provide an opportunity for the participant to provide addition information that is important (Longhurst, 2003). This is beneficial because the participant is able to discuss and provide more historical and contextual information pertaining to the study (Creswell, 2009) and it gives an opportunity for explanation in case the answer to the question is not clear (Tashakkori & Teddlie, 1998). Semi-structured interviews include both audio recordings as well as transcription as detailed by Creswell (2009).

3.4.2. DATA ANALYSIS

The study employs qualitative data analysis: the categories and themes were generated based on the narrative data obtained from the semi-structured interviews as suggested by Tashakkori & Teddlie (1998). The collected data was captured in a Microsoft Excel spreadsheet as the central location for all the collected information. The central location was used to categorise and apply themes to the collected data. The notes that were captured during the series of interviews were stored in a Microsoft Word document.

A descriptive coding process was applied to the study. Descriptive coding as discussed by Saldaña (2015) refers to extracting objective content and summarise passages. An iterative process was applied where the earlier steps were reviewed as new themes or categories materialized (Punch, 2005). The content analysis using coding, themes or categories and patterns allows the researcher to understand the social reality in a specific manner (Zhang & Wildemuth, 2005).

3.4.3. ANALYSIS OF THE INTERVIEW DATA

Based on the consent of the participants, some of the interviews were captured using audio recordings which indicate the detailed information on the views of the participants. However, all the interviews include notes that were captured based on feedback from participants. The collected data were evaluated to determine similarities

and patterns based on the number of times a specific item has been repeated in the collected data.

The interview data were analysed and interpreted based on similarities, trends in order to examine the interpretation and meaning on the interview feedback, categories and themes were analysed to identify the association amongst them.

3.5. LIMITATIONS OF THE STUDY

The limitations of the study include the fact that the researcher is a consumer of the FTTH service and is currently working for one of FTTH network and service providers which could positively or negatively impact the feedback from the participants within the same industry. The participants were made aware that that the researcher work for the competition as a result some of the participants declined to be part of the research.

Additionally, most of the participants have extensive experience from a mobile operator perspective and have less than five (5) years' experience in FTTH due to the fact that FTTH is a new industry that has recently been created as a replacement for ADSL.

Some of the interviews were not face-to-face and were conducted telephonically, which may have affected the communication and understanding between the participants and the interviewer.

The researcher/interviewer had never been exposed to interviewing for qualitative research methods as a means of obtaining detailed information from interviewees. However to ensure the validity of the study, the responses were validated through the views of the expert commentators to validate the interpretation of the views gathered as part of the study.

3.6. ETHICAL CONSIDERATIONS

According to Guillemin & Gillam (2004), there are two different dimensions to ethics in qualitative research. The first dimension is procedural ethics which refers to obtaining

approval from the institutional ethics committee. The interview questions, research instrument, participant letter and consent letter for the participant have been submitted to Wits University's ethical committee for approval through a process of ethical clearance. The approval process was followed before the interviews were conducted. After approval, the consent letter was given to each participant to read, understand and sign off. Some of the interviews were recorded based on prior approval from the participants. The interviewer/researcher guarantees that the collection did not harm others and ensures confidentiality, anonymity and secure storage of the data. Guillemin & Gillam (2004) argue that procedural ethics reminds us to protect participants from risk and harm. As a researcher, I followed the principles: as a result some of the participants chose not to share the number of customers connected within their network as they viewed it as highly confidential and protecting their competitive position.

The second dimension is ethics in practice which focuses on conducting the entire research in an ethical manner across all day-to-day issues that arise during the research. For example, as part of this process, all participants that were requested to participate in the study were informed about the purpose and the aim of the study. The participants were given the choice to opt-out of participating. All participants gave written permission to be part of the study.

The outcomes of the research were not modified or changed as this is an unethical behavior. The outcomes and findings of the study were discussed with the supervisor.

3.7. RELIABILITY AND VALIDITY

According to Creswell (2009), validity in qualitative research and validity in quantitative research do not carry the same meaning. In qualitative research, validity refers to checking for accuracy of the research and consistency of the research with other researchers whereas the quantitative research validity to refer to instances where the meaning is drawn from the valuable inferences and scores on particular instruments. The validity of the research has been adhered to through following the

different procedures. Creswell (2009) mentioned different procedures and these procedures were applied in this study:

- The transcripts were inspected in order to be able to identify any mistakes that may occur during transcription
- Regular verification of the codes with the actual data.
- The codes were validated against the codes generated to identify any unique codes.
- The instrument was tested and re-tested with one suitable participant in order determine reliability, validity of the instrument based on the responses from the participants.

The utilization of different sources of data is associated with triangulation. The report utilises two sources in order to justify the generated themes. These themes were created based on consolidating a number of sources or views of the individuals participating in a study (Creswell, 2009).

The outcome of the data report was also be validated with the participants to determine the accuracy of the documented feedback, this include follow-ups with the appropriate participants as discussed by Creswell (2009).

3.8. TRIANGULATION

Triangulation refers to a process of making use of different data sources to evaluate the research finding from the sources and use the information to build and substantiate the use of themes. The validity can be claimed when themes are generated from different sources (Creswell, 2009).

A total of three (3) expert commentators were interviewed using the face-to-face approach. The expert commentators include a member of the South African parliament that is responsible for the telecommunication and postal services, senior executive of the FTTX Council in Africa as well as a board member for FTTX Council in Africa. These commentators have extensive experience in the telecommunications industry and have been involved in and exposed to the FTTH industry. The expert commentators were used to provide feedback and views on the potential findings and also to provide perspective with respect to the industry as whole. This process allowed

for validation and clarity of the information obtained from the respondents. This approach justifies the validity for the study.

3.9. GENERALISATION

Qualitative generalisation refers to the process of applying the findings and results of the study to areas and contexts outside the study (Creswell, 2009). The participants of the study from both the FTTH network providers and service providers were from Gauteng only. The findings of the study reflect experiences, views and opinions based on Gauteng Province. Consequently, the results cannot be readily generalised and applied to other provinces since the respondents were limited to one province.

3.10. SUMMARY

This chapter detailed the qualitative method research strategy and design that was applied for this study. It details the rationale for selecting qualitative research methods as well as the participants in the study. The aim for selecting a qualitative research methodology is to obtain detailed information in terms of views, opinions and interpretations with regard to innovation-based competitive differentiation amongst the FTTH operators. It further indicates how the participants were selected and the process that was followed in order to analyse the data and, finally, the ethics, reliability, validity and generalisation aspects of the study. The following chapter focuses on the presentation of the collected data as well as the analysis of the captured data in order to make recommendations and conclusions for the study.

CHAPTER 4: PRESENTATION OF FINDINGS AND RESULTS

This chapter details the data collected as part of the research using semi-structured interviews with staff from different FTTH network operators, service providers as well as expert commentators. The intention for the study has been a holistic view of innovation-based competition differentiation for FTTH amongst South African operators, by understanding the drivers, supporting factors, limitations and extent of innovation-based differentiation to drive competitive advantage. The findings, based on the research questions, have been presented below.

4.1. NETWORK AND SERVICE PROVIDER OVERVIEW

A total of twenty (20) participants were interviewed for the study, fifteen (15) of whom were interviewed using the face-to-face approach while five (5) were interviewed telephonically. The participants are employed by network and service providers and some come from mobile operators that currently offer FTTH. Other participants include three (3) expert commentators that have worked closely with FTTH network and service providers. The mobile operators have experience in deployment of fibre through the installation of base station and switches and have recently been involved in residential deployment of fibre offering Layer 1, Layer 2 and Layer 3 services.

4.2. INTRODUCTION

The table below indicates the homes passed, homes connected, the number of year within telecommunication industry and revenue for the participants of the study:

Table 5: Background Information on Participants

Description	**Network and Service Provider**
Homes Passed	1,1 Million
Homes Connected	130 000

Experience in years	Range from 9 - 45 years
Revenue	R0 to R20 million (30%) R21 to R50 million (60%) R80 million to R100 million (10%)

The network providers represented by the participants have over 1,1 million homes passed. The service providers and network Providers have over 130 000 connected customers. The experience within the telecommunication industry across all the participants of the study ranges from 9 years to 45 years. The revenue generated for the past 6 to 12 months by these providers ranges from 30 percent of the providers with R0 to R20 million while 60 percent ranges between R21 million to R50 million and 10 percent have revenue between R80 million to R100 million.

4.3. BACKGROUND PROFILE OF RESPONDENTS AND PROCESS FOLLOWED

This section details the background profile of the participants that were chosen for the study. The respondents have extensive experience in the telecommunications industry and FTTH. All the participants have experience in FTTH and have been involved in deployment of fibre and offering FTTH services to customers in their respective providers. All the respondents hold and/or have held managerial positions in different network providers and service providers within the FTTH industry.

A total of twenty (20) participants were interviewed for the study, fifteen (15) of whom were interviewed using the face-to-face approach while five (5) were interviewed telephonically. The respondents hold positions such as Chief Executive Officers, Chief Operating Officers, Directors, Managing Executives, Executive Heads of Department, Portfolio Managers, Product Managers and Account Managers. These participants are senior managers and managers from different FTTH service and network providers.

Furthermore, three additional interviews were conducted with external expert commentators which include the senior executive for the FTTX Council Africa, a Member of Parliament responsible for Telecommunications and Postal Services, as well as a board member for FTTX Council Africa. The expert commentators have

experience in working with network and service providers and have a good understanding of the FTTH industry.

All the respondents were requested to participate in the study before the interview appointments were set up at different locations. Fifteen interviews such were audio recorded as per the approval shown in the signed consent form (Appendix C). A total of 30 individuals were invited to participant on this study and only 20 participants have given an approval to be part of the study.

4.4. PRESENTATION OF FINDINGS AND DATA RESULTS

This section details the findings of the semi-structured interviews that were conducted with employees of different FTTH network and service providers that are based in the Gauteng province as well as interviews with expert commentators.

It describes the findings and presents them graphically using bar graphs, as well as in tables.

4.4.1. DRIVERS OF FIBRE-TO-THE-HOME IN SOUTH AFRICA

This section details findings with regard to the drivers of FTTH in South Africa. Figure 5 below depicts the number of responses from the participants on the drivers of FTTH within the South African context.

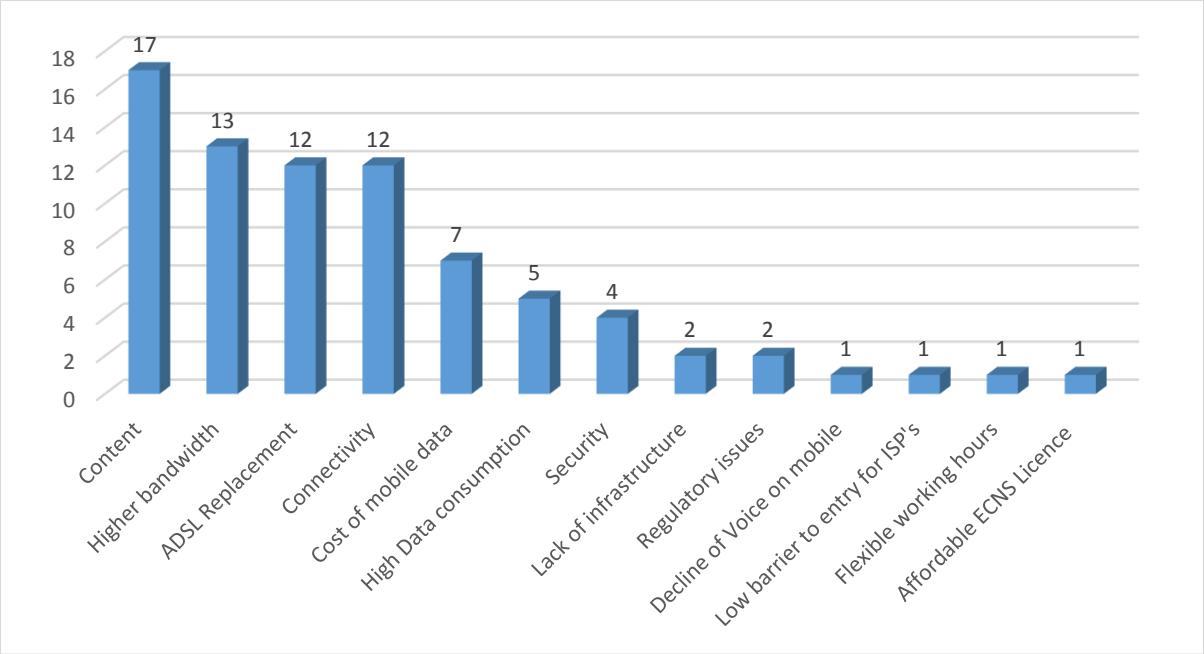

Figure 5: Drivers of FTTH in South Africa

The majority of respondents indicated that content is the main driver for FTTH in South Africa. Content includes services such as streaming, video on demand (VoD), Internet Protocol television (IPTV), over the top (OTT) content like Netflix and Showmax, and high definition television (HDTV).

Educational content, gaming, business applications, e-government and e-health have been highlighted as additional content that drives introduction and demand for FTTH. Content includes both customer generated content as well as content generated or provided by the organisations. There is limited content that is generated in South Africa which would drive utilisation of FTTH in South Africa.

Furthermore, high speed has been recognised as the secondary driver for FTTH. For example, one participant stated that:

> *"The main driver for FTTH from a consumer perspective is the demand for a high-speed broadband. Everything is driven by content in our days and same applies with business perspective content and high-speed content. Everything is now becoming a global marketplace where people need content, not only locals but foreigners would like to consume content in their own languages."*

A majority of respondents agreed that FTTH has been a replacement for DSL, as well as the technology used to meet limitations of the mobile network to carry the high volumes of traffic that can only be transported over the fibre network. DSL includes ADSL, SDSL and VDSL. One of the respondents stated:

> *"Fixed broadband versus mobile broadband. Mobile broadband is quite popular. However it is clear that mobile broadband cannot service the current demand for video streaming and on-demand video. FTTH is the alternative. Until about two years ago, South Africa only had ADSL as the fixed technology using copper and the mobile LTE. When South Africa only had copper fixed technology, the country was ranked very low in the world. ADSL was not considered a good technology for the applications of the day. We were ranked as the 99th in the world when we had copper only and we improved the position when LTE was introduced to 40 which has since improved due to introduction of FTTH. We service customers with the applications that they use and these applications can only be services by FTTH. We are now getting to a stage where there is multiple devices i.e. smart devices within a home and all these devices would be consuming data and as a result a 100Mbps uncapped product is becoming popular and standard amongst many households."*

Some respondents agreed with the fact that fibre is a better technology compared to copper in terms of higher bandwidth, quality and it allows for consistent connectivity for customers as indicated by the following respondent:

> *"The drivers for Fibre-to-the home is the need for higher speed, driven by the reliability and quality of service. The quality of services applies when the customer is connected without interruption in data and speed flow meaning the customer has a consistent connectivity. Not experiencing other external environmental influence like weather impact, lighting, water ingress like copper."*

Some of the respondents stated that the higher cost of mobile data and higher data consumption in the country has contributed to the demand for the latest technology such as FTTH. Customers prefer FTTH pricing in comparison to mobile data pricing due to affordability.

A selected number of respondents indicated that security requirements in terms of home and community closed-circuit television (CCTV) and alarm systems online monitoring via applications drive demand for FTTH within customer homes or premises.

Some respondents indicated that the lack of infrastructure for FTTH in South Africa has enabled network operators to roll out the fibre. Some of the network providers like Vumatel were the first to deploy fibre competing against Telkom or Openserve from a fixed perspective. Some have indicated that regulatory challenges, where there is limited allocation of spectrum from a mobile perspective, has led to the demand of FTTH technology in South Africa.

The decline of voice on the mobile network has escalated the demand for data including the low barrier to entry for ISPs to sell broadband packages on FTTH where the ISP sells voice, data and content to customers using the available open access networks that have already being built and managed by different network providers. This has made it possible for a number of ISPs to enter the market.

A few respondents indicated that there is low barrier to entry for service providers to sell FTTH products and services on open access networks. Additionally, the affordable Electronic Communications Network Service (ECNS) license allows providers to enter the market. FTTH also provides a platform for employees from different organisations to work flexible hours and to work from home.

Some participants indicated that several socio-economic factors drive the adoption of FTTH and Internet broadband in general:

- Socially, the adoption of broadband is on the rise as most people, particularly those on the upper end of the living standards measures (LSMs) view access to broadband as a necessary amenity for their careers, education, entertainment, social participation, etc.

- Economically, there is an understanding that there is an interconnection between broadband access and access to economic opportunities, and for that reason access to broadband has become a necessity. FTTH has therefore been positioned as a medium of choice for many households, primarily due to ever decreasing FTTH prices which makes it a better alternative to mobile broadband.

FTTH also offers better speeds when compared to traditional fixed access mediums. In addition to the above, respondents stated that access to open access networks by ISPs and cheaper access to digital content has been central in driving FTTH.

A limited number of respondents identified the lack of infrastructure, regulatory issues, declining voice on mobile, low barriers to entry, flexible working hours and affordable ECNS licences as the drivers for FTTH in South African. The affordability of the ECNS licence is the concern of the smaller network operators and new service providers within the market.

4.4.2. PRICING STRATEGY WITHIN THE INDUSTRY

This section details findings with regard to the pricing strategy that is evident for FTTH in South Africa. Figure 6 depicts the responses and number of participants on pricing strategy for FTTH within the South African landscape.

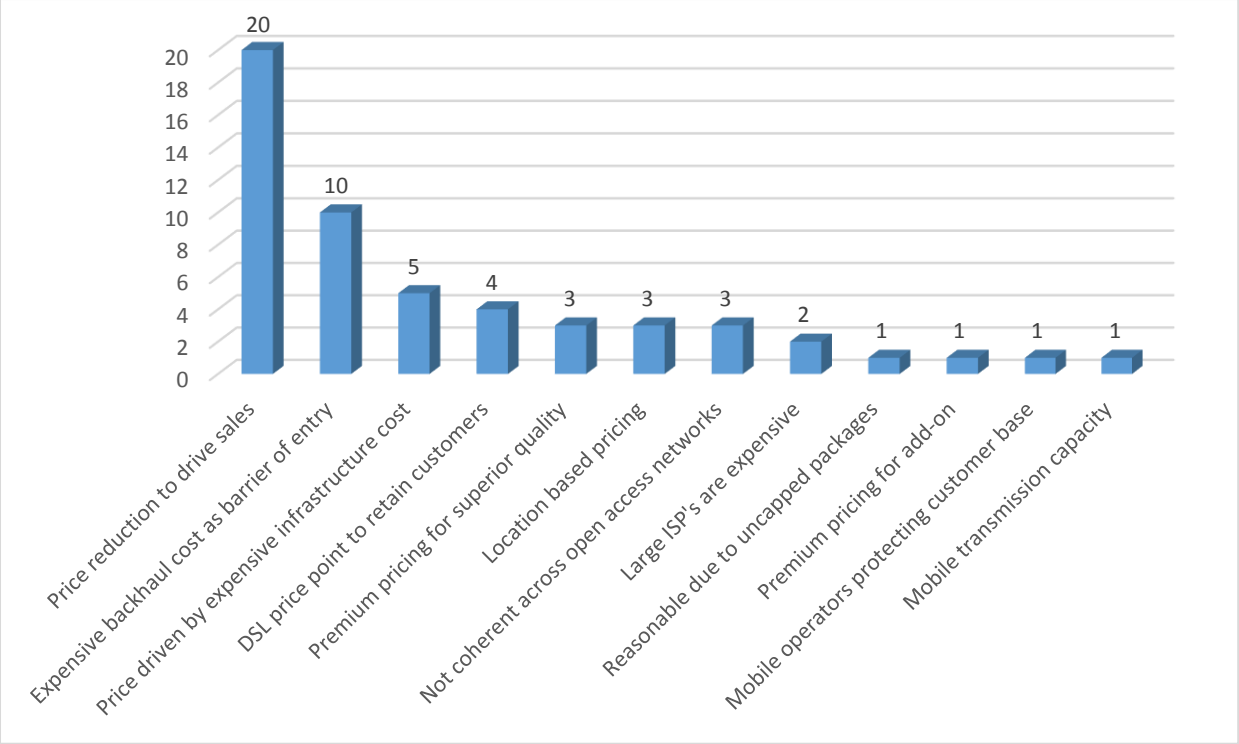

Figure 6: Pricing strategy within the South African Landscape

Most respondents agreed that the pricing strategy that is most evident within the South African landscape is price reduction to drive sales and connect customers. The industry has seen pricing coming down over the last few years. Also, network providers have reduced prices to ensure affordability for ISPs, however the ISPs pass the benefit to customers to remain competitive. This trend within the FTTH market does not seem to generate a sustainable pricing model for margins, especially for some of the ISPs.

One of the respondents stated:

> *"At the moment it's a customer grab, it has become more of reduction of pricing in order to obtain customers and Fibre-to-the-home is now becoming a commodity service. This pricing strategy seems to be working for the bigger Internet Service Providers however the smaller Internet Service Providers are challenged with significant low margin. As a result, the long term sustainability of the pricing strategy is questionable."*

Other respondents concurred with these sentiments and were of the opinion that pricing has dropped significantly over the years. The pricing for voice and data is going down due to the competitors in the market.

Some respondents indicated that the expensive network provider pricing is driven by the backhaul cost that is obtained from some of the network providers like Telkom or Openserve where the backhaul cost is significantly higher in comparison to the market. This was confirmed by one of the respondents:

> *"Telkom tends to be more expensive towards the Service Providers on the Openserve network due to the high backhaul pricing which is quite expensive in comparison to the rest of the market. The consumer FTTH product pricing from Service Providers on Openserve network is higher compared to other network providers like Metrofibre Networx, Frogfoot and Vumatel due to the high backhaul pricing. There is varying pricing across different network providers. It is only Telkom that has the high backhaul cost. Their IP Connect (IPC) is so high that it prevents the small operators from entering the market on the Telkom network. Some ISPs can never afford to use the Openserve Network because it will take them a long time before they can actually make money."*

The majority of respondents agreed that the ISPs reduce pricing to a level where it is aligned to the competition and the service providers make the necessary adjustment on pricing in order to drive connections of customers. However, this it is not a coherent strategy across the different bitstream network providers.

Another respondent confirmed and stated that:

> *"Internet Service Provider pricing on some networks returns negative margins even though the same ISP returns positive margins in other networks. These Internet service providers are happy to do this because if they don't return negative margins on these networks, the ISPs are not able to sell FTTH products because their competitors also generate negative margins due to competitive pricing. There is no clear or coherent pricing, so in essence the pricing is based on whatever it takes to sell even if it means negative margins."*

There was agreement amongst participants that pricing is very competitive in the market. As a result, organisations continuously monitor what is happening in the industry. Some respondents agreed that pricing is not coherent across different Open Access Networks where there is evident location-based pricing across different precincts where fibre is built and deployed by different network providers. Some respondents stated that ADSL Internet Service Providers like Telkom and Afrihost are migrating customers from the ADSL product offering to FTTH using the ADSL price point. This is implemented to ensure that customer base is retained within the same organisation.

There was a difference of opinion where some respondents indicated that the bigger Internet Service Providers are expensive when using their own network while others indicated that the pricing is reasonable across providers where customers tend to select the higher bandwidth i.e. 100Mbps, 200Mbps and 1000Mbps with an uncapped data allocation. Some respondents indicated that there is an opportunity to charge premium pricing where there is a carrier grade network as well as offering business service levels to household customers.

Two different commentators indicated that the degree of rollout and deployment of fibre amongst the mobile network operators has shown that mobile networks would like to ease mobile transmission capacity and also protect their existing customer base because when customers arrive at home they tend to switch from the mobile i.e. 2G, 3G or LTE to Wi-Fi using FTTH.

The strategy that is applied by network operators like Vodacom and MTN assumes that when the fibre has passed the home, the LTE consumption drops for the customer. These operators are protecting their mobile revenue and therefore the pricing strategy is to remain competitive in order to protect their mobile revenue and at the same time avoid churn to other FTTH Internet Service Providers.

One expert commentator indicated that the Internet Service Provider drives the cost down in order to attract more customers and later sell the customer base to other providers, to or consolidate at a later stage. This was confirmed by another expert commentator who stated:

> *"The First wave of Fibre-to the-home Internet Service Providers are selling below cost to drive take-up and company value in the hopes of selling their companies to larger operators in a future consolidation phase."*

Some respondents indicated that the consolidation trend is already visible amongst other network providers. For example, Vumatel's acquisition of the Fibrehoods and Link Africa infrastructure and MTN's consolidation with Smart Village. This is shown in Figure 6 and in the view of an expert commentator:

> *"When the consolidation has materialised within the market the differentiation on pricing will no longer be used to drive sales and customer connection but rather the innovation-based differentiation in terms of new products, services, value added services and devices will be used by network and service providers to create a sustainable competitive differentiation for the networks and service providers."*

The respondents stated that it is the norm that some network providers purely provide the infrastructure without operating and managing the network with the intention to sell the infrastructure at a later stage. Some participants indicated that the customers for FTTH are not price-sensitive where customers are expecting to pay more in comparison to ADSL while some respondents had a different view where customers want the best possible deal per gigabyte price they can obtain, and some customers want the service for free. FTTH customers are price sensitive according to one respondent:

> *"We are going to high end residential estates, most probably one of the top three expensive residential estate in the country with 20 to 30 million rand houses. The people in these areas still want to negotiate an FTTH product price of R499 a month to R399 a month. They want to bargain on R100 a month and we see this a lot with customers and this is because FTTH is perceived as a commodity."*

Some participants suggested that network providers need to reduce the cost of fibre build by means of commercial arrangements and agreements with landlords and

contractors and improved construction methods. Furthermore, partnerships with other service providers (water, power, etc.) are key to reducing service delivery costs.

4.4.3. INNOVATION BASED COMPETITIVE DIFFERENTIATION

This section details findings with regard to the innovation-based competitive differentiation that is evident for FTTH in South Africa. Figure 7 indicates the responses regarding innovation based competitive differentiation amongst the service and network providers.

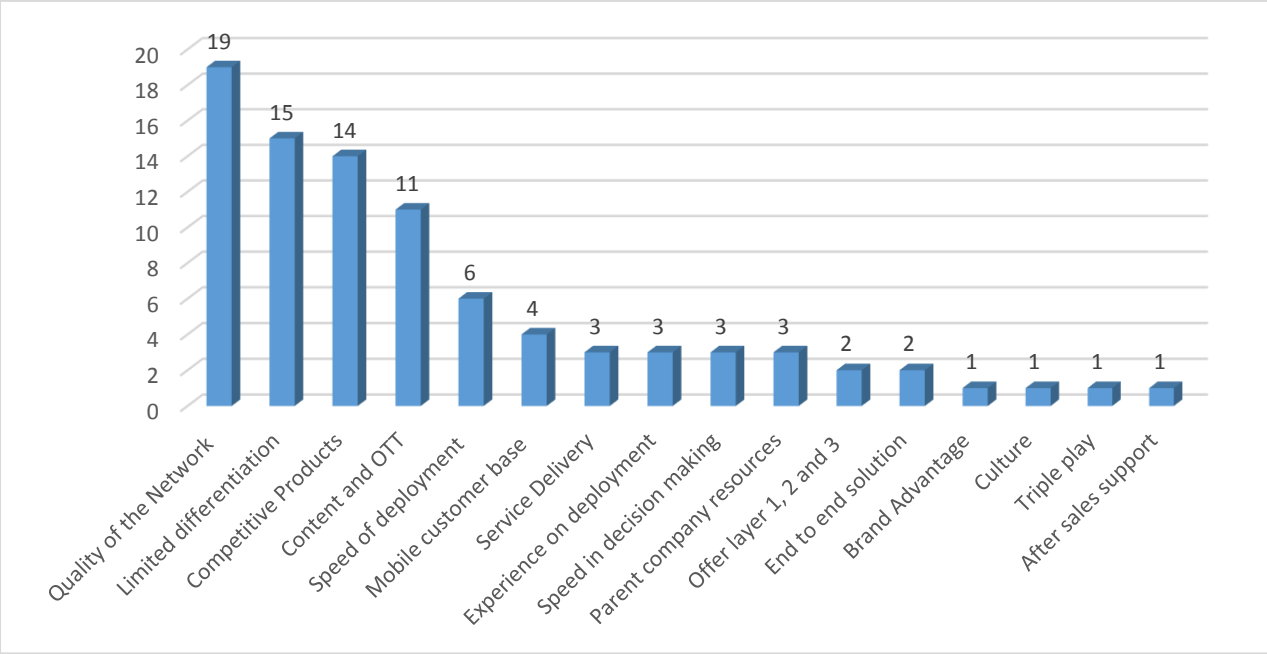

Figure 7: Innovation based Competitive Differentiation

The majority of the respondents reported that the quality of the network is the competitive differentiation amongst the network and service providers. The deployment of fibre architecture ranges from point to point (Active Ethernet) and point to multiple point (PON). The point to point architecture allows for dedicated fibre to the customer's home while in the point to multiple point architecture the fibre is shared across multiple homes (up to 128 homes). The deployment can either be trenching or aerial fibre. Some respondents raised concerns on aerial fibre indicating that it is subject to weather conditions and that it does not give customers the consistency that is expected on FTTH. Some of the respondents have indicated that the quality of the

network is dependent on the experience in FTTH deployment, service levels that are available for customers and the consistency in keeping the network operational over a long period of time.

One commentator from a network provider perspective responded and stated that:

> *"Our network is a premium development and our FTTH is superior in comparison to other network providers because the network is strictly governed by home owners associations and internal quality processes. Henceforth we also have a large demand from residents who require a high availability of services although it's a FTTH service and not a business connection. We deliver a quality service and we can therefore demand a premium service from the different ISPs. Our network is endorsed by MultiChoice as a carrier for DSTV over fibre which I cannot say the same for other FTTH providers"*

Some respondents shared the same sentiments about the quality of the network, quick service delivery and assurance. One respondent stated:

> *"We differentiate ourselves using the quality of our infrastructure network, price, turn-around time to connect a customer and the assurance over and above the installation once we have installed the services within a home".*

Some respondents indicated that some network and service providers have a competitive differentiation due to access to the brand and customer base of the mobile network.

One respondent agreed and said:

> *"The fact that mobile networks have access to the mobile customers that have a potential to connect to fibre is a differentiation for some of the Internet Service Providers especially the mobile operators. These operators have the knowledge and information regarding the location of the existing customers. Also, the differentiation is also on brand where customers prefer to select a provider they are familiar with. Most of the mobile networks need to protect their current base from churning to other*

ISPs. Some of the customers are rather loyal to their brand where they prefer to fulfil their broadband requirement on mobile and fixed network through the use of one provider."

Consequently, some of the respondents indicated that the bad customer experience and higher cost of data on mobile may impact the customer uptake on FTTH for mobile network operators that also provide FTTH.

Some of the providers obtained competitive differentiation through partnerships and consolidation with organisations that already have fibre networks. For example, one of the respondents indicated that:

"As an organisation, we have access to the footprint of the parent organisation, which we are now using to deploy the last mile to the end user. We have the advantage of national footprint of fibre and extending this to the fibre-to-the-home customers".

Some of the respondents stated that the differentiation is based on content and over the top players. One of the respondents stated:

"We drive the over the top (OTT) services. Initially fibre was about connectivity, however this has later changed to content and over the top services. We therefore differentiate ourselves based on digital services and partnerships with the over the top (OTT) players. We are no longer just the connectivity network organisation we are moving to Internet of Things (IoT) and digitalisation as well as smart home solutions."

A majority of the respondents indicated that there is a limited differentiation across the industry. There are only selected service providers that have unique differentiation and some of these include offerings such as LTE-while-you-wait, devices per package, segmented price plans, international breakout with no limitation on the amount of data offered to the customer, no shaping, no contention and free voice services, free porting of the voice line and advanced monitoring systems which proactively monitor the devices at the customer's premises every 60 seconds. These monitoring systems automatically log a call to the network provider and inform the customer. One of the participants indicated:

> *"It's a land grab and it's about coverage that means the differentiation is not very strong in this market as we would like it to be. However, as a service provider, we would like to differentiate based on customer experience."*

Other respondents agreed to the fact that competitive differentiation is limited:

> *"Currently as an ISP, we have very little differentiation on processes, all the flexibility available on bitstream network is given to all ISPs therefore it is very difficult to differentiate on processes for bitstream networks."*

Some of the respondents highlighted that competitive differentiation included owning the mobile customer base, improving the service delivery for customers, offering Layer 1, Layer 2 and Layer 3 services where the customer is serviced by one provider for all customer broadband requirements, brand advantage especially for the service providers that have been in the telecommunication industry over a long period of time, triple play i.e. mobile, fixed and content, speed of deployment and speed in decision making.

Furthermore, some respondents stated that the competitive differentiation is achieved through quick turn-around time on service delivery, capability to offer end-to-end solutions for customers, culture which enables quick deployment, triple play (fixed, mobile and content) and after-sales support. There were a small number of respondents that highlighted this, probably because competitive differentiation is not coherent across the industry and is limited to certain providers.

4.4.4. TECHNIQUES USED TO DRIVE COMPETITIVE DIFFERENTIATION

This section details findings on the differentiation techniques that are used within the FTTH industry. Figure 8 depicts the number of responses from the participants on differentiation techniques for FTTH within the South African landscape.

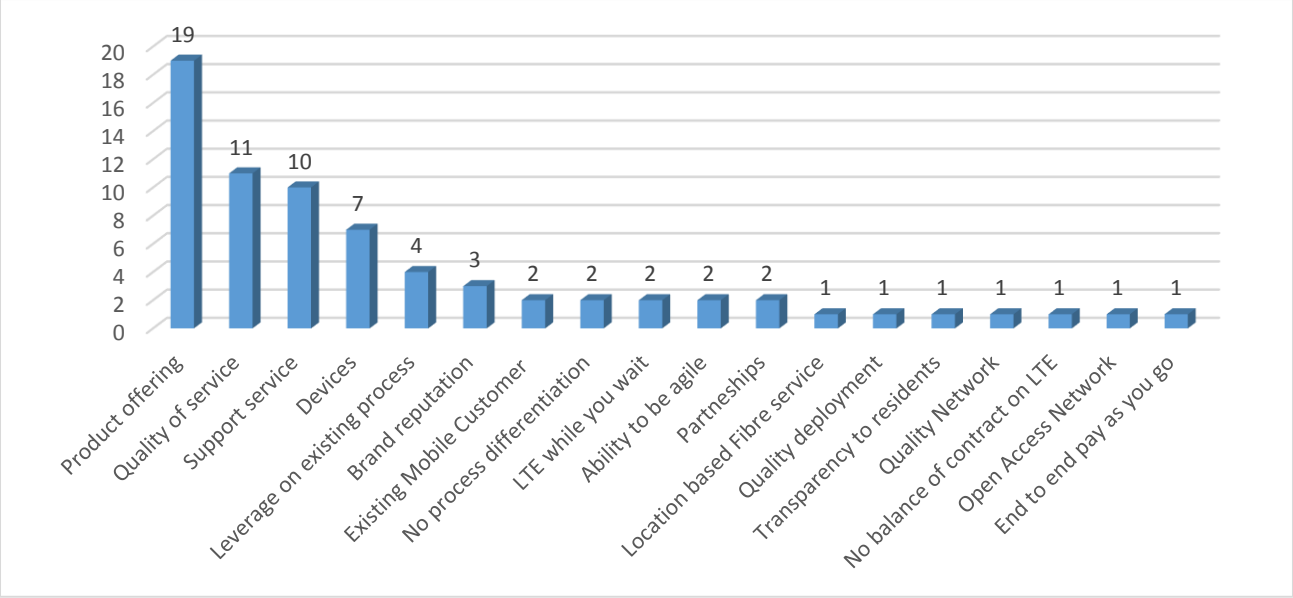

Figure 8: Techniques that drive Competitive Differentiation

The majority of the respondents indicated that the differentiation is mainly focused on product offering – the providers are always looking for ways to be innovative in order to meet customer requirements. One of the respondents stated:

> *"We try to leverage on mobile network to provide value to the customer by offering products with the mobile connectivity while fibre is being installed and when the FTTH installation is completed, we take the LTE-while-you-wait back with no balance of contract for the customer. Furthermore, we try to use mobile customer base to our advantage."*

According to the respondents, products, processes, prices and devices are very important. If the customer experience is better, then providers can charge a specific premium to customers. One respondent stated:

> *"We have a wider range of offerings for our clients with more value in comparison to other service providers in the market. With regards to products, we carry top products and the routers that we provide to customers are tested thoroughly to support the speed that we sell to the customer. Some of the ISPs sell the highest line speed and provide a router that can only support half of the speed."*

Some of the ISPs have positioned themselves as premium brands which differentiates their organisations from the competition.

As mentioned by one of the respondents:

> *"Our hardware is ideal for every single purpose so we are not selling a cheaper Yealink which is a Chinese brand but we offer Gigasets which is the German brand that has been around for quite some time and has been a leader in DECT technology. We only carry the best Wi-Fi extenders and we are doing the consumer Wi-Fi extenders and other ISPs are offering like TP-Links. We position ourselves as the premium ISP. Our branding is very different, the colour is royal green. Our website is all about people. We don't have cartoon characters on our website like other ISPs. Afrihost has promoted themselves as a premium brand as well which has worked over the years."*

Network providers that also operate as an Internet service provider do not put much effort on the service provider side of business due to the fear that there is unfair competition. One respondent stated that:

> *"ISP is something we are not pushing aggressively in the market. We have reduced our drive towards the Internet service provider. We don't want to be seen as competing with our customers. However, it gives us a retail arm to use in areas where it is not feasible to deploy and there is not a lot of potential uptake. We use the ISP as a vehicle to drive uptake in conjunction with our partners."*

The respondents indicated that location-based pricing is vital to meet customer requirements through offering segmented products. Also, the quality of the deployment is essential to maintain good customer experience. The payment method that has been evident in the market is mainly post-paid and the respondents indicated other payment methods need to be explored in instances where the customer is paying for a holiday home. For instance, other methods of payment like prepaid, hybrid as well payment through the credit card facility should be utilised for FTTH.

The respondents highlighted that processes for mobile networks can be replicated on FTTH. However, some of the respondents stated that fixed network processes are not

the same as mobile network processes. For example, customers will walk out with a mobile phone from the store, whereas in case of FTTH it may take weeks before the customers can have services. Therefore, the use of processes should be customised to meet the specific requirements of FTTH.

Some respondents indicated that the smaller providers tend to be quick in deployment and decision making which make it beneficial in comparison to the large network and service providers. Additionally, some network and service providers are more transparent to their customers than others, for instance, where some network providers communicate that their network will be open for open access, while other networks make promises to customers without fulfilling them.

Additional techniques that drive competitive differentiation that have been highlighted by some respondents include transparency to residents, quality of network and service, open access networks, no balance of contract on products such as LTE and end-to-end pay as you go payment methods. The disparity in the views of the respondents indicates that differentiation is limited and only pockets of real differentiation are available from different network and service providers.

4.4.5. LIMITATIONS FOR COMPETITIVE DIFFERENTIATION

This section details findings on limitations for competitive differentiation within the industry. Figure 9 depicts the number of responses from the participants on limitations or barriers for competitive differentiation:

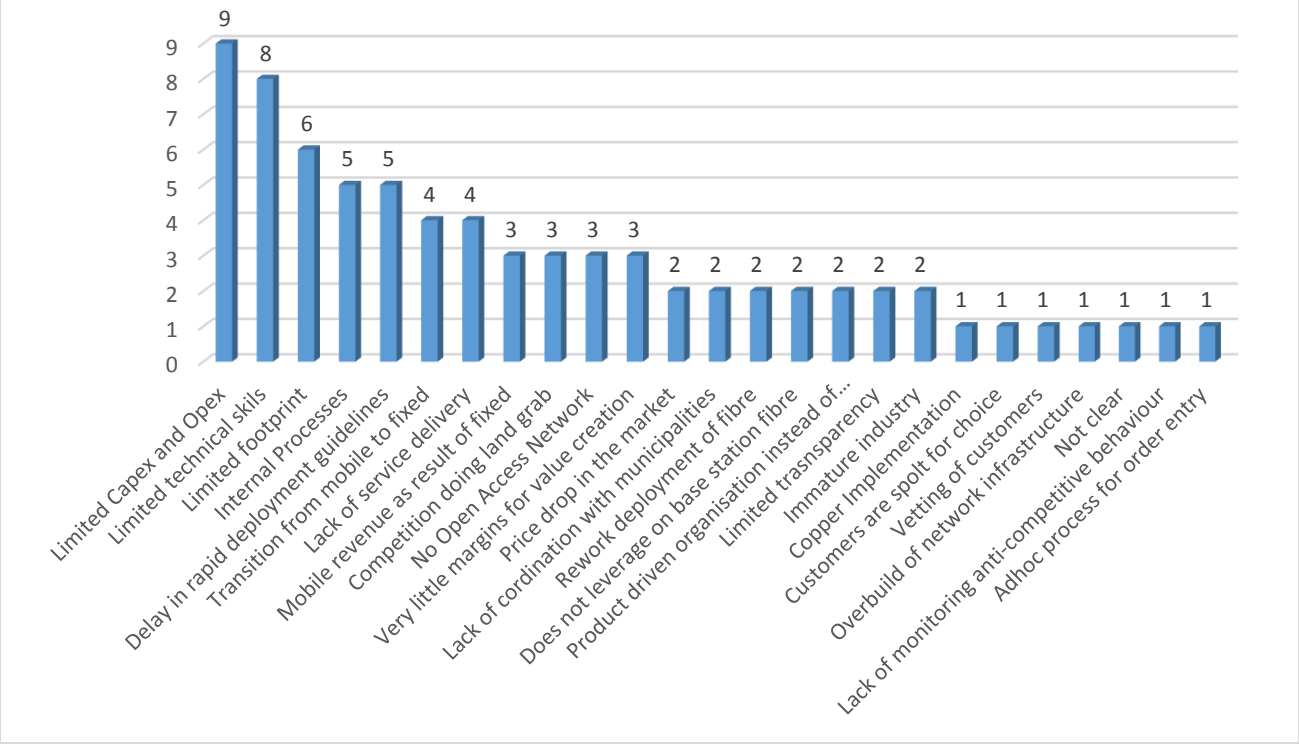

Figure 9: Limitations for Competitive differentiation

The respondents indicated quite a number of barriers and limitations based on their respective organisations and the FTTH market. One of the main barriers is the cost of deployment. One respondent stated:

> *"The deployment of fibre becomes very expensive with regulatory constraints especially if you want to build fibre in Cape Town as an example. The network provider is required to pay a huge deposit to the municipality for possible damages to the municipal infrastructure that becomes cost prohibitive and it drives the pricing up. It is the hygiene factors around build of fibre network that drive the costs up."*

The majority of the respondents concurred with these sentiments and it is most evident amongst small to medium organisations where the rollout of fibre is their primary focus. However, the large organisations, including the mobile network operators, do not share the same views. Furthermore, the large organisations highlighted human resources as a major concern because the quality of the workforce determines the quality of the services offered to customers.

One respondent stated:

> *"We have the money to build the network however there is a huge limitation with regards to the technical resources and it is not feasible to purchase the service delivery system out of the box but rather it has to be built. The industry has ad hoc solutions for order processing, service activation and service delivery, however there is a limited focus on fixed line support. The industry current main focus is the rollout and connection."*

The view of one expert commentator indicated that barriers or limitations for competitive differentiation include skills shortage, lack of effective and efficient processes to provide wayleave by municipalities, as well as the quality of fibre installation and rollout from some of the network providers:

> *"There are two things that prohibit or rather delay the rollout of fibre in South Africa. Firstly, it is the shortage of skills for technicians to do the onsite installation and secondly, coordination between the departments of municipalities to grant the wayleaves to the infrastructure or network providers which is the major bottleneck to the rollout of FTTH. Private fibre networks like Vumatel in municipalities saw a hunger for fast reliable Internet as a result there was a land grab and some of the fibre installations were done in a hurry to meet the demand and there are now complaints that these installations need to be refined. There is a need to correct and upgrade some of the rushed work that was done before which does not only contain fibre but also include repairing of sidewalks."*

Some of the respondents indicated that there is lack of infrastructure for service providers to provide products with rich value for the customers. One respondent stated:

> *"We are probably the only ISP that offers free voice as the value add to customers and if some of the ISPs do not have investment and infrastructure in voice switches they won't offer the free voice services. It works in our favour, however against our competitors even the big*

brands do not have the investment in this technology because it is costly to outsource, unlike us we offer this service for free."

The main barriers for the industry are the initial investment to outlay equipment and the skill set to manage the equipment. There is a huge barrier to entry with regard to the availability of funds i.e. capital. Some respondents articulated that the key barrier to entry is the capital to deploy especially if the network provider has plans to roll out the fibre network at a bigger scale i.e. rollout to the entire country.

A number of additional barriers or limitations for competitive advantage include limited partnership with other network providers in order to drive uptake. One respondent stated that:

"There is a limitation in terms of competitive differentiation mainly because our open access agreements with major network providers have not been concluded which results to limited footprint."

Additional limitations include technical skills to deploy and build capacity to roll out infrastructure and lastly market research on where to build in order to execute timeously. The major network operators in the country are closely monitored by other network providers, service providers and consumers for what may be perceived anti-competitive behaviour. This has the potential to hinder the organisation's ability to significantly differentiate itself. Due to competition, the service providers find themselves in an environment with very small margins for competitive value creation. The customers are spoilt for choice with an option to purchase routers anywhere, not necessarily from the service providers.

For mobile operators, the challenge is mainly prioritising the capex investment to fibre-to-the-home versus the mobile network. One respondent stated:

"All the mobile operators prioritise the GSM capex investment and when you look at the MTN and Vodacom, they are both fighting for the best GSM mobile network which is where their main capital investment goes."

The capex prioritisation of FTTH for organisations that run other businesses in addition to FTTH seems to be a challenge which affects the speed of rollout.

Furthermore, the respondents indicated additional limitations for competitive differentiation in the following categories:

1) Mobile network operators are challenged with the process of transition from mobile to fixed, impact on mobile revenue as a result of the fixed network since the rate per gigabyte is lower on FTTH compared to mobile and operators not leveraging on the base station fibre to backhaul mobile traffic to fibre.
2) Network provider's limitations include limited footprint since the fibre is only available on major metropolitan areas, delays in the deployment guidelines from regulatory authorities.
3) Service providers' barriers include manual and ad hoc processes for order entry, product driven instead of solution driven organisations, and very small margins for value creation.
4) Customers are credit vetted for some of the providers and the customers are spoilt for choice due to the variety of product prices in the market.

4.4.6. POTENTIAL INNOVATION DIFFERENTIATORS FOR ORGANISATIONS

This section details findings with regard to the potential innovation differentiators for organisations within the industry. Figure 10 summarises the responses from service providers and network providers.

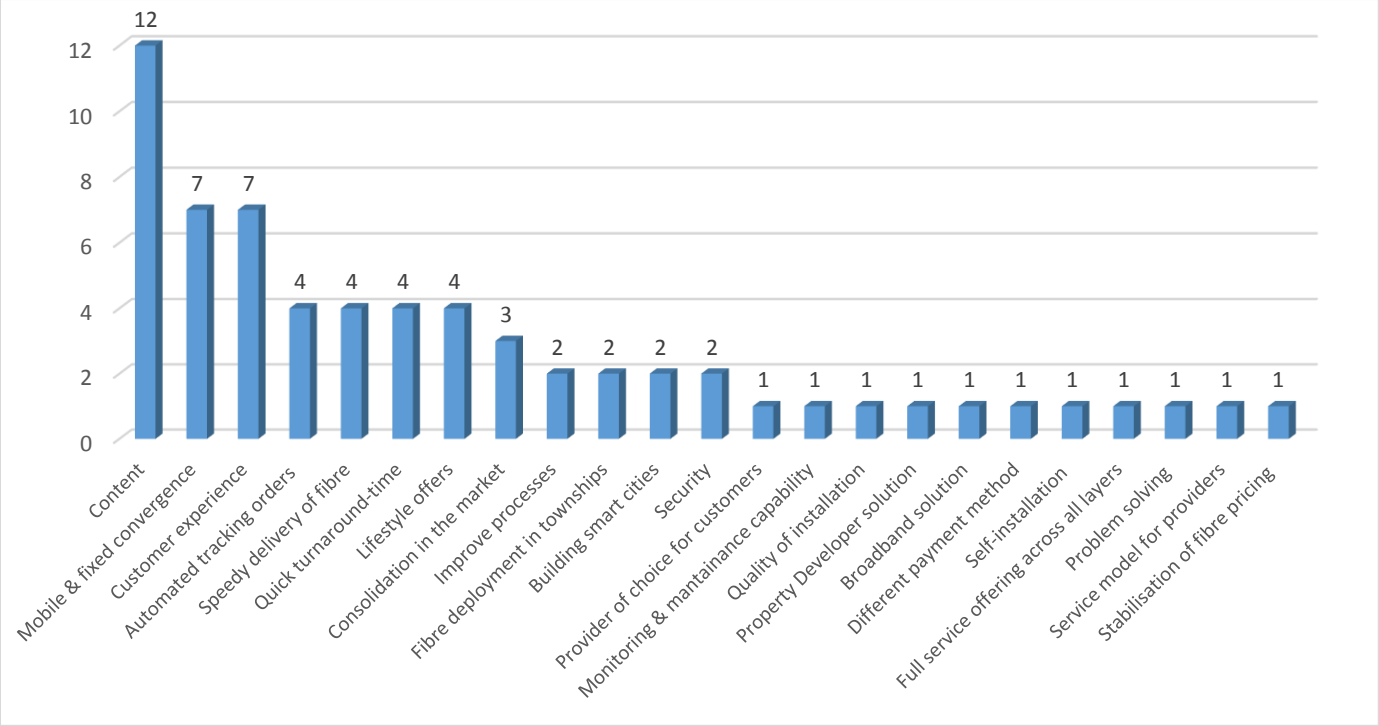

Figure 10: Potential Innovation Differentiation for organisations

The majority of the respondents indicated that more content would be an ideal innovation differentiator. Content includes online education which would be beneficially for long distance learning, gaming, and so forth. Some of the respondents preferred to leverage on existing digital products and services that are available on mobile and offer these on FTTH. Furthermore, enterprise business applications which uses the FTTH infrastructure and service provider can also be utilised by the business working from home. Over the top (OTT) services are being explored by quite a number of service providers within the industry.

Potential differentiators for other ISPs include efficient order processing systems as well in-home wiring and cabling for Wi-Fi. One respondent stated that:

> *We will be launching products that other ISPs already have which will streamline our systems and processes by reducing the order processing time by 200 percent which will make us more efficient and provide overall better experience for our subscribers. Some of the ISPs already have the system so we won't reinvent the wheel. This will be huge innovation*

differentiation for us. Most of the ISPs are not doing the in-home wiring and cabling for Wi-Fi as well as advanced monitoring.

The customer experience is key for most of the respondents as it enables the organisation to charge or bill a premium to customers. At the moment, the few ISPs and network providers that excel in this area will use it as a differentiator going forward. One of the respondents stated:

"It's a land grab and it's about coverage that means the differentiation is not very strong in this market as we would like it to be. However, as a service provider, we would like to differentiate based on customer experience."

Some respondents suggested that value added services and partnerships should be able to create value that will enable providers to differentiate themselves from the competition.

"As an organisation, we would like to add value added service content as part of the offering that can be sold on the open access network and also explore the niche partnerships like security where we can link security cameras and offer the service as white label and the Internet service providers can repackage it and sell it as their own. Furthermore, we need the ability to sell the higher speed [i.e. 200Mbps, 500Mbps and 1Gbps]. However this is a niche market, therefore only a limited number of customers will make use of these higher bandwidths."

Currently, competitive differentiation is not very strong within the industry as stipulated by some of the respondents. However, there are lots of opportunities to differentiate both the network provider as well as the service provider by offering unique value-added services to their respective customers.

Furthermore, respondents indicated that there are potential innovation differentiations that can be applied across the FTTH industry, including:

a) Products i.e. mobile and fixed convergence, security, lifestyle offers, property development solutions, broadband solutions with different access technologies and prepaid or credit card payment methods.

b) Processes, these include automated tracing of orders, proactive monitoring systems with maintenance capability, a speedy delivery of service to customers, turn-around time deployment and customer support, self-installation of devices.

c) Coverage provider an opportunity to expand to townships, build smart townships and ensure quality installations and deployment.

4.4.7. THE ROLE OF THE REGULATORY BODY TO DRIVE COMPETITIVE DIFFERENTIATION

This section details findings on the role of the regulatory bodies i.e. Independent Communications Authority of South Africa (ICASA) and Competition Commission of South Africa to drive competitive differentiation within the industry. Figure 10 depicts the responses from the participants.

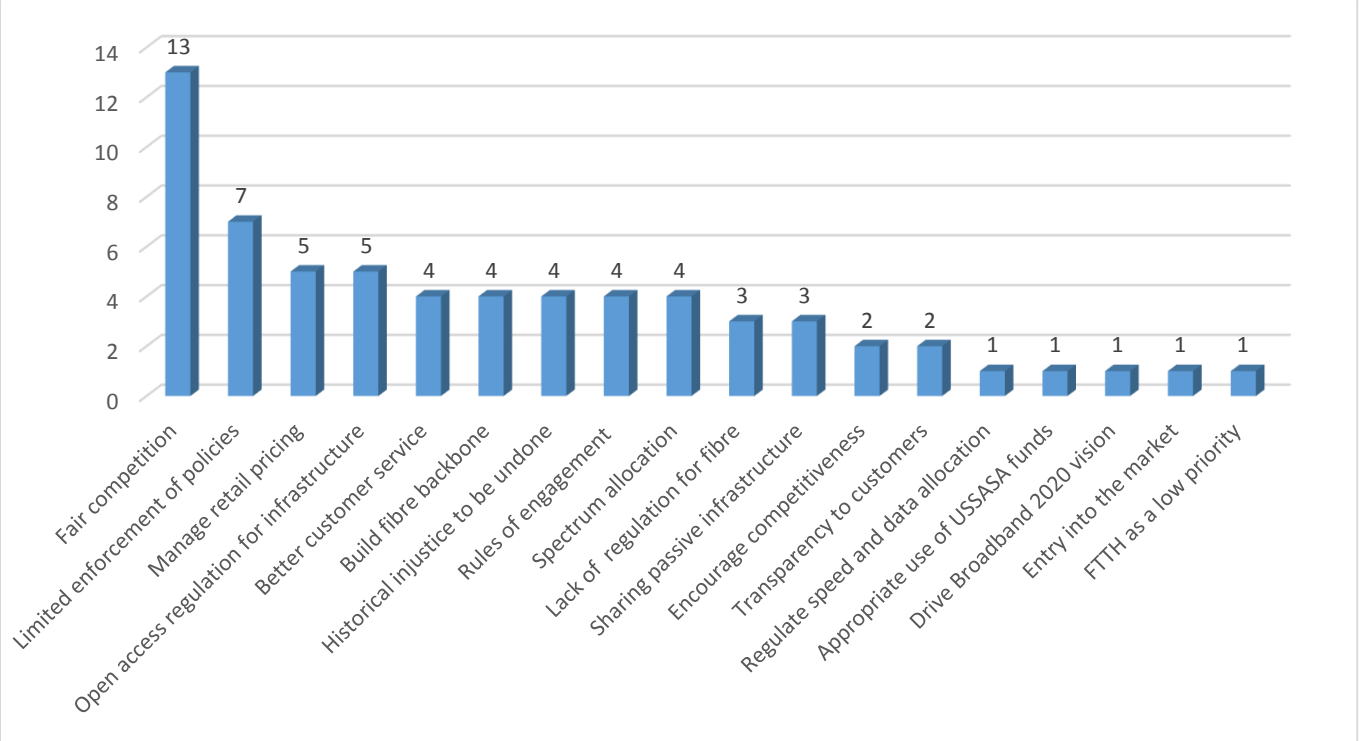

Figure 11: The role of regulatory body to drive competitive differentiation

A majority of the respondents stated that the regulatory body is responsible to manage and ensure fair competition amongst the industry players. One responded stated:

> *"The role of regulatory body should create policy certainty. How does the regulators create proper mechanisms regarding access to infrastructure for network providers? Some of the issues that we deal with now is the instances where other network providers occupy our ducts because there is no clear regulations regarding access to infrastructure. The regulatory body needs to regulate the access to existing infrastructure without creating a crisis in the market and encourage other providers to invest and grow the market."*

Some respondents indicated that ICASA regulated service level agreements and policies need to be made relevant to market needs and to be evolved from historical requirements because the market has moved on in the last few years. It is vital for the regulatory body to align and remain relevant for the industry and ensure certainty on policy decisions. There has not been much input or contribution from the regulatory body to drive competitive differentiation. However, the regulatory body has now started to look into FTTH requirements and it needs relevant skills in order to benchmark the FTTH market with international best practice.

The majority of respondents were concerned with the limited involvement of the regulatory body to drive differentiation within the industry. One respondent stated:

> *"The role of the regulator is to create an environment where things work properly and you can see even in an environment where there is a dysfunctional regulator there is a good competition in the market. The regulator should take a strategic position and drive the broadband 2020 vision in the country. FTTH Council is currently driving single wayleave application across the country and getting rid of the unnecessary municipal deposit for damages. We need to have a single deck policy in place and finalise the proper open access rules and regulation. Those enabler things are absent from the regulator body".*

Some respondents indicated the regulator needs to drive down cost, not necessarily the retail cost but the infrastructure cost, for example, by removing the municipal deposits. This will enable network providers to be able to roll out fibre into the rural areas and meet the broadband 2020 targets. The Universal Service and Access Agency of South Africa (USASSA) funds need to be utilised efficiently by providing

subsidies for rolling out fibre to the rural areas. The fund could be used to provide the fibre to every school and every hospital in the country which will enable and ensure that the fibre backbone is built and the network operators can implement the last mile at the end of that network.

The respondents also highlighted other aspects that need to be managed by the regulatory body in South Africa in order to drive competitive differentiation, including:

a) Network providers. The regulatory body needs to provide polices and regulation for open access networks, provide support by building the fibre backbone, resolve the historical injustice where the infrastructure, i.e. ducting for Telkom/ Openserve, needs to be shared with other providers.
b) Service Providers. The regulatory body needs to define minimum acceptable standards in order to improve customer experience and provide policies to eliminate barriers to entry.
c) Network operators would like to offer converged services with both mobile and fibre therefore the regulatory body needs to distribute and allocate spectrum to enable the network operators.
d) Lastly, the regulatory body should enforce transparency of the service providers and network providers for the benefit of the end users.

4.4.8. COMPETITIVE DIFFERENTIATION TO DRIVE COMPETITIVE ADVANTAGE

This section details findings on the competitive differentiation required to drive competitive advantage for organisations within the industry. Figure 12 summarises the responses from the participants on competitive differentiation to drive competitive advantage.

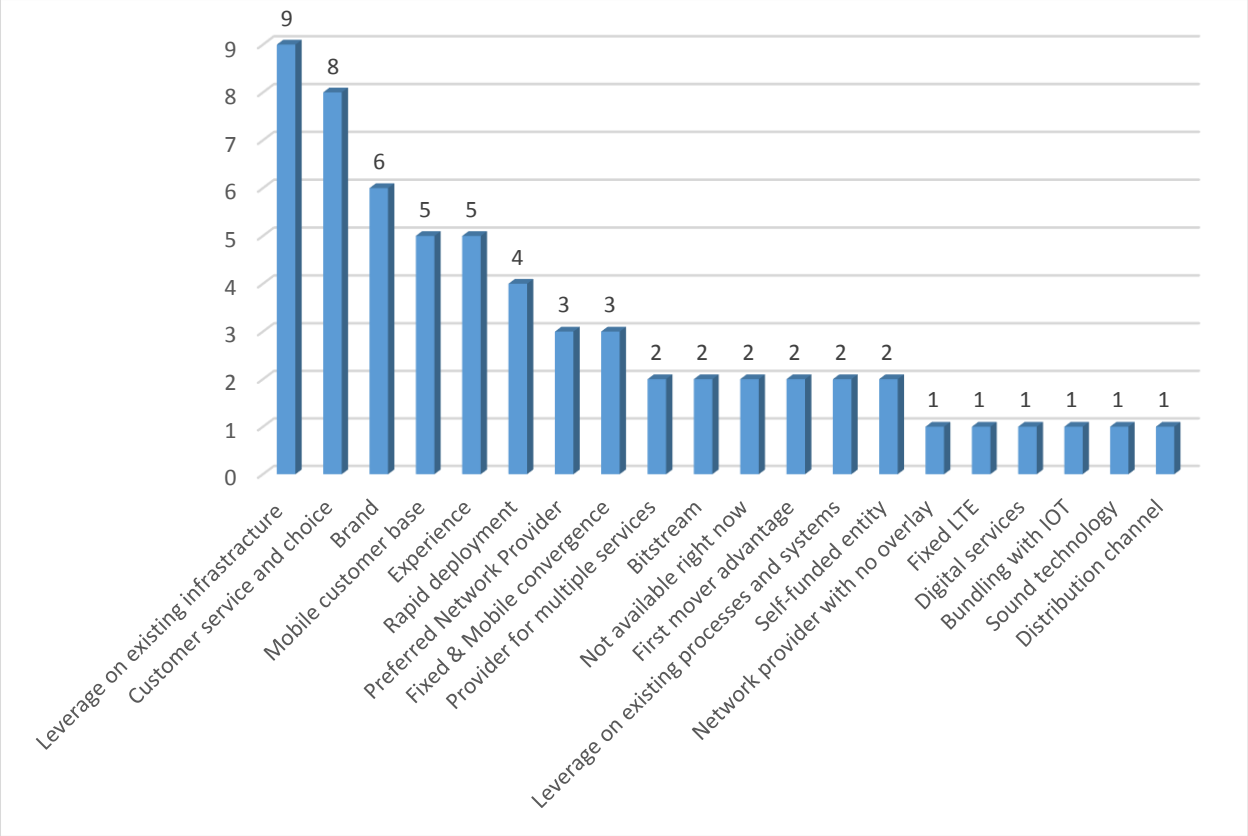

Figure 12: Competitive Differentiation to drive Competitive Advantage

The majority of respondents suggest that the utilisation of the existing infrastructure, customer service, brand, mobile customer base and experience are the main enablers for competitive differentiation to drive competitive advantage. One respondent stated that:

> *"Our mobile customer base is loyal and some customers do not like to be managed by a number of service providers, therefore we leverage on the existing infrastructure and base to offer FTTH services to the customers."*

The majority of the respondents highlighted the utilisation of the existing infrastructure as the competitive differentiator. The infrastructure ranges from using the fibre network in order build the FTTH network to making use of existing systems in order to do the order loading process. There is consensus that competitive differentiation drives competitive advantage and it is evident through the increase in customer base as well revenue.

> *"As an ISP, we have a suite of products and this has translated in customer increase and revenue. We have the ability to roll out the alarm systems, we have all the certification and teams ready and we will be building on IP camera solution, home automation and alarm system and all these will controlled by an application. The customer will be able to turn on the lights anywhere in the world. The customers are interested in these kind of offerings."*

Some respondents indicated that competitive advantage for mobile operators with the FTTH landscape is based on traditional mobile transmission capabilities. These network and service providers can leverage fibre-to-the-site (mobile base station) to enable connectivity to homes and businesses. This gives mobile operators a cost advantage in fibre rollout and access to technical resources. The mobile operators have additional advantages which include brand equity and a captive customer base. The biggest differentiation has been mainly around price. However, for the network providers, differentiation focuses on the quality of the network as well as service assurance capability. This will increasingly become a source of competitive differentiation to drive competitive advantage as the market starts maturing.

The respondents indicated that competitive differentiation drives competitive advantage because this has been evident through increases in customer base. One respondent stated:

> *"We have seen an increase in connectivity rate from the 10 percent, 20 percent and now have increased to 30 percent. We have seen that customers purchase the higher speeds. The smaller speeds like 4Mbps are exactly the same as the ADSL therefore some customers upgrade to higher speeds in order to get the benefit of FTTH."*

In addition to the above, once the customer installation is completed there is a need to continually improve the FTTH network assurance for availability and the capability to scale up in order to be manage traffic growth.

A number of respondents stated that the historical fixed network such as Telkom or Openserve have a competitive advantage due to their background as the monopoly for fixed network. Some of the respondent views stated that these organisations have

an unfair advantage because of their big network. At the same time, these networks do not allow sharing of their ducts. In response to this, one respondent stated:

> *"Indeed, we do not allow other network providers to make use of our ducts because we plan to deploy on those areas where we have ducts and also there is regulatory uncertainty regarding the sharing of ducts. There are lot of issues that we need to manage. There are areas where other providers have invaded our ducts and have damaged our infrastructure there. We need to put rules around access and maintenance. Others intentionally sabotage our copper and create a disgruntlement amongst customers so that they can deploy their network. We have been to court with a number of players and we have won all those cases."*

Some respondents stated that there is an opportunity for the players with ducting already in the ground to share and rent out the ducting. In response, one respondent stated:

> *"It is something we are looking at, however we need regulatory certainty and in the mean time we won't allow other role players to make use of these ducts because of the complexity to share the ducting with multiple providers. Sharing is available through Open Access Network as we are treating the market equally."*

Some respondents have seen the growth due to the advantage of getting to the customer first by making use of the existing mobile base, which applies to the mobile operators. However, the network operators that started with the rollout of fibre in South Africa like Vumatel have also benefited from getting to the customer first.

4.4.9. VALUE INNOVATION

This section details findings on value innovation within the FTTH industry. Table 6 presents the responses from the service providers and network providers.

Table 6: Value Innovation

REDUCE		ELIMINATE	
Complicated & nonsensical products	12	Shaped & Capped services	4
Capped packages	3	ADSL & Mobile	3
Coverage & land grab	3	Competition on physical layer	2
Not Sure	3	Separate billing for VoIP	2
CPE device with limited capability	2	Price decline	2
Minimum FUP on uncapped	2	infrastructure Competition	2
Shaped services	2	Operator owning end to end solution	2
Delivery of CPE by technician instead of self-install	1	Core funding and core build with developers	2
Programmed television	1	Multiple devices - ONT & CPE	1
Video on demand	1	No service while waiting for Fibre	1
Pricing with low margins	1	Legacy telephone	1
Mobile data promotions & competition	1	Copper based broadband	1
DSL - Saturated & Poor technology	1	Legacy email as VAS	1
Limited payment method	1	Use of pricing to penetrate market	1
		Telephony services	1
		Sole ownership of infrastructure	1
		High deployment costs	1
		Not Sure	1

CREATE		RAISE	
Segmented content	5	Quality of delivery	19
Bundling of services	5	Customer support	7
Fixed Mobile Convergence	5	Regulatory framework for ISP and OSP	5
Broadband Alternative	4	Training	4
Value Added Services	2	Pricing	3
Regional ISP	2	SLA improvement	2
Culture	1	Stringent testing	2
Competition based on differentiation	1	Aerial Fibre	2
IT Support	1	Rapid deployment policy	2
Commodity pricing data	1	Geographical expansion	2
One OSP provider	1	Competition on services	1
Security	1	Content	1
Consolidation in the market	1	Quality Assurance	1
Student offers	1	Value Added Services	1
OTT	1	FUP	1
Roaming on different operator infrastructure	1	Bandwidth for Fibre	1
Regulatory Body for Fibre	1	Open Access Network	1
Geographical expansion	1	Simplicity of products	1
Wholesale franchise	1		
Flexibility of Products	1		
Mobile Application for FTTH	1		
Offer government services in rural areas	1		
Leverage on existing base	1		

As indicated on Table 6, the majority of the respondents have highlighted the following aspects of the value innovation which include the factors that should be created, reduced, eliminated and raised:

a) *Reduce.* The providers should reduce the number of complicated products
b) *Eliminate.* The shaped and capped services should be eliminated
c) *Create.* The segmented content and bundling of service should be created

d) *Raise.* The network and service providers should increase the level of quality in the delivery of services to customers.

The factors on which the industry has long competed, and no longer provide value, that should be removed within FTTH

Figure 13 shows the responses of the participants on factors that the industry has long competed on and no longer provide value and should be removed.

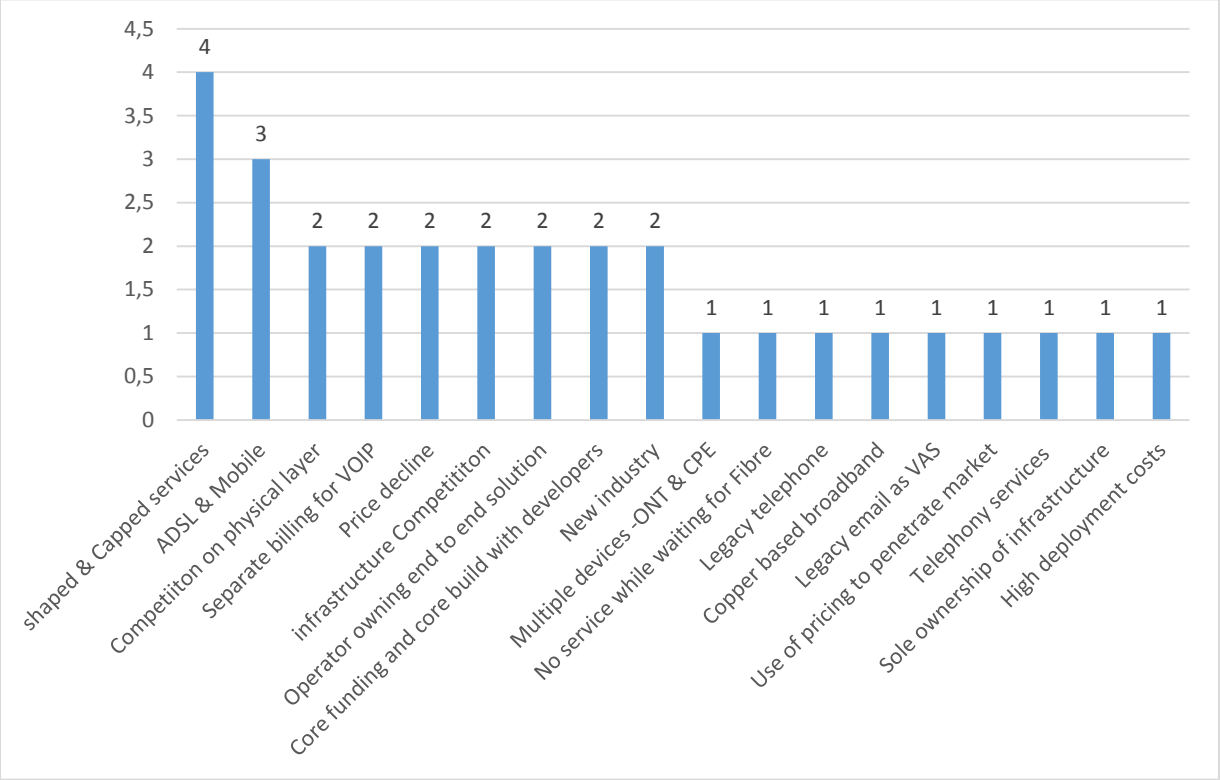

Figure 13: Factors that no longer provide value and should be removed in the industry

A number of respondents indicated that since FTTH is a new industry there are minimal items to reduce and eliminate. One of the respondents stated that the industry should move away from multiple devices within a home and rather have one device that combines the Optical Network Terminal (ONT) and Customer Premises Equipment (CPE). Another respondent stated:

> *"The home installation has many components (devices) that are being installed within a home, these include ONT, CPE therefore we need one device for all."*

Some respondents highlighted that the capped and shaped data packages should be removed as they restrict customer usage and access. Some respondents suggested that penetration pricing strategies should be removed and the different providers should differentiate based on their value added services. The respondents advocate for penetration based on the availability of service and network in different locations as alternative to the price based differentiation. In addition to the above, some respondents agreed with this view and suggested that retail pricing should be limited to a specific reasonable margin. One respondent stated:

> *"What we have seen as the ISP is that on capped data, when the customer requirements were less, the usage was also low and the capped option made sense. Based on usage requirements, the demand for more data has increased in comparison to the time when we first launched FTTH. The association with uncapped products has more value in comparison to selling a customer capped products. This is also driven by the FTTH market because the majority of the competitors are offering the uncapped products. In most instances, customers do not exceed their capped data allocation. However, uncapped products are bought by customers to ensure continuity after the data allocation is fully depleted."*

Additional respondents indicated that the network infrastructure and access network technology (GPON, Ethernet options) is now stable and should be removed as the major point of competition. According to the respondents, the market is moving primarily to uncapped products. Therefore, capped products and shaping should be eliminated from the service provider product offerings.

The products and services that have been over designed in an effort to exceed the competition, should be reduced within the industry

Figure 14 shows responses from the service providers and network providers on factors that have been overdesigned in an effort to exceed competition and should be reduced.

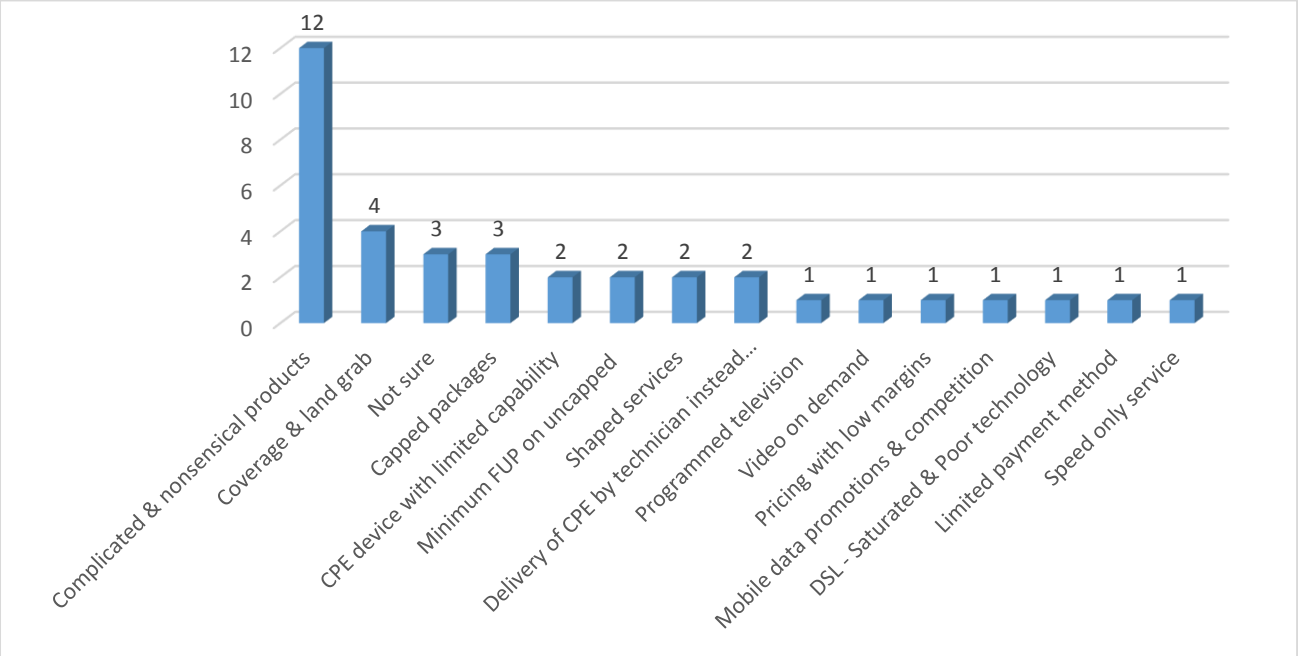

Figure 14: Factors that have been overdesigned in an effort to exceed competition and should be reduced

The majority of the respondents indicated that FTTH product offerings are complicated with nonsensical products. For example, a number of service providers have lower speeds which are similar to ADSL speeds i.e. 4Mbps and 5Mbps. These offerings should be reduced because they do not give customers the benefit of FTTH.

Some respondents have indicated that the home installation process is slow where the customer premises equipment (CPE) is being delivered by a technician. However, there is an opportunity to courier the devices to the customer to enable to self-install and quicker turnaround time. Additionally, some respondents highlighted that capped Internet packages should be reduced due to the limitation in data access. One respondent stated:

"The capped packages and shaping have been offered within the industry. However, due to the applications that require the high volumes of data and the industry is moving more towards uncapped offers, the capped packages should be reduced".

Furthermore, the providers agreed that pricing-based competition should be reduced because it does not generate a sustainable model for the industry where there are minimum margins to generate value for customers.

The factors that must be increased above the standard of the industry

Figure 15 shows responses from the participants on factors that must be increased above the standard of the industry.

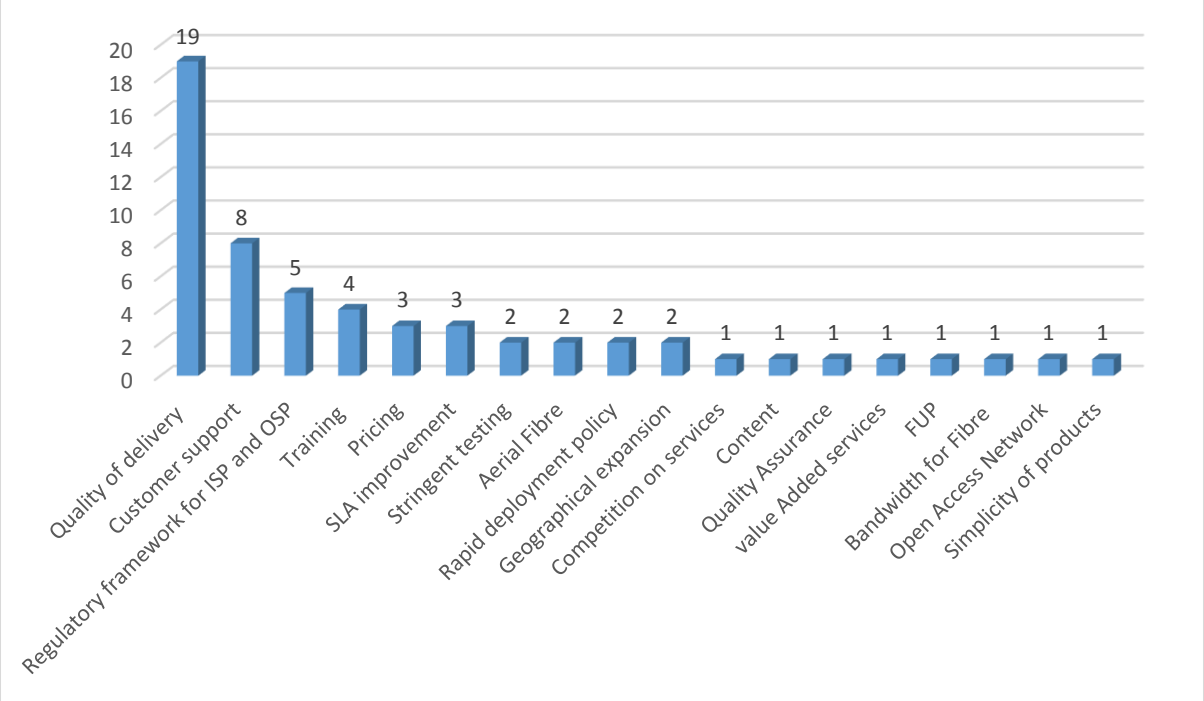

Figure 15: The factors that must be increased above the standard of the industry

The respondents stated that quality of service delivery needs to be improved within the industry to acceptable levels that will enable ISPs to provide good customer experience to the end users.

One respondent stated:

"The contractors that some of the network providers use to carry out the work, the standard of service delivery and excellence leaves a lot to be desired. They do not offer the level of workmanship that I would like to see and as an example we had to call one of the contractors for the network providers to come and clean up their shoddy installation. Especially the network providers that grow too fast. Their staff are shocking, their systems are automated and are falling over and there are bugs on the systems that create duplicate orders. There is a lot that needs to be done to bring the service delivery that I would expect as the ISP to an acceptable level. The standard of contract personnel, systems and processes needs to vastly improve."

In addition to the above, the majority of the respondents would like to see an improvement in the quality of the network infrastructure. One respondent stated:

"The network itself is not that stable, we have experienced downtime where a point of presence [i.e. Optical Line Terminal (OLT)] where there are backup batteries instead of a generator and when the power goes out then the customers are affected."

A selected number of respondents indicated that geographical expansion, over and above the metropolitan areas such as Gauteng, Western Cape and KwaZulu Natal, should increase. Therefore the focus should be on increasing access to FTTH for lower Living Standards Measure (LSM) demographics. The network and service providers need to operate and expand product offering, support and maintenance in those areas.

Some respondents indicated that regulation should mandate all network providers to operate as open access to ensure fair competition within the network. Furthermore, some respondents indicated that government should increase investment in FTTH infrastructure by building the backbone and long-haul infrastructure to enable the industry to expand nationally.

The factors that should be offered within the industry, that have never been offered

Figure 16 shows the responses from the participants on factors that should be offered within the industry that have never been offered before.

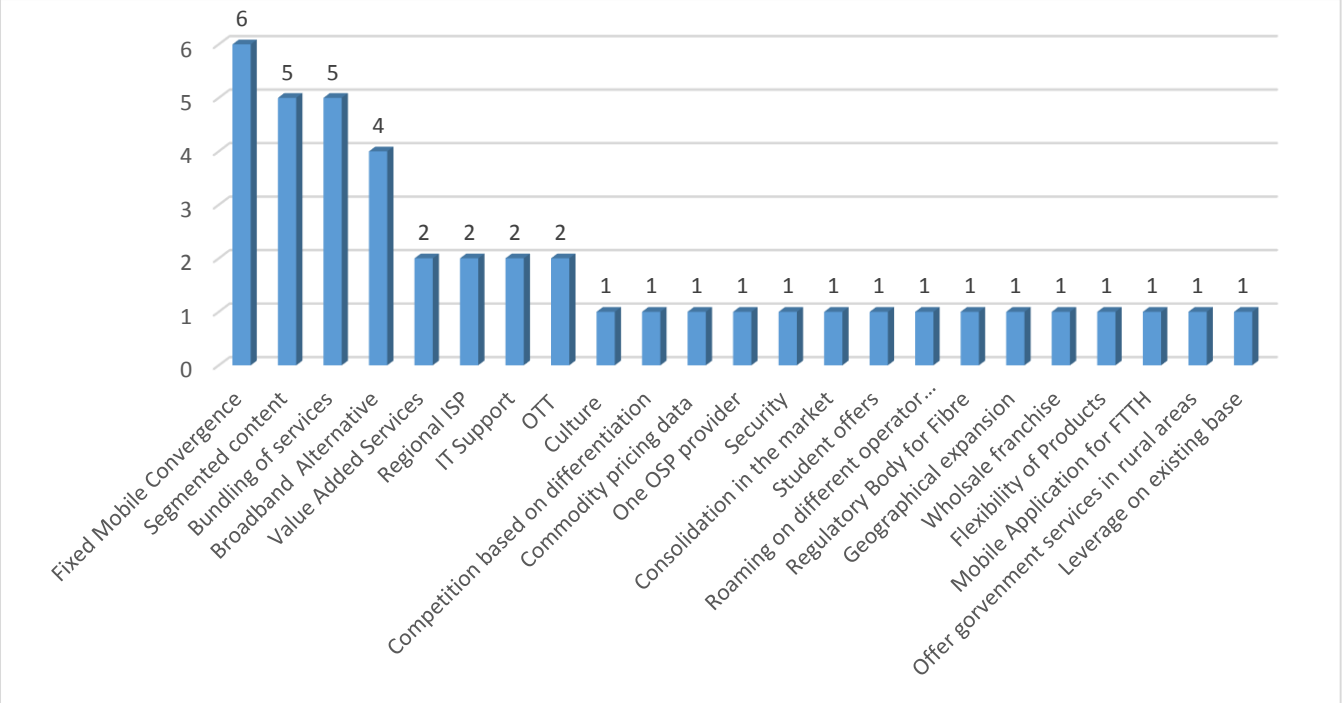

Figure 16: The factors that should be offered within the industry, that have never been offered

The majority of the respondents indicated that fixed mobile convergence should be implemented within the industry where mobile operators drive convergence of mobile and FTTH more aggressively through offloading mobile traffic to the fixed network. Once a person is in the home, offload him to the fixed connection and release congestion on the tower and mobile network. The respondents have highlighted that FTTH in South Africa has seen an increase in the number of service providers and consolidation is inevitable amongst the providers. In addition to the above, the convergence can allow mobile customers to make use of their fixed data allocation and vice versa. One respondent stated:

> *"There is an opportunity to offer segmented content, over the top offerings and partnership with content providers which is the next wave for innovation within the fibre-to-the-home landscape."*

Furthermore, some respondents stated that there is a need to add more value-added services, virtual security and network security. Customer education content that can be offered through fibre which includes streaming, content, over the top and connecting the home device and manage them through an application which will increase the demand for higher speeds.

4.5. SUMMARY OF COLLECTED DATA

4.5.1. THE DEMAND FOR FTTH IN SOUTH AFRICA

The findings from participants indicate that the demand for fibre-to-the-home is driven by content, FTTH being a replacement for ADSL from a technological perspective, social aspect as well economically. In addition to these, the higher cost of mobile data and higher data consumption has an impact to drive the latest technology such as fibre within South Africa.

4.5.2. PRICING STRATEGY EVIDENT IN SOUTH AFRICA

The findings as indicated by the participants show that the dominant pricing strategy is price reduction in order to drive sales. There are concerns that the model is not sustainable. Some of the service providers are driving the price down in order to attract customers with the plan to sell or consolidate at a later stage. There is a view that the retail cost is expensive due to backhaul costs from some of the network providers. The pricing is not coherent across different networks meaning it is location dependent and in some instances it does not generate any margin for the Internet service providers. The pricing is kept the same as ADSL for providers that are migrating customers from ADSL to FTTH.

4.5.3. COMPETITION IN SOUTH AFRICA

The respondents indicated that the fibre-to-the-home landscape is quite competitive with a number of smaller network providers that build one or two estates as well as

large operators with over 100 000 homes passed. The respondents highlighted that there is an evident increase in the number of service providers, some of the providers are new and have been created recently and some are large service providers and have been in existence over a long period of time. Some of these large ISPs also have a customer base of ADSL customers. The main contributor to price reduction is the highly competitive environment of the FTTH market.

4.5.4. FTTH PRODUCTS AND SERVICE IN SOUTH AFRICA

The findings from the respondents indicated that the different operators offer different products as services ranging from broadband, voice, content, over the top, LTE-while-you-wait, advance device monitoring systems and IoT offerings. In some instances, the price plans and packages are segmented to meet customer requirements from 4 Mbps to 1 Gbps speed, and capped and uncapped allocation.

4.5.5. COMPETITIVE DIFFERENTIATION

The findings from the respondents indicate that there is limited competitive differentiation and the network providers have minimal focus on differentiation mainly because if the customer moves between ISPs, the customer still remains with the same network provider. The network providers are only challenged with competition where there is overbuild of fibre in the same location. Hence it is essential for these network providers to provide quality and assurance of the network and partner with home owner associations (HOAs) in order to avoid overbuild and to connect customers quicker.

4.5.6. COMPETITIVE ADVANTAGE

The findings from the respondents indicate that network providers and service providers have seen differentiation leading to competitive advantage based on customers' connectivity, as well as revenue resulting from competitive differentiation. The growth in some instances is due to the advantage of getting to the customer first by making use of the existing mobile base, which applies to the mobile operators.

Furthermore, the network operators that started with the rollout of fibre early in South Africa like Vumatel have also benefited on the getting to the customer first. Vumatel has set a trend with the Alexandra deployment and therefore the competitive advantage could accelerate the Broadband 2020 vision and be facilitated properly with the capex cost in mind. The focus will be more on broadband to the home and not just FTTH to the home to drive competitive advantage.

The network operators and service providers that have resources and capabilities leverage on these resources in order to drive competitive advantage. This is evident with mobile operators as they use the mobile customer base to sell fibre and package the fibre offering with mobile. Also, the network and service providers with customer base on ADSL migrate the base to fibre.

4.5.7. REGULATORY BODY TO DRIVE COMPETIITVE DIFFERENTIATION

The findings from the respondents showed that there is limited involvement from the regulatory body currently to drive competitive differentiation. They have also showed that there is a need for the regulatory body to enable the operators through developing the fibre infrastructure to rural areas in order to meet the broadband 2020 vision.

The findings also indicate that the regulatory body needs to provide clarity on policies regarding the open access network, infrastructure sharing and utilisation of the USAASA funds. ICASA-regulated service level agreements and policies need to be made more relevant to market needs and evolved from their historical requirements because the market has moved for the last few years. Lastly the appropriation of the USAASA funds is required in order to drive broadband access to the communities in South Africa.

4.5.8. LIMITATIONS AND BARRIERS FOR COMPETITIVE DIFFERENTIATION

The respondents identified the high demand for Capex and Opex for the deployment of fibre networks amongst the providers and highlighted that there is limited access to

funding, and delays in the deployment of guidelines and internal processes for the different providers. In addition to the above, there is a lack of appropriate technical skills for the implementation of FTTH in South Africa. The industry needs to invest in young talent since it is faced with an ageing workforce. The respondents indicated that the barriers for competitive differentiation for different providers include the erosion of margins generated by the service providers which does not give an opportunity to create value and differentiation for customers. The loss of margin is most visible among the service providers that utilise different open access networks or bitstream networks.

4.5.9. VALUE INNOVATION

The respondents highlighted the factors that should be reduced and removed within the industry, including capped and shaped product offerings and pricing-based competition. The respondents indicated that competitive differentiation should not be primarily based on price, but rather on innovation by providing products, services and processes that meet the customer needs.

The findings show that the quality of the network as well as the quality of service delivery need to be improved above the current industry standard. The regulatory policies need to be updated and be aligned to the current state of the industry. In addition to these, respondents indicated that geographical expansion over and above the metropolitan areas such as Gauteng, Western Cape and KwaZulu Natal should be on increased in order to give access to FTTH to lower LSM demographics. The network and service providers need to operate and expand their product offerings, support and maintenance in those underserved areas.

The findings from the respondents is that network and service providers need to understand customer requirements in order to create the products, services and processes that would benefit customers their day-to-day lifestyle.

CHAPTER FIVE: ANALYSIS AND DISCUSSION OF THE RESEARCH FINDINGS

5.1. INTRODUCTION

This chapter reviews the findings of the data presented in chapter four and aims to analyse and synthesise these findings based on the literature in chapter two. There are four areas that will be analysed in this chapter, including: drivers for FTTH in South Africa; innovation-based competitive differentiation; limitations and barriers for innovation differentiation; and future differentiation in order to obtain competitive advantage. The findings of this study will be examined against the literature in chapter two in order to answer the research questions based on the proposed framework.

5.2. BACKGROUND

The data collection for the study was done through semi-structured interviews with personnel from FTTH network and service providers that are based in Gauteng. Furthermore, external expert commentators were also interviewed as part of the study.

5.3. THE DEMAND FOR FIBRE-TO-THE-HOME

Sheth & Ram (1987) mentioned drivers for innovation as cited by Goffin & Mitchell (2017, p. 49) which include four external factors: technological advances, changing customers, competition and the business environment; and one internal factor: strategic intent.

Goffin & Mitchell (2017, p. 50) mentioned that technological changes have an influence on firms (Adams, 2003), including new technology that has a potential to create a new industry. The findings that have been confirmed by the respondents suggest that technological advancement of FTTH, in terms of higher speed and better connectivity in comparison to ADSL, has driven the demand for FTTH in South Africa.

The second driver for innovation is changes in consumer characteristics and requirements. The organisation needs to update existing products and services in line with changing customer needs (Goffin & Mitchell, 2017, p. 51). The respondents stated that customers are attracted to the high speed of FTTH due to their demanding applications. However, there is limited local content that is generated in South Africa which would further drive utilisation of FTTH in the country.

The third driver of innovation is intense and growing competition, some of which may come from external industries (Adams, 2003). The competitive environment of the FTTH market has driven cheaper prices due to intense competition, as indicated by the respondents.

The fourth driver for innovation is the business environment which may change over time or radically (Adams, 2003). This driver is affected by regulation, policy changes and the stability of the business cycle. The findings indicate that there has been limited involvement from regulators and policy makers in the FTTH landscape.

The final driver that has been identified by Goffin & Mitchell (2017, p. 52) is strategic intent which is driven by the ambition of the leaders in terms of the selecting the degree and the level of innovation to be pursued by the organisation. The findings indicate that the novelty of innovation has been rather incremental within the South African FTTH industry.

According to Atherton (2009), high speed broadband technologies increase the utilisation of advanced multimedia services, such as Internet Protocol television (IPTV), High Definition television (HDTV), and Video on Demand (VoD). The end user demand for high speed bandwidth, which also increases the demand for heavy applications like VoD, requires a minimum speed of 10Mbps (Scott, 2010). Due to the high demand for bandwidth, the providers are challenged with providing a network that can support the high demand as well as the vast number of services. As a result, high demand capable networks as well as methods to manage quality of service are needed (Pereira & Ferreira, 2012). The demand for quality and high speed on-demand videos enable video to be the driver going forward, which requires a speed of up to 200Mbps for ultra-high definition and super high definition (Scott, 2010). The findings have been confirmed by the respondents to the effect that the drivers for FTTH include high speed broadband and bandwidth demanding applications that cannot be serviced

by other access networks like mobile and ADSL. Atherton (2009) suggests that the high speed broadband enables business applications such as video conferencing, cloud storage, hosted voice over IP (VoIP) as well as virtual private networks (VPNs). The respondents agree that the high bandwidths enable end users to work from home and to make use of business applications, especially cloud-based applications.

Fibre-to-the-home is being selected due to high speed bandwidth in residential areas, being a future-proof technology, and delivery of enhanced network quality, reliability, improved customer satisfaction, extended service capability, and improved network OPEX (Kunigonis, 2009). The findings from the respondents indicate that the end users make use of fibre due to its quality of service, reliability which relates to the consistent speed, and connectivity without environmental impact unlike copper.

According to Seys, Meer, & Verdegem (2010), the market demand for FTTH is characterised by the dedicated niche market instead of the mass market. The providers need to attract other segments of the market which are currently not connected to FTTH. Based on the feedback from the respondents, FTTH in South Africa is primarily focused in three metropolitan areas, including Gauteng, Western Cape and KwaZulu Natal provinces. The FTTH South African market does not focus on the mass market but rather on selected high value residential areas. The providers seem to overlook the mass market which is not considered part of the areas to potentially build the fibre network, with the exception of one network provider, Vumatel, which has a pilot project in the Alexandra township of Johannesburg.

5.4. PRICING STRATEGY FOR FIBRE TO THE HOME

According to Lee, Marcu, & Lee (2011), there are several factors that impact the acceptance of fixed-line communication from a consumer perspective. These factors include pay, location, the level of education and the price of broadband, which are essential aspects for the diffusion of fixed line broadband adoption. In agreement with these findings, especially the price impact, the respondents stated that the most expensive estates and suburbs still try to negotiate the price of the FTTH products in order to obtain value for their money. The respondents additionally highlighted that the customers are spoilt for choice due to the price reduction in the market.

Differentiated competitive advantage can be achieved through price reduction and/or innovation of products. Accordingly, the comparison between organisational products and services is based on the longevity of the product or service in the market place (Coyne, 1986). Facilities-based network and service providers have intense competition that leads to price war in a mission to build customer base (Fuke, 1996). The findings from the respondents indicate that the dominant differentiation amongst providers is the price whereby providers drive price down in order to increase sales. However, the industry has limited innovation-based differentiation in terms of products and services.

Broadband availability of coverage, quality and prices are the key components to improve the standard of the network competitiveness and social acceptance (Lyons & Coyne, 2017). There is a need for government involvement to make broadband available to areas where commercial offering are not able to reach; this can be achieved by means of subsidies (Lyons & Coyne, 2017). The smaller operators indicate that the average prices of plans have limited premium for higher end download speeds whereas large operators charge a fee for the high end download speed (Lyons & Coyne, 2017). In addition to the above, as stipulated by Lyons & Coyne (2017), television service bundles attract a premium of approximately 40 percent. Pricing is affected by competition structure, regulatory engagement, infrastructure, technology as well indirect competition. Howell (2010) argues that flat-rate pricing for broadband cannot be sustainable in the long term due to the option of offering different tariffs to attract low end customers. Biggs & Kelly (2006) postulate that the growth and development of the broadband market is driven by the adopted pricing strategies for broadband which is initiated by the providers.

In light of the above perspective, price regulation is an essential element for Open Access network, the government needs to subsidise coverage for broadband in areas where the commercial offering is not able to reach, and lastly the operators can offer television services bundles in order to increase the price by up to 40 percent.

Based on the feedback from the respondents, there is no pricing regulation for open access networks in the FTTH market and there are no clear guidelines with regard to policies on open access network. Hence some of the network operators charge a high backhaul cost in comparison to the market and there is no government contribution by

means of subsidies towards broadband access for uncommercial areas where the network operators are not able to reach due to large initial capital investments. The products and services offered by the different service providers have limited television focus, meaning the market is missing the opportunity to increase the price by up to 40 percent.

5.5. COMPETITION FOR FIBRE TO THE HOME

Hersh & Abusaleem (2016) indicate that it is essential for operators within the telecommunication industry to differentiate their service and product offerings from competitors to reduce the high level of competition and increase their market share.

Banerjee & Sirbu (2005) discussed the different models for competition within the telecommunications industry, including facilities-based competition which applies when the organisation provide services to the market using its own network infrastructure. In this instance, the operator builds, uses and manages its own network (Gruber & Koutroumpis, 2011). For example, this is evident in Spain as discussed by Frias & Pérez Martínez (2016) where mobile network operators deployed fixed networks to remain competitive. Facilities-based providers and service providers had intense competition that led to price war in a mission to build customer base (Fuke, 1996). Non–facilities-based competition, or service level competition, applies when the service provider does not own the network infrastructure, but shares the network to provide services to its own customers utilising third party owned network infrastructure. As stated by the respondents, FTTH network provider and service provider competition in South Africa has reduced the retail price to a point where there are minimal margins generated for the provider due to efforts to build customer base and, potentially, later sell the customer base to other providers.

The open access model for competition allows all service providers an equal share in third party network infrastructure in order to provide data, voice and video services to their own customers. Also Forzati, Mattsson, Wang, & Larsen (2011) indicate the different roles between the network provider and the service provider in comparison to instances where the same operator provides services to customers on its own network. The open access model is truly open when all the service providers are treated the same without discrimination from a quality and cost perspective, which

address instances where the network operator also competes as a service provider; then the network operator does not obtain competitive advantage on the basis of owning the network infrastructure (Lehr et al., 2008). The findings from the respondents indicate that there is no fair model of competition applied in an open access network model because some of the providers are given advantage in terms of selling to suburbs, complexes or estates before other service providers are given access. Based on the feedback from the respondents, some network providers are not truly open access even though some of the providers complete agreements with different estates that open access will be made available for the specific areas. It has been indicated that some service providers within so-called open access networks obtain preferential treatment whereby those service providers are given access to sell before other service providers are given an opportunity to sell to these areas. In addition to the above, the lack of regulation with regard to engagement within the FTTH landscape has opened up for some of the providers to offer financial rewards in order to obtain access to some areas, estates and suburbs.

5.6. PRODUCTS AND SERVICES FOR FTTH

According to Fournier (2007), there are certain focus areas in order to offer services and capabilities that are more than ADSL services and at the same time meet the customer demand:

(1) *New services.* There is a need and demand to offer symmetrical high-end speeds, multi-stream television, and high definition television. This view has been confirmed by the respondents, who stated that customers are increasing or upgrading their bandwidth to higher levels and also that network providers are planning to offer 200Mbps and 1Gbps to meet the needs of the customer demand. High definition communication (voice and video), sharing of user generated content, personal broadcast, gaming, security and converged services can be used to bundle offers with fixed and mobile. These have been indicated by the respondents as potential innovation-based differentiators for service providers going forward.

(2) *Marketing.* Customers are attracted to innovation through high end speeds, simplicity and triple play packages of products and services that offer fixed, mobile, content, customer support and quality. There is an opportunity to offer segmented offers using HDTV. The respondents indicated that the mobile networks leverage on their existing mobile customer base and expertise to offer mobile products to FTTH customers like LTE-while-you-wait and offer this service in conjunction with the FTTH offering and content.

(3) *Partnerships.* Build relationships with property owners in order to drive efficiencies during deployment. The respondents stated that partnerships are essential to reduce the cost of deployment through making use of existing infrastructure to roll out fibre and remain competitive in the industry

(4) *Service Delivery.* Manage and reduce the lead time to connect, install and activate a customer at customer premises to a range of 4 to 12 hours per service activation. Service delivery has been highlighted as an area that needs to improve above the standard of the industry because some installations are shoddy and need to be redone. This has been highlighted as the essential differentiation for competition going forward due to the customer experience component.

Stork et al. (2013) suggested that broadband services are sold to customers as packages with mostly triple or quadruple play i.e. voice, data, video on mobile and fixed. This competitive differentiation, as suggested by Stork et al. (2013), is currently not offered as a consolidated offering, however various operators especially the mobile networks are planning to offer these services in order to obtain a competitive edge within the market.

Moore (2015) pointed out the difference in the degree and novelty of innovation, in comparing incremental and radical innovation. The author postulates that incremental innovation refers to small changes required to improve performance, reduce costs and improve desirability while radical innovation focuses on new domains and paradigms with major changes. Based on the feedback from the respondents, potential competitive differentiation includes segmented content, over-the-top offerings and partnership with content providers, as the current wave of innovation within the FTTH

landscape is rather incremental. Furthermore, there is a need to add more value-added services, virtual, network security and educational content.

5.7. COMPETITIVE DIFFERENTIATION

Biggs & Kelly, (2006) suggest that providers can differentiate their services by offering broadband packages with installation charges, device charges, monthly subscriptions, thresholds based on time or megabytes as well as additional service charges like Internet access, virus checks, and email accounts. Based on the findings from the respondents, the South African market offers broadband packages with installation charges, device charges, monthly subscriptions, threshold-based megabytes as well as Internet access. There are limited offerings on virus checks and respondents indicated that the email account offering is no longer relevant within the market because most customers already have an email account from over-the-top players.

The operator may offer discounts in terms of loyalty, renewals, sign-on discounts and offer VoIP and email address. Broadband can be bundled with other triple play services i.e. VoIP and TV. According to Gauthey (2007), the implementation of the offerings that motivate customers include Internet access up to 100Mbps, due to its simplicity and support of triple play (Internet, TV and VoIP), which has created an interest in multimedia content amongst the households in France (Fournier, 2007). The findings highlight the lack of loyalty discounts as the focus is mainly on sign on discounts, but this is expected to change as the market becomes mature.

5.8. COMPETITIVE ADVANTAGE

The open access model is truly open when all the services providers are treated the same without discrimination from a quality and cost perspective. This addresses instances where the network operator also compete as a service provider, then the network operator does not obtain competitive advantage on the basis of owning the network infrastructure (Lehr et al., 2008). Based on the findings from the respondents, some of the network providers have not opened their FTTH networks for open access. These network providers have competitive advantage just on the basis of owning the network because they also operate as service providers. An organisation can have a competitive advantage when the organisation has implemented a strategy which

create a new value that is not available within the industry (Porter, 1985). It becomes a sustainable competitive advantage when the value created is not easily duplicated (Porter, 1985). The findings from the respondents indicate that mobile network providers have a competitive advantage based on network skills, experience, brand and customer base from mobile which is being utilized to create converged offers with both mobile and FTTH. This advantage for mobile networks cannot be duplicated by other service providers that do not own a mobile network. Porter (1990) stipulated that organisations are able to gain competitive advantage through domestic partnerships, local suppliers, demanding customer bases and slow competitors. The findings from the respondents also indicated that partnerships with different stakeholders and providers can potentially enable the network providers to reduce their deployment cost and enable efficiencies for the building the FTTH network. This competitive advantage is achieved through implementation of innovation utilising technology and creating new processes and a strategy that embrace innovation (Brem et al., 2016). The respondents agreed with this view and proposed that providers need to position themselves as premium brands which differentiate the organisation from the competition.

5.9. REGULATION TO DRIVE COMPETTIVE DIFFERENTIATION

The telecommunications industry is seen as an industry that has demonstrated successful regulatory reform (Gruber & Koutroumpis, 2011) with the United States (US) enabling facilities-based competition (Yoo, 2014) while European regulation influences the industry towards bitstream access and unbundled models. However, this has not been the case in some nations that are hampered by limited regulatory involvement or rather unsatisfactory regulation (Cave, 2009). The view from Cave (2009) is in accordance with the observation from the respondents, that the market is driving competitive differentiation with no involvement from the regulatory body. However, market-driven competitive methods can only be done to a certain extent, there is a gap from the market perspective especially on policies and sharing of infrastructure, like ducting, which is expected to enable users to choose among providers. Furthermore, the gated communities are not given an option to choose an Internet service provider because the open access network policies and guidelines are not defined. Generally, there is unsatisfactory regulation of sharing of infrastructure.

Regulatory influence to promote the open access model is essential to drive competition in the market, offer services in a non-discriminatory manner, and also ensure that the industry offers competitive prices which protect both the end user and the competition from monopolies and incumbents with significant market power (Lehr et al., 2008). The policy makers may regulate open access, or depend on the network infrastructure providers to define the terms of engagement with regards to the open access – this type of open access is referred to as the voluntary open access. There are three key elements for regulation within open access, including price regulation, terms on providing open access, and business restrictions and activities for network providers (Lehr et al., 2008). Based on the findings from the respondents, the regulation on open access is lacking with no price regulation in terms of providing open access and guidance to the network providers.

5.10. LIMITATIONS AND BARRIERS FOR COMPETITIVE DIFFERENTIATION

Gerasymenko (2013) highlighted three different types of barriers to competition, including:

a) Barriers to entry, which refers to all the obstacles which bar or limit organisations from entering a market. This type of barrier has been identified by the respondents in the high backhaul costs which restrict and limit service providers from entering and selling in the most expensive networks due to zero or near-zero margins and longer payback periods to recover such cost.
b) Barriers to competitive fringe expansion, which refers to limiting the growth of small coexisting organisations in an effort to preserve the market power of the dominant organisation. The findings from the respondents have stated that the reduction of price has led operators to sell with limited or no margin with the expectation of later consolidating or selling the customer base to other operators. This is a limitation because these organisations cannot expand due to price reduction and cannot grow in isolation but rather have to sell or consolidate with other

organisations which empowers the dominant operators within the industry.

c) Barriers to switching demand, which refers to the shrinkage of market boundaries in order to decrease competition from traditionally distant substitutes and thus enhance the market power of the dominant organisation.

The insights from the respondents have indicated that the large service providers are expensive in comparison to the market. Other network and service providers migrate their existing ADSL customer base to FTTH keeping the same pricing as ADSL, which is done to reduce churn from customers.

5.11. VALUE INNOVATION

According to Kim & Mauborgne (1999), most organisations build their strategy in an effort to obtain competitive advantage over their competitors. However, when managers are looking for competitive advantage, they always evaluate the offering of the competitor and improve on it due to the competitive differentiation that is focused on competition. Organisations often achieve imitation of other organisation's product offerings by reacting to the competition through replication, however the mass market opportunity and changing customer needs are overlooked (Kim & Mauborgne, 1999). This has been stated by the respondents in that service providers and network providers tend to monitor the actions of the providers within the FTTH market and respond with the same or similar product or the same price point. FTTH network providers and service providers have indeed overlooked the mass market because the focus is mainly on the high value estates and suburbs and the customer needs for the mass market has not been evaluated.

Sustained high profits for organisations can be achieved through value innovation. Value innovation makes competition irrelevant by creating new offerings for customers in the existing market (Kim & Mauborgne, 1999). Value creation is based on the Four Actions Framework which is to:

1) Reduce the aspects that have been overdesigned in an effort to exceed the competition.

2) Eliminate factors that the industry has long competed on and no longer provider value.
3) Raise aspects that need to be increased above the standard of the industry.
4) Create aspects that should be offered within the organisation that have never been offered before with the industry as discussed by Kim & Mauborgne (2014).

In the South African FTTH context, this translates to:

1) Reduction of the factors that the industry has long competed and no longer provide value and should be removed. The findings from the respondents have indicated that the FTTH market is still new therefore there are minimal options to be removed. However, findings from respondents indicate that the following must be removed: multiple devices within a home in terms of the optical network terminal (ONT) and customer premises equipment (CPE); capped and shaped packages (since the market is moving to uncapped offerings); and network infrastructure and access technologies as the main point of competition.
2) The products and services that have been overdesigned in an effort to exceed competition. The findings from respondents indicate the 4Mbps and 5Mbps line speeds should be removed because these products were designed in an effort to compete with ADSL. However, the market has a demand for higher line speeds. Respondents also indicated that requiring technicians to install the services at the customer's premises in an effort to have a human intervention impacts the delivery process, therefore an option to allow the customer to install the service themselves should be considered.
3) The aspects that must be increased above the standard of the industry. The respondents agreed that there are areas that need to be improved above the standard of the industry, including quality of the service delivery, and rollout of FTTH to other areas. The lack of regulatory engagement should be increased in order to define and enforce open access on network providers. In addition to the above, government investment towards the development of the FTTH backbone should be increased.
4) The factors that should be offered within the industry that have never been offered before. The respondents highlighted that such new offerings and propositions include mobile and fixed convergence, offloading mobile traffic to the fixed network, segmented content, over-the -op offerings, value added

services, and broadband using other access technologies like satellite, LTE, etc.

Value innovation is central to blue ocean strategy as it does not benchmark against competitors in the industry, but rather creates new value for the organisation with a purpose of making the competitors irrelevant by creating new markets. There is a difference between blue and red ocean as discussed by Kim & Mauborgne (2005a). The qualities for red ocean strategy include:

a) the organisation focusing on competing with the existing market;
b) the organisation making effort to be ahead of the competition;
c) the existing demand is being exploited;
d) the value/cost compromise.

The red ocean strategy is evident in the FTTH market based on the feedback from the respondents because network provider and service provider behavior and offerings are almost entirely based on the competition. Furthermore, the high value customer has been the main focus segment for the network providers. In addition to the above, price erosion or price reduction has led Internet service providers to sell FTTH product offerings based on zero or negative margins.

5.12. SUMMARY OF THE DISCUSSION

The literature indicates that market demand for FTTH is mainly focused on the dedicated niche market instead of the mass market. The study reveals that there is a gap in the South African market with regard to offering FTTH to the mass market since network providers and service providers offer products targeted at high value customers. The providers need to attract the other customer segment of the market which is currently not connected to FTTH.

The literature indicates that the source of differentiated competitive advantage can be achieved through price reduction and innovation of products. The facilities-based network and service providers' intense competition can lead to price war in an effort to attract customers and increase the customer base. The study reveals that there is a need for innovative products within the FTTH market because the dominant

differentiation amongst providers is primarily focused on prices where providers drive prices down in order to increase sales.

The literature indicates that government involvement is required to make broadband (FTTH) available to areas where commercial offering is not able to reach and this can be achieved by means of subsidies. Additionally, the operators can attract a premium estimated to be up to 40 percent when offering television service bundles. The study reveals that governmental involvement is lacking within the South Africa FTTH market and suggests that the providers should offer television bundles in order to substantial increase the margins that are affected by price-based competition. The evidence indicates that there is no pricing regulation for open access networks and a lack of clear guidelines on government's contribution by means of subsidies towards providing broadband access to the areas where the network operators are not able to reach due to the need for massive initial capital investment.

The literature reveals that focus areas required to offer services and capabilities that are more than ADSL services and meet customer demands include new services, marketing, partnerships and service delivery. The study reveals that there is limited innovation-based competitive differentiation within the market and, as indicated in the results, the network operators and service providers should offer symmetrical high-end speeds of 200Mbps and 1Gbps speed. Moreover, providers can offer sharing of user generated content, personal broadcast, gaming, security and converged services, i.e. bundled offers with fixed and mobile, to meet the needs of the customer demand. Also, network providers and services providers can leverage on existing capabilities in order to offer differentiation in the market. The providers should also enhance partnerships to reduce the cost of deployment through making use of existing infrastructure to roll out fibre and remain competitive in the industry. Lastly, the service delivery needs to be improved above the standard of the industry because some installations are shoddy and need to be redone, this is essential to improve customer experience going forward.

The literature indicates that incremental innovation focuses on small changes to improve the performance, reduce the costs and improve the desirability while radical innovation focuses on new domains and paradigms with major changes. The study shows that providers typically make changes to improve performance, reduce cost and

improve desirability with minimum focus on new domains, new markets and major changes. The results indicate that the providers can offer competitive differentiation through offering segmented content, over-the-top offerings and partnership with content providers as the next wave for innovation within the FTTH landscape. Furthermore, there is a need to add more value-added services, virtual, network security and educational content.

The literature states that different types of barrier to competition include barriers to entry, barriers to competitive fringe expansion and barriers to switch demand. The study indicates that the barriers need to be mitigated in order to drive competitive differentiation. The findings indicate that that the high cost of backhaul restricts and limits service providers from entering and selling in the most expensive networks due to the higher cost, zero margins and longer period it takes to recover the cost. Moreover, the reduction of price has led the operators to sell with limited or zero margin with the expectation of future consolidation or selling the customer base to other operators. This is a limitation in competitive differentiation because the providers cannot expand due to price reduction and cannot grow in isolation but rather have to sell their organisations which empowers dominant operators within the industry.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1. INTRODUCTION

This chapter summarises the findings of the study based on the semi-structured interviews conducted as well as the literature review. The purpose of the study is to explore a holistic view of innovation-based competition differentiation for FTTH amongst South African operators. It seeks to understand the drivers, supporting factors, limitations and extent of innovation-based differentiation to drive competitive advantage amongst South African operators.

The research questions and the propositions of the study are as follows:

- What is the current level of innovation-based competitive differentiation for FTTH?
    - P1: There is a low level of innovation-based competitive differentiation for FTTH in South Africa.
    - P2: FTTH providers tend to focus on more on incremental innovation using products and services.
- How can innovation-based competitive differentiation be further utilised as a competitive advantage amongst FTTH operators?
    - P3: South African operators and service providers can make use of customer needs in the market in order to differentiate themselves from the competition.
    - P4: The high level of available resources and capabilities can be used to differentiate operators from their rivals and enable competitive advantage.

6.2. MAJOR FINDINGS

The study is based on innovation based competitive differentiation amongst South African network and service providers. The findings of the study are based on in-depth

analyses of the literature and interviews with network providers and service providers based in Gauteng, South Africa. The study seeks to to explore a holistic view of innovation-based competition differentiation for FTTH amongst South African operators. It seeks to understand the drivers, supporting factors, limitations and the extent of innovation based differentiation to drive competitive advantage amongst South African operators.

The research findings indicate that the FTTH market is highly competitive, with many network providers and service providers offering products and services to customers in order to meet customer needs. However, there are challenges with innovation-based competitive differentiation, since competition is primarily based on the price of the broadband product and, as a result, prices have been plummeting, leading to some service providers operating and selling FTTH products with zero or negative margins.

It is evident that there is a gap with regards to offering FTTH to the mass market, since the network and service providers offer services targeted at high value customers. Providers need to attract this other customer segment of the market, which is currently not connected to FTTH. The network and service providers' employees that were interviewed ascribed this to the fact that FTTH in South Africa is primarily focused on three metropolitan areas, namely, the Gauteng, Western Cape and KwaZulu Natal provinces. Furthermore, the South African FTTH is highly focused on selected high value residential areas, rather than the mass market. To maximise the customer base, network providers and service providers need to explore mass market penetration for FTTH.

Governmental or rather regulatory involvement is limited within the South African FTTH market. The evidence shows that there is no pricing regulation for open access networks, no clear guidelines with regards to infrastructure sharing, and no governmental contribution by means of subsidies towards providing broadband access to the areas which the commercial network operators are not able to reach due to the unattractive and unrecoverable capital investments required. The public Wi-Fi currently being offered by the different metropolitan municipalities i.e. City of Johannesburg, City of Tshwane, City of Cape Town, City of Durban and Nelson Mandela Bay (Central, 2017) is not an integrated effort with network providers therefore the backbone does not enable the providers to deliver telecommunication

services for FTTH, i.e. last mile to customer's premises. Furthermore, the unintegrated implementation of fibre has not been utilised in an efficient manner which allows for sustainability. It is vital for government and regulatory bodies to play a bigger role in order to accelerate the rollout of FTTH especially the last mile and to drive healthy, sustainable and fair competition amongst the providers.

The results show that there is limited innovation-based competitive differentiation in the FTTH market. Instead, price-based differentiation is evident in the market. High-end speeds are currently limited to 10 % of the network and service providers therefore competing network and service providers should increase the focus on offering symmetrical high-end speeds to 200Mbps and 1Gbps. Moreover, network and service providers have an opportunity to offer and enable the sharing of user generated content, personal broadcast, gaming, security and converged services i.e. bundled offers with fixed and mobile to meet the needs of the customers. Network and service providers can also leverage their existing capabilities in order to offer differentiation in the market e.g. mobile customer base, FTTH coverage and brand. Based on the findings from the respondents, FTTH network and service providers can offer competitive differentiation through offering segmented customer content, over the top offerings and partnerships with content providers as the next wave for innovation within the FTTH landscape. Furthermore, there is a need for more value-added services, virtual and network security and educational content.

Network and service providers are challenged with limited capex for the deployment of fibre to new areas, therefore providers should enhance partnerships to reduce the cost of deployment by making use of existing infrastructure to roll out fibre and remain competitive in the industry. Additionally, the scarcity of technical skills has limited the quick deployment of fibre networks, and therefore it is essential for providers to train and empower young talent in order to build teams with skilled resources and to replenish the ageing workforce.

The evidence, as indicated by the respondents from different network and service providers, shows that the quality of fibre rollout, service delivery and installation of the service at the customer's premises is substandard. Therefore, service quality needs to be improved above the current standards of the industry, for instance, some installations are shoddy and need to be redone. This is essential to improve customer

experience going forward and can be used as an opportunity to differentiate the operator.

The FTTH network operators' and service providers' strength should lie on the competitive differentiation required to meet sales and revenue targets. Respondents identified barriers that are faced by the providers that need to be mitigated in order to drive competitive differentiation. The findings indicate that the higher backhaul cost restricts and limits the service providers from entering and selling in the most expensive networks due to the higher operational costs, which causes the service providers to generate insufficient margins and longer periods to recover the cost of selling the FTTH product or service. Moreover, the reduction of prices in the market has led operators to sell with limited or zero margin with the expectation to later consolidate or sell the customer base to other operators. This is a limitation because these organisations cannot expand due to price reduction and cannot grow in isolation but rather have to sell their respective organisations.

6.3. FINDINGS ON THE LEVEL OF INNOVATION-BASED COMPETITIVE DIFFERENTIATION

Based on the first proposition, there is a low level of innovation-based competitive differentiation for FTTH in South Africa. The results show that there is limited innovation-based competitive differentiation in the FTTH market. Instead, price-based differentiation is evident in the market. The results show that the dominant pricing strategy is price reduction in order to drive sales and this model is not sustainable. The evidence indicate that some of the service providers are driving the price down in order to attract customers with the plan to sell or consolidate at a later stage. The pricing is not coherent across different networks meaning it is location dependent and in some instances it does not generate any margin for the Internet service providers. The pricing is kept the same as ADSL by providers that are migrating customers from ADSL to FTTH.

The second proposition indicates that FTTH providers tend to focus on more on incremental innovation using products and services. The literature indicates that incremental innovation focuses on small changes to improve the performance, reduce

the costs and improve the desirability while radical innovation focuses on new domains and paradigms with major changes. The finding of the study shows that providers typically make changes to improve performance, reduce cost and improve desirability with minimum focus on new domains, new markets and major changes. The findings from the respondents indicated that the different operators offer different products that are focused on incremental innovation such as services ranging from broadband, voice, content, over the top, LTE-while-you-wait, advance device monitoring systems and IoT offerings.

6.4. FINDINGS ON INNOVATION-BASED COMPETITIVE DIFFERENTIATION BEING USED AS THE COMPETITVE ADVANTAGE

The third proposition suggests that South African operators and service providers can make use of customer needs in the market in order to differentiate themselves from the competition. The results indicate that operators expand primarily in metropolitan areas such as Gauteng, Western Cape and KwaZulu Natal. However, this needs to change in order to give access to FTTH to lower LSM demographics and meet the access customer needs for different LSMs. The network and service providers need to operate and expand their product offerings, support and maintenance in those underserved areas.

The fourth proposition indicates that the high level of available resources and capabilities can be used to differentiate operators from their rivals and enable competitive advantage. The results indicate that the network operators and service providers that have resources and capabilities leverage on existing resources in order to drive competitive advantage. This is evident with mobile operators as they make use of the mobile customer base to sell fibre and package the fibre offering with mobile. Also, the network and service providers with customer base on ADSL migrate the base to fibre.

6.5. RECOMMENDATIONS FOR BUSINESS / STAKEHOLDERS

This section details recommendations for network and service providers within the FTTH industry based on the research conducted with different network and service

providers in Gauteng. The recommendations are focused on innovation-based competitive differentiation amongst operators:

1. Network providers and service providers should consider leveraging their existing resources and capabilities (customers available from mobile network customer location information, skills, partnerships, and brand) to differentiate themselves from rival operators and enable competitive advantage.
2. The service and network providers should move away from the price as the primary differentiator and means to attract customers. Instead, the service providers should consider offering innovation-based differentiation through FTTH and mobile convergence, segmented content for education (e.g content for various grades), over the top services, security offerings, home automation solutions and proactive monitoring systems. Network and service providers should consider offering television bundles in order to substantially increase the margins affected by price based competition.
3. The deployment of FTTH products are focused on specific metropolitan areas with perceived high value customers and this has led to the mass market being neglected. The network and service providers should create FTTH access for different segments based on specific customer requirements which will enable the providers to meet their revenue targets due to high volumes in the mass market.
4. The FTTH industry should consider investing in training young people in developing fibre-related skills, specifically in installation, implementation and support. The training should also include hands-on training by learning on the job. This will mitigate industry concerns of the pressing need for younger talent since the industry is faced with an ageing workforce. The ageing workforce can be used to transfer knowledge to the recently trained young people. Providers can then use the combined experience and knowledge for quality deployment as the differentiator for the network operators.
5. ICASA, the regulatory body for FTTH, should provide clarity with regards to the policies on fibre infrastructure sharing between the different network providers. This will reduce wastage of resources in terms of overbuild of the fibre network by creating a competitive environment which will increase the deployment of

fibre within the South African landscape and meet the government's Broadband 2020 vision.

6. Network operators should work with different partners within the industry in order to reduce the capex cost for deployment. In addition to the above, as per the Republic of South Africa (2006) Electronic Communications Act no. 36 of 2005 S21 which states that the Department of Telecommunications and Postal Services (DTPS) should work in conjuction with Provincial and Local Government, the Minister of Land Affairs, the Minister of Environmental Affairs, the Authority i.e. ICASA and other applicable organisations to create guidelines for the rapid deployment and provisioning of electronic communications facilities. This is per the ongoing consultation between DTPS, ICASA, FTTX Council and other institutions as well as the network providers to create and accelerate the implementation of the rapid deployment guidelines, the open access network rules and regulations to define the engagement procedure with different parties within the industry. The rapid deployment guidelines need to be finalised and be made available for implementation.
7. DTPS in partnership with ICASA and the Universal Service and Access Agency of South Africa (USAASA) should consider investing in the deployment of the fibre backbone to enable network providers to roll out to the entire nation of South Africa, while the network providers can be responsible for the rollout of the last mile.
8. The quality of the deployment for FTTH and service quality has proved to be lacking amongst the network and service providers. The network and service providers should consider implementing quality control and quality assurance in order to improve the customer experience and leverage on this as a competitive advantage.
9. There is limited content that is generated in South Africa which would drive utilisation of FTTH in South Africa therefore there is an opportunity to create local content e.g. educational content, video and make it available in different South African languages.

6.6. DELIMITATIONS OF THE STUDY

- The study has been limited to the network operators and service providers in Gauteng province and did not include the service and network providers in other South African provinces.
- The research was conducted based on information and feedback from the participants at a specific point in time and did not look at historical or longitudinal innovation based competitive differentiation amongst network and service providers over an extended period of time.

6.7. SUGGESTIONS FOR FUTURE RESEARCH

The research findings indicate that innovation-based competitive differentiation is necessary for the FTTH organisation to have a competitive advantage in comparison to its rivals. Consequently, the organisation needs to remain relevant by providing innovative solutions. Limitations and barriers for innovation differentiation have been identified, but not in detail, which could provide potentially fruitful areas for future research:

- The data collection has been limited to network operators and service providers in Gauteng province. It is recommended that future studies be extended and conducted in other provinces especially the metropolitan areas with FTTH.
- A comparative study is required to compare the results on South African FTTH network and service providers to those in other African countries and other continents.
- A comprehensive study of the constraints and impact on innovation within the FTTH industry arising from the complexity and multiplicity of related government institutions (executive/policy, legislative/oversight, regulatory, judicial) and associated policies, laws, rules, regulations, judicial rulings. For example, DTPS and DoC at executive/policy level, Parliament and Parliamentary Committees at legislative/oversight level, and ICASA, Competition Commission and USAASA at regulatory level.

- Customer-centred view of the market, since this study is focused on the perspective of service providers and network providers.
- A detailed study of the FTTH ecosystem is recommended for network service provision and consumption including but not limited to the users, infrastructure, devices, regulatory and content; and comparing the South African industry to the global view.

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APPENDIX A

TITLE: INNOVATION-BASED COMPETITIVE DIFFERENTIATION AMONG SOUTH AFRICA FTTH OPERATOR

QUALITATIVE RESEARCH: SEMI-STRUCTURED INTERVIEW

The purpose of the study is to explore the holistic view of innovation based competition differentiation for FTTH amongst the South African operators, it seeks to understand the drivers, supporting factors, limitations and the extent of the innovation-based differentiation to drive the competitive advantage amongst South African operators.

By completing the questions below, you agree to participate in this study. All information gathered from this research will be confidential, anonymous and the data obtained will be stored in an environment protected with a username and password. Complete the questionnaire by answering the questions below.

Section 1 : Background Information

1. **What is the date of the interview?**
2. **What is the name of the organisation?**
3. **What is your job title within the organisation?**
4. **What is the number of years you have been in telecommunication industry?**
5. **What is the number of homes passed and connected for FTTH within your organisation?**
6. **What is the FTTH revenue within the past 6 or 12 months that has been generated for the organisation?**

   Select the applicable range.

   a. **R0 Million – R20 Million**
   b. **R21 Million – R50 Million**
   c. **R51 Million – R80 million**
   d. **R81 Million – R100 Million**
   e. **Above R100 Million**
7. **What are the main drivers of FTTH in South Africa?**
8. **What is the pricing strategy that is evident within the South African FTTH landscape?**

Section 2 : Competitive Differentiation

1. **How does your organisation differentiate itself in comparison to the competition and the industry?**
2. **What are the differentiation techniques that are being used by the organisation to differentiate from the industry e.g. Price, Products, Services, Devices, Process and others?**

3. **What are the barriers or limitations for the competitive differentiation within your organisation?**
4. **What is the most important potential innovation differentiator for your organisation going forward?**
5. **Are customers placing more value to your innovation differentiation within the industry?**
6. **What is the role of the regulatory body to drive competitive differentiation in South Africa?**

Section 3 : Competitive Advantage

1. **What is your understanding of the competitive advantage?**
2. **What do you believe is the competitive advantage within your organisation?**
3. **Is there an increase in competitive advantage (customer base, revenue etc.) within your organisation due to the competitive differentiation?**
4. **What are the future plans to differentiate your organisation in order to obtain competitive advantage?**

Section 4: Innovation

1. **What are the factors on which the industry has long competed, and no longer provide value, that should be removed within FTTH?**
2. **Which products and services, have been over designed in an effort to exceed the competition, should be reduced within the industry?**
3. **Which factors must be increased above the standard of the industry?**
4. **Which factors that should be offered within the industry, have never been offered?**

Please provide add any additional information on FTTH

_____
_____
_____
_____
_____

Thank you very much for your input and contribution to this study

APPENDIX B

Wits Business School
Graduate School of Business Administration
Master of Management in the field of Innovation Studies
2 St David's Pl & St Andrews Road, Park town, Johannesburg, 2193
P.O Box 98, Wits, Johannesburg, Gauteng, South Africa, 2050
TEL / FAX: 011 717 3600 / 011 717 3514
Website: www.wbs.ac.za

Dear Participant,

I am a student at the Wits Business School studying towards the Master of management in the field of Innovation studies (MMIS). As part of the master's programme, I am required to conduct a comprehensive research in order to meet all the requirements.

The purpose of the study is to explore a holistic view of innovation-based competition differentiation for FTTH amongst South African operators. It seeks to understand the drivers, supporting factors, limitations and the extent of the innovation based differentiation to drive competitive advantage amongst South African operators.

In order to conduct the study, I will interview knowledgeable individuals regarding the study and that are actively working for FTTH network and service providers. You have been recognized as a suitable individual to provide information regarding this study. I would like your approval to interview you regarding the competitive differentiation for FTTH.

The estimated time for the semi structured interview is 60 minutes and your contribution, time and feedback would be appreciated. All information collected from this study will be confidential, anonymous and the data obtained will be stored in an environment protected with a username and password. I will get in contact with you to make an appointment for a suitable time.

Dr. Mjumo Mzyece is the supervisor for this study and in the event you have any questions you can contact him via email at mjumo.mzyece2@wits.ac.za.

Kind regards

Andiswa Ntsandeni

Wits Business School, MMIS Student

APPENDIX C

The consent form that has been signed by the participants is as follows:

Consent Form

Title of the Project: Innovation-based Competitive Differentiation amongst South African Fibre-to-the Home Operators

Name of the Researcher: Andiswa Ntsandeni

I …….. agree to participate in this research project. The research has been explained to me and I understand what my participation will involve.

I agree that my participation will remain anonymous	YES	NO	(please circle)
I agree that the researcher may use anonymous quotes in her research report	YES	NO	
I agree that the interview may be audio recorded	YES	NO	
I agree that the researcher may take photos of me (but not my face)	YES	NO	
I agree that the information I provide may be used anonymously by other researchers following this study	YES	NO	

…… (Signature)

…… (Name of Participant)

…… (Date)