

**EXPLORING BUSINESS MODELS
IN AFRICA'S UNDERSEA CABLE MARKET FOR BROADBAND
DEVELOPMENT**

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Declaration

I declare that this report is my work unaided. It is submitted in partial fulfilment of the requirements of the degree Masters in Management (in Information and Communications Technology Policy and Regulation Management) to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree of examination at any other university.

Dedication

My dear wife *Safiya* and children *Humza and Fatima Zahra*, the anchors of my life, the roots and basis of my equilibrium - strengthening me in moments of weakness and sharing my moments of joy.

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'...Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers...' (UN Declaration of Human Rights, December, 1948)

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ACRONYMS

ACE	Africa Cable to Europe
ADSL	Asynchronous Digital Subscriber Line
AEO	African Economic Outlook
AFDB	African Development Bank
AICD	African Infrastructure Diagnostic Consortium
AMCOST	African Ministers Council on Science and Technology
APC	Association for Progressive Communications
ARAPKE	African Regional Programme on Knowledge Economy
ARPU	Average Rate of Profit per User
AT&T	American Telecommunications and Telegraph Pty
AU	African Union
BCG	Boston Consulting Group
BMBB	Business Model Building Blocks
BPO	Business Process Off shoring
BRICSA	Brazil- Russia-India-China-South Africa
CCK	Communications Commission of Kenya
CERN*	European Organisation for Nuclear Research
CRASA	Communications Regulatory Association of Southern Africa
COMESA	Common Market for East and Southern Africa
CRM	Customer Relationship Management
CTO	Commonwealth Telecommunications Organisation
DARPA	Defense Advanced Research Projects Agency
DBSA	Development Bank of Southern Africa
EASSy	East African Submarine Cable Marine System
ECA	Electronic Communications Act
ECNS	Electronic Communications Network Service license
ESFD	Essential Facilities Doctrine
EIA	Environmental Impact Assessments
EIB	European Infrastructure Bank
EU	European Union

FCC	Federal Communications Commission
FDI	Foreign Direct Investment
FLAG	Fibre Loop Around the Globe
FOSS	Free and Open Source Software
FRTA	Forum for Regulation of Telecom in Africa
GATS	Global Agreement on Trade in Services
Gbps	Giga Bits Per Second
GCAP	Global Campaign Against Poverty
GDP	Gross Domestic Product
GEANT	Global E Academic Network
GPG	Global Public Goods
GPT	General Purpose Technology
GSMA	Global Mobile Systems Association
GSR	Global Symposium for Regulators
IBRD	International Bank for Reconstruction and Development
ICA	Infrastructure Consortium for Africa
ICANN	International Council on Assigned Names and Numbers
ICASA	Independent Communications Regulator for Southern Africa
ICT's	Information and Communications Technology
IEEE	International Engineering
IFC	International Finance Corporation
IGF	Internet Governance Forum
IGW's	International Gateways
ILS	International Landing Stations
IPR	Intellectual Property Rights
IRU	Indefeasible Rights of Use
ISOC	Internet Society
ISP	Internet Service Providers
IT	Information Technology
ITU	International Telecommunications Union (ITU)
IXPs	Internet Exchange Points

KDN	Kenya Data Networks
LAN	Local Area Network
LS	Landing Station
LED	Local Economic Development
LEO	Low Earth Orbit
MDG's	Millennium Development Goals
MDI	Multilateral Development Institutions
MFN	Most Favoured Nation
MVNO	Mobile Virtual Network Operator
MNC	Multinational Corporations
NEPAD	New Partnership for African Development
NGN	New Generation Networks
NGO	Non-Governmental Organisations
NREN	National Research and Education Network
NTT	Nippon Telecommunications Corporation
O3B	Other 3 Billion
OECD	Organisation for Economic Cooperation and Development
OER	Open Education Resources
PFMA	Public Finance Management Act
POP's	Point of Presence
PPID	Privatisation Project Infrastructure Database
PSTN	Public Switched Telecommunications Network
QoS	Quality of Service
R&D	Research and Development
RBP	Resource Based Perspective
RCIP	Regional Communications and Information Programme
REC	Regional Economic Communities
RIA	Research in Africa
ROI	Return on Investment
SADC	Southern Africa Development Community
SAP	Structural Adjustment Programmes

SAT-3/WASC	South Atlantic Telecom- West Africa Submarine Cable
SEA-ME-WE	South East Asia-Middle East-Western Europe cable
SDH	Synchronous Digital High definition
SMME's	Small and Medium Enterprises
SMP	Significant Market Power
SPC	Special Purpose Vehicle
SPII	Support Programme on Information Infrastructure
SSA	Sub-Saharan Africa
SSNIP	Small but Significant and Non-transitory Increase in Price
STM	Supply Telecommunications Measurement
TA	Technical Assistance
TAT	Trans-Atlantic Telegraph
TCP-IP	Telecommunications Communications Protocol- Internet Protocol
TEAMS	The East African Marine System
TENET	Tertiary Education Network
TRAI	Telecommunication Regulator of India
UNCTAD	United Nations Congress on Trade and Development
UNDP	United Nations Development Programme (UNDP)
UNECA	United Nations Economic Commission on Africa
UNESCO	United Nations Educational Science and Cultural Organisation
USC	Undersea Cable Systems
USF	Universal Service Funds
VANS	Value Added Network Providers
VPNs	Virtual Private Networks
WAN	Wide Area Network
WDR	World Dialogue on Regulation
WEF	World Economic Forum
WSIS	World Summit on Information Society
WTO	World Trade Organisation
WWW	World Wide Web

ABSTRACT

The problem the research investigated is the effectiveness of business models for key 'resource inputs' to broadband infrastructure, namely undersea cable systems (UCS) and landing stations (LS) and how this relates to the availability of broadband infrastructure in Sub-Saharan Africa.

A qualitative methodology was adopted, including document analysis, policy and regulatory analysis and exploratory interviews were conducted with regulators, cable owners and funders. The application of theories of emerging business models (Osterwalder, 2004) to the data unveiled new insights into the value-chain of broadband infrastructure and services. Relevant theoretical frameworks such as competition policy, with an emphasis on essential facilities doctrine, economics of infrastructure regulation, public good and infrastructure theory were utilised.

Historical barriers to increasing broadband access include the lack of development finance and infrastructure financing models and lack of dynamic competition in the undersea cable market, as well as inappropriate regulatory instruments and ineffective business models. The main findings include that, more recently, competition at 'critical resource points' such as undersea cable landing stations have led to significant infrastructure investments and a flourishing of several new cable systems using various business models (open, hybrid, closed). Africa as an 'emerging market region' is attracting record inward foreign direct investment in the undersea cable market from Asian firms.

More significantly, these changes have led to new funding and investment approaches by diverse funders, including the World Bank, operators and private equity.

The adoption of open access business models has proven to stimulate competition leading to wholesale and retail price competition, thus reducing prices and increasing broadband usage, demand and diffusion, and contributing to regulatory innovations, development applications and socio-economic outcomes.

CHAPTER 1: INTRODUCTION AND RESEARCH PROBLEM – UNDERSEA CABLE SYSTEMS AND GLOBAL CONNECTIVITY

Telecommunications is inextricably linked to national economic growth and development, nation-building, rural development, democracy promotion and generally has positive multiplier socio-economic effects in societies (Hudson, 1984; Benjamin & Dahms, 1996).

Telecommunication networks are the foundation of the IT-driven knowledge economy and the core platform for the Internet- the transforming global economic and social technology of the 21st Century. The Internet uses the global Internetworking protocol (TCP-IP) as an enabler of connectedness for business and social communication. Hence, both telecommunications networks and the Internet are inextricably linked to the current wave of globalisation of information, finance, flows of trade and services and knowledge (ITU, 2009; UNCTAD, 2009; Castells, 1998; Benkler, 2006; Jagun, 2008). When Alexander Graham Bell made the first telephone call in 1875 it was certainly pioneering. However, it was only in the 1920s that a national network for the United States of America was established by AT&T. Only then did the full value of national long distance exchange become possible as investment by banks, financiers and news agencies commodified telephony (Malecki, 2002; Drahos, 2003).

The Internet is the most significant recent inter-generational general purpose technology and the key technology of the fifth Kondratief cycle of the 21st century (Malecki, 2002). According to Helpman (cited in Malecki 2002), it is one of a small number of technologies that creates innovational complementarities and increased productivity in all downstream sectors. It is increasingly referred to as a General Purpose Technology (GPT), because of its massively large scope of use, user participation in improvement and its general complementarities. And on a scale of 'historical technology significance', its emergence is similar to the advent of the printing press and electricity, lasers, mass production and flexible manufacturing, with similar impact and contributions to economic development, industrialisation and modernisation (Lapsey, Baker & Carlow, 1998). Utilising the Internet for economic transactions and social communication assumes access to undersea cable networks as one of the core means of delivering content via the Internet. This chapter sets the scene for the discussion and analysis of undersea cable business models.

The basic telegraph was delivered by international early Trans-Atlantic cables. Today, international undersea fibre optic systems circle the global and can deliver Internet (millions bits per second per fibre optic) at speeds to a global market and all regions of the world. Undersea cables are the 'digital arteries' and have seen mega growth with of over 300 undersea cable systems in operation (Southwood, 2008).

Like telecommunications, the Internet's evolution, growth and global diffusion path follows a similar trajectory. Its initial development was largely financed and 'incubated' by governments – in particular the USA government through ARPANET – the Internet's predecessor in the 1960s; the development of World Wide Web protocols by Europe's high tech CERN Institute in the 1970s and 1980s injected significant public R&D in its foundational infrastructure, standards, inter-operability and early phase development. Its business potential was recognised by large firms, and particularly large banks were central in development of high-speed data technology that earlier influenced the telegraph and its development. The Internet's 'economic value effects' make it easier and more profitable to move invisible, intangible goods than physical goods and hence the rapid growth of various industries like e-commerce, online entertainment and financial services. A third feature common to telecom networks is its 'systemness spectrum' - its multiple simultaneous nodes - which illustrates the network-economics effect whereby the more users on the network, the more valuable it becomes. Hence, an inherent incentive for mass roll outs of digital networks drove investment decisions of global telecommunications corporations in the 1990s and 2000s (Malecki, 2002).

In recent years, the Internet has been subject to rigorous intellectual and policy debate across disciplines – in political science, public policy, law, economics, sociology, critical media studies, and anthropology. The 'critical school' contends that the Internet must be seen in context of the prevailing inequities in the world system and a 'continuation of capitalist mode of wealth accumulation' (Castells, 1998). By virtue of its global reach and inter-network logic, it is generating a 'new space of flows' whereby finance, investment and knowledge are opening up immensely profitable possibilities.

But many barriers to its access remain for large parts of the planet and local neighbourhoods (UNDP, 2005; ITU, 2005; APC, 2008), partly due to lack of or highly priced international backbone connectivity via undersea cables. This 'critical school' contends that information and Internet inequities also contribute to a deepening of the current 'development divide' between developed and developing regions- especially Africa and within nation and city-states, by creating new nodes of exclusion, thus deepening existing developmental and social divides at global, regional and local-community level (Castells, 1998).

However the Web is also generating negative externalities or 'public bads' such as spam, privacy and security breaches, pornography and on-line child trafficking, which require public interest regulation, increased regulatory compliance and monitoring, which adds greatly to transaction costs and introduces a multitude of regulatory challenges for the Internet society (IGF, 2010).

It is not surprising that at the dawn of the 21st Century, global debates on 'information society' and Internet policy have been elevated to the United Nations level. The ITU's recent WSIS summits in Geneva (2003 and Tunis (2005) and the follow-up annual Internet Governance Forums (IGF) incorporated a multi-stakeholder approach that included divergent parties from Google, US Dept of Commerce, the Chinese government, to global NGOs such as the Association of Progressive Communications (APC) and professional associations like ISOC, IEEE - all of which have special interest in the Internet's future (Jagun, 2005; UN ICT Task Force, 2004). Key policy pertaining to issues ranging from critical Internet resources (IPv4 & 6 numbering), access, copyright, multilingualism and local content, privacy & security and open standards are major sub-themes that are currently being debated at the UN's IGF whose mandate has been extended for another three years (APC, 2010).

1.1 Broadband for Development in context with global UN initiatives

In September 2010, and on the eve of the 10th year of the UN review of the UN Millennium Development Goals (MDGs), the ITU/UNESCO's new Digital Commission for Broadband Development (DCBD) formally launched its *2010 Declaration of Broadband for Inclusion for All* at the UN General Assembly with a clarion call for an inclusive broadband agenda:

We believe that the Internet should be used for the benefit of mankind. Beyond any physical and virtual infrastructure that has preceded it in the industrial revolution or information age, and as a catalyst of and critical enabler for recovery in the wake of the global financial meltdown, broadband will be the digital invention and innovation and foundation for digital and other investments that lie at the very heart of our shared knowledge economy and society... (ITU, 2010, p: 5)

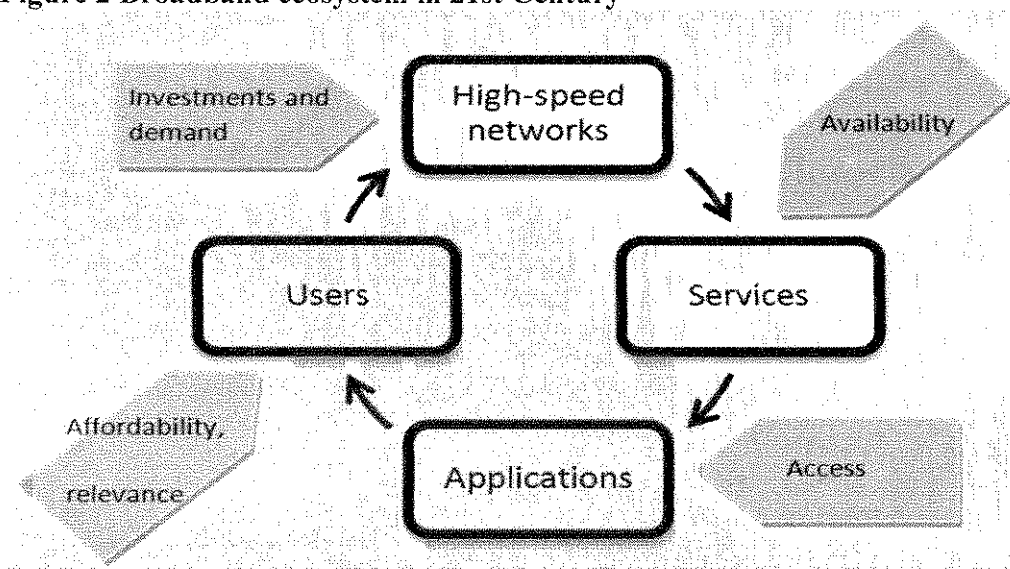
It is significant (and not surprising) that one of the recommendations of the ITU/UNESCO Broadband Commission, recommendation 3.1, calls for investments in 'future proofing technology' (ITU DCBD: 6). *'Optical fibre is desirable at the core of the Internet, and for the majority of backhaul traffic, to achieve a high-capacity backbone..'* And it is international undersea optic cables that will deliver the high speed broadband networks for both developed and for developing regions.

Re-defining the broadband ecosystem for the 21st Century

According to the ITU's declaration, broadband has evolved due to rapid proliferation of new technologies (fibre, wireless, SDH) and the advent of spectrum availability due to spectral efficient technologies and digital TV migration. However, the broader issue of universal service and access in many developing regions and countries persists. Policy makers and business and the academic community are working collectively to develop the tools and technology and modes for broadband delivery. Key inhibitors to broadband usage include: costs, lack of access, digital literacy, and relevance (Bowen, H, 2010, Hernandez, J, 2010). The notion of the 'broadband ecosystem' is a dynamic one as it recognises the dynamic interaction and relationship between 'supply-side' factors and demand-side stimulation and usage patterns.

According to current debates within the ITU, to expand this broadband ecosystem policymakers must continue the traditional focus on the supply of access networks (wire-line, fixed, wireless broadband networks) as they are the critical pipeline linking the other elements in the ecosystem. To complement the supply inputs, *demand-side* stimulation requires smart policy and regulations (open access, essential facilities, interconnection) to promote usage. More importantly, it recognises that once non- adopters have Internet access – the focus is then on appropriation - the cost of access, devices, digital literacy and relevance of services are the main obstacles to promoting the sustainable subscriber.

Figure 2 Broadband ecosystem in 21st Century



Source: Hernandez, J, ITU GSR, 2010,

In order to develop the broadband ecosystem - as illustrated above – as well as to promote its use as a general purpose technology, it requires that the foundational components need to be in place as well as the development of policy and regulations and programmes that promote broadband development in and integrated use.

The new broadband ecosystem includes the following components:

- *International Internet connectivity and cables:* the global interconnectivity networks of undersea fibre optic cables, satellite and other related infrastructure

- *Backbone networks*: These are essentially the high capacity communications' facilities that carry traffic between at least two major nodes, and consist of fibre optic, satellite, or terrestrial wireless systems. High capacity backbone networks are essential for broadband connectivity as they link access networks to end users.
- *Backhaul access*: Backhaul refers to the links' need to transport traffic from a geographically distant point (wireless base station) to an aggregation point in the network, such as mobile switching office. Backhaul costs can constitute a significant portion of network operations' costs (especially mobile operators). It's important that competitive and well functioning wholesale markets for backhaul connectivity are a critical component for broadband diffusion uptake.

Investment in broadband infrastructure and new generation networks (NGNs) are believed to be a significant contributor to economic growth and confirmed by empirical studies. Greenstein, McMaster and Spiller (1995) show that a doubling of fibre optic cable infrastructure leads to an increase of more than 10% in economic activity. Similarly, in OECD countries, Roller and Waverman (2001) found that there is a positive causal relationship between broadband investment and economic growth while 10% increase in broadband leads to an average 2.8% of GDP growth (Cambini & Jiang, 2009).

Access gap remains for the 'next 2 billion' and Sub-Saharan Africa

However the access to broadband in the developing world and poor regions remains. Significantly, the ITU's recent WSIS summit (2003 and 2005) and its Internet Governance Forums (IGF) (2006-2010) focused on Internet access and the connecting of the 'next 2 billion' as a core theme (Jagun 2008; Currie 2008, APC, 2009). A special focus on Sub-Saharan Africa and Least Developed Countries (LDCs) identified the need to promote investment in international and regional backbone connectivity, setting Internet exchange points (IXPs), as well as international accounting reforms that hinder its Internet access and diffusion (ITU WSIS Plan of Action 2005).

At a recent ITU's *Connect Africa* summit held in Kigali in 2007, multi-stakeholder donors which estimated that Sub-Saharan Africa would require at least USD50 billion over the next 10 years to meet its telephony and Internet access targets (ITU Connecting Africa, 2007).

1.2 Sub-Saharan Africa: The 'Missing Link' in global Internet connectivity, access and usage

Sub-Saharan Africa is the one region that is experiencing severe challenges with regards to Internet *accessibility, availability, affordability and usage*. Internet, mobile and broadband prices in Sub-Saharan African are the highest in the world. This is a paradox given Africa is the poorest region in the world and needs low cost basic services to meet its Millennium Development Goals (UNDP 2009). A recent International Telecommunication Union (ITU) report shows that the cost of a broadband connection/service in Africa is, on average, about USD 110 for 110 kilobits per second. This represents over 96% of its typical GNI per household income level! As a result, only a paltry 2.1% of the population is connected to broadband (ITU 2008). By contrast, in Europe and Central Asia the same type of connection costs USD 20 while in Latin America and the Caribbean, it is just USD 7. The Middle East and North African countries pay less than USD 30 (ITU, AfDB African Economic Outlook Report, 2009).

Table 1 World Internet Statistics showing disparities of Internet usage

World Regions	Population (2008 Est.)	Internet Users Dec/31, 2008	Internet Usage Latest Data	% Population (Penetration)	Usage % of World	Usage Growth 2000-2008
Africa	956,206,348	4,514,400	51,065,630	5.3 %	3.6 %	1,031.2 %
Asia	3,776,181,949	114,304,000	578,538,257	15.3 %	38.5 %	406.1 %
Europe	800,401,066	106,096,093	384,633,765	48.1 %	26.3 %	266.0 %
Middle East	197,090,443	3,264,800	41,938,209	21.3 %	2.8 %	1,176.8 %
North America	337,187,248	108,096,800	248,241,969	73.6 %	17.0 %	129.6 %
Latin America/Caribbean	576,091,673	18,068,919	139,009,209	24.1 %	9.5 %	669.3 %
Oceania/Australia	33,981,562	7,820,488	20,204,331	59.5 %	1.4 %	165.1 %
WORLD TOTAL	6,676,120,286	360,955,492	1,463,632,361	21.9 %	100.0 %	305.5 %

NOTE: (1) Internet Usage and World Population Statistics are for June 30, 2008. (2) CLICK on each world region name for detailed regional usage information. (3) Geographic (Population) numbers are based on data from the [UN Census Bureau](#). (4) Internet usage information comes from data published by [InternetWorldStats](#), by the [International Telecommunications Union](#), by local NIC, and other reliable sources. (5) For definitions, disclaimer, and navigation help, please refer to the [Site Surling Guide](#), now in ten languages. (6) Information in this site may be cited, giving the due credit to [www.internetworldstats.com](#). Copyright © 2001 - 2008, Minixia Marketing Group. All rights reserved worldwide.

Source: Internet World Statistics, www.internetworldstats.com

The table above shows Sub-Saharan Africa's paltry share of Internet access and usage. With almost a billion in population, it has the lowest penetration rate in the world, but rapid usage growth rates suggest high demand.

Sub-Saharan Africa (SSA) is also the poorest region of the world and the region unlikely to meet the Millennium Development Goals (UNDP, 2009). African consumers often pay the highest prices for services such as telecommunications, health-care, textbooks, medicines, bank services and have weak consumer services and consumer protection legislation (UNCTAD, 2009). Furthermore, lack of investment in key economic infrastructure such as transport, railways and ports means that distribution of goods to ports and market are on average over three times the global average, leading to the high cost of goods and leading to ‘economic drag’ – resulting in many African nations being low on global competitive rankings.

In fact, of the 50 lowest performing economies on the WEF’s global competitive rankings, 33 were from Sub-Saharan Africa (AfDB, 2009; WEF, 2009). Telecommunications and broadband are often cited by developmental analysts as key economic infrastructure enablers. Firstly, they represent a key input resource for general business infrastructure and operations, as well as the foundation of the Internet - the key platform for services’ economy and essential for new economy, such as business process outsourcing (BPO), e-commerce and supply chain management services. Increasingly, the need for quality affordable, available and accessible bandwidth is seen as the ‘petrol of the new economy’ (Southwood, 2008) and essential for competitiveness, productivity and growth (UNCTAD, 2009; ITU, 2010; AICD, 2010).

1.3 The Research Problem: Sub-Saharan Africa’s uneven telecoms outcomes

Many developing regions such as Asia, Latin America and Oceania have made good progress with providing Internet and broadband to citizens at affordable rates. In Sub-Saharan Africa Internet access, usage, affordability and hence its social appropriation is the lowest in the world. Several structural, policy, regulatory, investment and other variables have led to low Internet connections and usage patterns in Sub-Saharan Africa.

With over 500 million subscribers and the highest ARPU rates in the world, Africa’s mobile sector is super successful. Yet consumers still pay the highest mobile costs – hence defying economies of scale benefits (GSMA, 2009; Frost & Sullivan, 2010). By contrast, low investment in national telecom networks and backbones means SSA is unprepared for the ‘broadband Internet’ revolution. Africans still spend the highest proportion of monthly household income on

communication services and in some countries as much as 20% of monthly income is invested in basic communication services, which has a detrimental effect on household savings (Gillwald & Stork, 2009).

Access to affordable broadband is increasingly seen as the lifeblood of an information and knowledge economy. Historically, the African telecom market has been subjected to an unfair global Internet interconnection regime, unequal Internet traffic flows, monopolies and weak regulatory institutions that have resulted in *high communications costs & impeded access* (Jagun, 2008; McLaughlin, 2004; Jensen, 2005). Until recently, SSA was the only continent not fully wired to the global Internet backbone network, due to its east coast lacking any fibre network which left 33 African Internet-connected states dependent on prohibitively high cost satellite links (APC, 2006).

The ‘big telecom story’ of Sub-Saharan Africa in the past year or more has seen the flurry of new undersea fibre cable developments with five (5) new developments operational by October 2010 and several more in the pipeline (manypossibilities.net). The SAT-3-WASC and SAFE cables in existence since 2002 have operated on a ‘club-consortia’ model resulting in monopoly access to gateways. The consequences included high access pricing, price discrimination, bottlenecks in essential facilities and paradoxically spare capacity in an era of high demand.

1.4 Purpose Statement

This study investigates how the advent of competition in the undersea cable market and new open access models have influenced business models of undersea-cable systems in Sub-Saharan Africa. It further explores how these changes have impacted on Sub-Saharan Africa’s broadband development. The research investigates Sub-Saharan Africa’s current status of broadband access, availability and pricing and compares the impact of new models and funding approaches and strategy.

The research explores several themes examined in the literature review, thus providing context to the research. These include 1) dynamics of competition, 2) public interest regulation and regulatory governance, 3) business models for undersea cable systems, and 4) infrastructure financing.

By analysing data with respect to several undersea cable systems and national backbone networks, and the impact of the WIOCC open access model in particular, the research explores several trends related to price, diffusion, usage and the impact of regulation on the market. By analysing backbone infrastructure funding models and the emerging business models in this area of the telecom sector, the researcher seeks to better understand how operators and investors ‘co-operate and compete’ in different parts of the value-chain. For instance, infrastructure sharing is being adopted by competing operators who are co-building national backbones and leasing capacity. The research also explores the ‘demand driven’ approaches of innovation as it contributes to Internet expansion, access, usage.

1.5 Research Objectives

A research strategy should be selected according to the purpose of the research and its particular research question (Nichols, 1991; Dobson, 2002). The research design and strategy aims to enable the researcher to collect and analyse data with respect:

- 1) To applicability of *competition theory and policy through the essential facilities doctrine (ECD)* and open access principles’ impact on the telecommunications sector in SSA;
- 2) To analyse the Sub-Saharan Africa *undersea business models*(i.e. private, consortia, hybrid and co-build models) and impacts on *price, access, usage*;
- 3) Assessment of how competition in Sub-Saharan Africa’s undersea-cable is impacting on *Internet pricing outcomes and diffusion* in period (July 2009- Oct 2010);
- 4) Analyse *new generation regulatory incentives* (i.e. open access and infrastructure sharing) and how they are catalysing new national backbone connectivity models (wholesale carriers, third party providers);
- 5) To discuss and dissect new approaches to infrastructure development financing models in the telecommunications sector in SSA.

Problem Element 1: Monopoly bottlenecks of undersea cables is leading to high Internet costs

Until recently, SSA had just one international undersea cable providing Global Internet access- SAT-3/WASC. However, SAT 3/WASC was developed as a closed consortia model in a pre-liberalisation era when national telcos were monopolies protected by domestic law. As more players emerged in domestic markets, more bandwidth services were required but they have been frustrated by the monopoly position of SAT-3-WASC owners who had no incentive to increase traffic on the cable. At one stage, *Angola Telecom* charged USD 20 000 for an E-1 line circuit and VSAT market prices were also very high. Competition has made some impact with the advent of new cables such as Seacom, TEAM, EASSY and others and prices are down (My Broadband, no date). For instance SAT-3 allows open access to landing stations i.e. Neotel in South Africa has access to SAT-3 and Seacom landing stations.

Problem element 2: The ICT Policy and regulatory environment inhibits competition and access to essential facilities

Closely linked to the international Internet bottleneck is the problem of lack of effective regulation and fair competition. Recent supply and demand led studies on African telecommunications (ResearchICTAfrica, 2008-9) show that even in cases where there has been good growth in the telecommunications sector, overall sector performance has been sub-optimal – leaving large sections of underserved communities out of the national service. Telecom analysts refer to this as the need to intervene in ‘imperfect markets’ where monopolies extract high rents, oligopolies conspire to price-fix in competitive markets, resulting in high prices for basic services (i.e. high mobile termination rates) (Gillwald & Stork 2009). Crucial deficit is that many surveys revealed that the Internet featured sparsely in Africa telecom usage strategies due to perceptions of unreliability, poor network quality, limited bandwidth and high costs and in a 2007-8 survey of 16 African countries usage rates, less than 5% of households surveyed had Internet connection, with many below 1% penetration (RIA, 2008).

To respond to this problem, an effective regulator not only has to promote fair competition, but has to respond to market failure and ensure equity and inclusion.

Problem Element 3: Open access and participation models can lead to competition by generating dynamic business models

The research is significant in the current wave of telecommunications investments. As of December 2010, there were five (5) new undersea optic cables by October 2010 (Seacom, EASSy, TEAMS, Glo-1, LION,) and several more are in the pipeline for 2011 and 2012. Significantly, different ownership models such as private, hybrid, closed, private-public, carrier owned, with a diverse investor base, have created a new competition dynamic. However, the ‘access gap remains’. Socio-economic and ‘public interest’ objectives have driven many governments and MDI funders like the World Bank’s International Finance Corporations (IFC) to call for the adoption of ‘open access’ models that lead to competition as well as lead to ensure strong socio-economic outcomes.

An innovative open access model is the East African Submarine Cable System (EASSy) which allows for a special purpose vehicle (SPV) called WIOCC, which is owned by smaller telcos from landlocked countries who have shares in EASSy, allowing them first tier wholesale prices for their downstream operations. Lopsided supply investments that provide excess capacity in wholesale supply (i.e. low cost wholesale bandwidth via submarine cable), lead to overcapacity. The lack of critical domestic fibre investment and backbone network at local level is crucial.

1.6 Significance of the research study

The study is justified as a *public policy and advocacy study* in context of contemporary policy debates in the ICT and telecoms sector, and its approaches regarding *funding, licensing and regulating backbone connectivity networks in developing regions and in Africa* (UN WSIS, 2005, ITU, 2009). The proliferation of multibillion dollar commitments to build seven (7) undersea cables in Africa is a signal that ‘there is a market to meet Internet and bandwidth demand’ for the continent to develop its knowledge society.

The institutional, policy, regulatory and various business models of each of these large scale telecom businesses are complex and multi-layered. The research takes place against the backdrop of major technological transformation and the rise of IP based networks, and part of the complex evolution and necessary institutional building of ‘regulatory foundations of network economies’

(WDR, 2005). The multiple undersea cables and terrestrial backhaul access at country level will be multi-layered and complex. It will make recommendations on the capacities and resources required by telecom regulators in an increasingly complex environment. It seeks to draw lessons from Africa's only international fibre cable (SAT-3/WASC), and caution on repetition of mistakes of anti-competitive behaviour and unfair competition.

Secondly, in context with the UN WSIS Plan of Action (POA), the development of international and regional fibre backbones as well as demand driven models are seen as crucial steps in bridging Africa's digital divide. More specifically, and in context of the global financial meltdown, new approaches and regulatory practices such as 'infrastructure- – sharing' has seen prominence by the ITU, as evidenced by its 2008 Global Symposium of Regulators (GSR) theme. Africa requires well capacitated and well resourced independent regulators to support and ensure effective and fair competition and a commitment to users and consumers and citizens.

Finally, in context of global financial crisis, the developmental discourse has changed significantly with the role of states, multilateral funding institutions and private investors and the complex interplay and institutional (and funding) models around infrastructure financing. The provision of infrastructure (roads, telecom, railways) are viewed as crucial supply-side inputs in order to bolster public social infrastructure recognised in the Millennium Development Goals (MDGs) as crucial inputs (R&D, infrastructure, human capital investment). Finally, this research is meant to contribute to the dynamic and robust debate on ICT for Development discourse and the roles *public, consumer and academic networks are playing in the development of the Internet* in this issue and in the context of bridging Africa's digital divide and the UN/ITU's goal of 'connecting the unconnected by 2015'.

1.7 Limitations of the research study

The Sub-Saharan Africa undersea cable market is very complex due to rapid growth of new international cables. It has become more competitive and all major operators as well as international operators and content providers such as Vodafone and Google have major investments. The researcher found it challenging to get detailed information and market statistics from the various owners SAT-3/WASC, EASSy, Seacom consortia due to 'commercial confidentiality'. Furthermore, it was easier to get key informants to share information in face-to-face interviews than in the two skype interviews conducted.

A further limitation is the dynamic nature of data, as it changes constantly. The Seacom cable commenced operations in July 2009, EASSy in 2010, TEAMS in 2010, and given that the research is current, it was a challenge to collect 'up to date' data and bandwidth data.

CHAPTER 2 OVERVIEW OF TELECOMMUNICATIONS AND UNDERSEA-CABLE EVOLUTION IN INTERNATIONAL CONNECTIVITY NETWORKS

This chapter will give a brief historical overview of the international telecommunications industry and the emergence of the undersea cable market and its dynamic evolution. More specifically, it will assess the impact of inter-generational technological shifts (i.e. analogue to digital, fibre optics light technology, other) and competing technologies (i.e. satellite, wireless) and its effects on the business and investment models of the undersea cable industry/market. An assessment will be conducted of the new telecommunications value chain and re-organisation through global alliances and joint ventures in the context of competition and deregulation of the telecom industry in the past decade of post-WTO Basic telecom reforms. It will then assess current developments of undersea cable *usage, ownership patterns and regulation*, as well as the geo-economic shift towards ‘emerging markets’ and regions of Asia, Africa, Latin America.

2.1. History and evolution of international telecom and undersea cable industry

The impact of telecommunications on the global scale began in 1844 with the telegraph, “the first effective mechanism for telecommunications” (Hugill, 1999 cited in Malecki, 2002). Almost immediately, businesses - especially banks and news agencies - took advantage of the ability to send and receive information in the new “global electronic space” without simultaneous human movement (Beniger 1986; Headrick 1991; Gabel 1996; Rantanen 1997, cited in Malecki, 2002). It can be argued that the international telegraphy was a first case of telecom technology enabling trade routes and patterns while also serving the political and administrative functions of the British empire. And it was the vested interest of private capital and news agencies that funded early cable ventures. In 1861 the first Trans-Atlantic Cable (TAT-1) laid the foundation for the growth of a unique industry that saw rapid deployment of several TATs over many decades. It is a significant observation that in the 21st Century leading investment bankers and news agencies (i.e. JP Morgan, TimesWarner/AOL,) are lead investors in global cable systems (Malecki, 2002).

Submarine cables have been a key feature of empire since the 1850s when Britain was a leading colonial power and driven by imperatives of managing its colonies through transcontinental

administrative systems (Malecki, 2002; Wei, 2006). An intensive period of investment activity from 1866-1886 effectively resulted in most of the 'world being wired'.

Significantly, most of the investment was private, with only a small portion subsidised by government (Headrick, 1991, cited in Malecki, 2002). Hence, by 1892, the world had 246 871 km of cables laid out of which 89.6% of the length was privately owned, and the balance of 10% was government owned- mainly connect small islands. Undersea cable ownership, equipment and knowledge were held by the British elite who owned 267 private cables, representing 63.1% of the world total.

International telecommunications have always been linked to political dominance of the hegemonic global powers of the day and its growth imperatives, and ownership patterns generally mirror global economic, political and social power of each inter-generational era. For instance, the United States' first Trans-Pacific cable project was a response to the fact that its transcontinental messages from its Philippines' colony were travelling on rival British cables. Japan invested considerable resources to 'reverse engineer' telecoms technology so it could establish new capability in this strategic industry in the post-World War 2 era, and it emerged as a leading global player and exporter of telecom, ICTs and electronics in the 20th Century (Malecki, 2002). The mega Wikileaks release of over 250 000 secret US state department cables by this NGO in late 2010 have demonstrated that power in the 21st Century society is being distributed and increasingly conferred to citizens or 'netizens'. (Shirky, 2011).

Similarly, at the dawn of the new millennium, with the financial downturns of the past decade- the 2001 dot.com bust and the 2008-10 US mortgage debt-induced global economic recession- have seen a qualitative and quantitative geo-economic and political shift to developing nation blocks such as the G-20, G-77 and the Brazil -India China- Russia (BRICS) constellation of nations and regions.

The African Union (AU) too is playing an important role in global forums in international economic governance. In particular, East Asia - led by China, India, South Korea - as well as Brazil, South Africa, Nigeria, Mexico and Turkey are seen as new 'engines of global growth' with GDP rates averaging 8% p.a. accounting for a higher proportion of global trade in goods,

services, electronics, and Intellectual Property Rights (IPR) and not surprisingly, Internet and broadband usage (Van Agtmael, 2007; ITU 2009; UNCTAD 2010).

Significantly, new patterns of investments from G-77 and BRICSA nations are not only recipients of traditional FDI from industrialised north triad (US, EU, Japan), but are now exporters of outbound FDI to both developed and developing regions - reflecting new South-South trade and investment patterns. For instance, China's state-owned multinational corporations like CNOOC are lead investors in energy resources - especially in Africa - and Huawei is a lead telecom *vendor – infrastructure investor* in Africa. India's Tata, Bharti, VSNL, Infosys and Reliance groups are global players in the IT and telecommunications industry as well as key investors in many global major undersea cable systems (FLAG NGN, SAT-3/WASC; Unity); Korea's Samsung is a leading mobile device manufacturer in the world today (Agtmael, 2008,).

One can argue that the current wave of global undersea fibre optic investment mirrors the global ambitions of emerging powers in the shifting economic, social and political geography of the Internet in the 21st century (Malecki, 2002). Another trend in private investment and FDI is that while North-South FDI may have declined, continuing rapid rollout and the far less significant drop in total telecommunications investment as measured by the ITU (where 2002 investment remained higher than 1999 levels) suggests that South-South and domestic financing, combined with retained earnings, have grown sharply enough to stave off any collapse in sector growth. Mobile telecommunications have been the success story of African telecom and have attracted massive FDI flows and shown the robust nature of the African market as seen by several high level FDIs in telecom.

In Africa, Zain Telecommunications' purchase of Celtel at USD3.2 billion in 2006; Bharti Airtel's 2008 USD10.8 billion purchase of Zain' telecom (now Airtel Africa); Telkom SA's purchase of Multilinks Nigeria; and MTN's purchase of Investcom as well as its forays in Africa and the Middle East market, all indicate that emerging and African markets are lucrative. Hence, Japan's NTT's outright acquisition of South Africa's Dimension Data group again proves that the African telecom, ICT markets are robust and attractive for global investors and shareholders.

2.2 Global telecommunications privatisation of the 1990s and impacts

In terms of the global telecommunications sector, the WTO driven telecom liberalisation directives of 1996 have been central in the internationalisation of global telecom that led to the opening of international markets. This led to the massive wave of privatization and FDI in the developing world, thus changing traditional market structures as well as telecom firms' value chain -thus spurring new models of investment across value chains (Whalley, 2002).

2.2.1 Changing nature of Telecom as the traditional 'natural public utility monopoly'

Telecommunications, like electricity, water and gas were seen as traditional public utilities with public interest obligations. Infrastructure services are essential to economic and social activity and civil life and thus strong public interest in ensuring that they are accessible and available to all citizens. Hence governments' policy is that that they are treated differently for market failure and public interest. Melody (2005) contends that the experience of the infrastructure industries a century ago in the US led to major instabilities in prices and supply, and led to destructive competition and collusive oligopoly, leaving large segments of the population without service. A key characteristic of network industries is that they are inter-dependent on a number of players and require regulation, namely to protect the public interest. The inherent tension between public interest goals and profit seeking and maximisation is key theme and debate in new generation network roll outs.

2.2.1 WTO's privatization framework strategy of the 1990s

Liberalisation is essentially a political-economic process which has its roots in the 1970s and 1980s shift towards deregulation and restructuring of economies. Driven mainly by IFIs like the World Bank and the US and UK governments as an ideological mechanism that essentially lobbied for the reduction of the role of the state, it opened opportunities for private sector participation across sectors and across the world.

For Sub-Saharan Africa this process commenced in the 1980s with a series of World Bank Structural Adjustment Programs (SAPs) reforms which implemented exchange controls, privatised SOEs, dismantled of price controls of state subsidies. Mkwandawire (2010) argues that the SAP's effectively dismantled the capacity of the African state and ...reduced it to an anaemic, regulatory state' (cited in Edidhegi, 2010).

Parker and Kirkpatrick describe the policy roots of liberalisation and privatisation agendas as driven by developments in *new economic theory* such as the principal-agent theory which emphasized the importance of private property creating optimal incentives for investment and rate of return. *Public-choice theory* advocates defended this approach by often citing critical evidence from studies of bureaucratic elite behaviour models where agents of government act in own interest and own behalf of 'special interest groups' that stifled allocation of resources and distorted competition and optimal functioning of markets (Edidhegi et al, 2010).

Privatisation activity grew significantly in developing countries during the 1990s. Estimated privatisation revenues totalled USD250 billion between 1990 and 1999 (World Bank, 2001). Infrastructure privatisation, mainly in telecommunications and power, accounted for a large share of these privatisation sales. Foreign participation in developing country privatisations has also increased and reached 76 % of total proceeds in 1999, of which foreign direct investment accounted for 80%.

Table 2: Telecommunications investment requirements for developing regions

Table 10: Telecommunications Investment Requirements		
Annual Requirements for Developing World Telecommunications Investment, 2005–2010		
	New Capacity	Maintenance
Developing World, US\$ millions	104,986	82,040
Developing World, % GDP	1.24	0.96
Sub-Saharan Africa, US\$ millions	3,814	2,834
Sub-Saharan Africa, % GDP	0.82	0.61

Source: Fay and Yepes (2003).

The formation of the World Trade Organisation (WTO) in 1996 ushered in a new era for global economic regulation as it was a binding body within the rules based trade system. A key component was the creation a Global Agreement on Trade in Services (GATS). The WTO Basic Agreement on Telecom was signed by 72 countries in February 1997 and was a key catalyser of massive FDI and privatisation in emerging markets in the developing and developed world. Its

first and main principle was market access which subsequently opened the way to the servicing by and the establishment of foreign operators in the national markets, globally.

Secondly, the principle of national treatment or most favoured nation (MFN) status meant that all actors must be treated equally – effectively giving foreign operators equal treatment in local markets, thus eroding the system of subsidised pricing in local markets. It also affected the accounting rate system that has prevailed in international telecommunications for decades. In this case the removal of the accounting subsidies via the FCC Telecom Preservation Order of 1997 that developing countries received from Northern operators (up to USD 10 billion p.a.) were removed. This key form of income for national telcos - normally used for universal service extensions in developing regions - was abruptly removed.

The ITU even set up a dedicated study working group on accounting reform to assess its impacts (Melody, 2000; Henten, 1998; Jensen, 2005), but rapid transition from PSTN to digital networks and competition eroded the accounting rate system. Thus, both aspects of the process of internationalisation are affected – both settlement and international traffic that gave global operators market access and key outcomes unfavourable for developing regions such as Africa. For instance, the settlement extended to the Internet traffic termination where Africa ISPs paid for both end of termination costs, thus resulting in a perverse ‘reverse subsidy’ from poor to rich nations (McLaughlin, 2005; Jensen 2005).

Subsequent WTO GATS Protocol 4 agreements went further with the ‘institutionalisation and domestication of reforms’ by prescribing additional commitments, detailed provision for telecom reform and a set of indicators for adherence. Schedule 4 commitments included: *independent regulation, interconnection, competitive safeguards, licensing, allocation of scarce resources tariff regulation and universal service*. These fortified WTO commitment into domestic telecommunications legislation and institutional development. The ITU regulatory statistics estimate that 120 countries have separate telco-sector regulators, managing telecoms market development and regulating competition in the sector.

As a result of the late 1990s' WTO and GATS reforms, private participation in telecommunications reached astronomical levels. The private participation in infrastructure database (PPID) that captures outside private investments in telecommunications projects in developing countries suggests that investments in infrastructure projects with private participation totalled USD210 billion 1992–2000. This is equal to 60% of the ITU's estimate of total investment in telecommunications in developing countries over that period, although the two numbers are not exactly comparable (World Bank, 2003).

According to the World Bank, 111 countries have attracted private participation in telecommunications infrastructure worth more than 1% of their GDP in aggregate over the period spanning 1990 to 2002, including 34 countries in Africa. Sixty-six developing countries have attracted private participation in telecommunications infrastructure worth in aggregate more than 5 % of their GDP over 1990–2002, including 14 in the Sub-Saharan region. Between 1990 and 2000, over 350 private operators began providing mobile services in more than 100 developing countries. By 2003, among all 164 countries with available data, 130 had three or more competing digital mobile operators (Qiang, 2004). In Africa, the top six (private) strategic investors in mobile had total revenues in 2003 estimated at USD7 billion, with profits of USD800 million (World Bank, 2003).

The four types of projects included in the World Banks' PPI Database are the following:

1. *Management and Lease Contracts*: A private entity takes over the management of a state-owned enterprise for a given period. The facility is owned by the public sector, and investment decisions and financial responsibilities also remain with that sector.
2. *Concessions*: A private entity takes over the management of a state-owned enterprise for a given period during which it also assumes significant investment risk.
3. *Greenfield Projects*: A private entity or a public-private joint venture builds and operates a new facility for the period specified in the project contract.
4. *Divestitures*: A private entity buys an equity stake in a state-owned enterprise through an asset sale, public offering, or mass privatisation programme.

2.3. The telecommunications value chain network and evolved business model

Prior to deregulation and rise of IP based digitised networks, the traditional telecom model was divided into three traditional segments and operated as single vertical pipes. The phone carried voice, LAN/WAN networks carried data and broadcast networks carried video. Each network in this system was essentially closed with vendors providing hardware, software and services in a closed environment. Given the Internet's network effects it naturally the most economical way of distributing, and its an open system and standards, different companies launched products and services- hence customers were no longer tied to one service provider. This could be described as 'disruptive competition' as the vertical disintegration of pipes- thus opening up the market to a multitude of players dynamic market effect (Whalley & Joh, 2002).

Table 3 Value chain of new generation networks

LAYER	ACTIVITY	EXAMPLE COMPANIES
VI	<i>Customers/Consuming</i>	-
V	<i>Applications Layer, including contents packaging</i> (e.g. Web design, on-line information services, broadcasting services, e-commerce etc)	Bloombergs, Reuters, AOL-Time Warner, MSN, Newscorp, etc
IV	<i>Navigation & Middleware Layer</i> (e.g. browsers, portals, search engines, directory assistance, security, electronic payment, etc)	Yahoo, Netscape, Vizzavi, Genie, etc
III	<i>Connectivity Layer</i> (e.g. Internet access, Web hosting)	IAPs and ISPs
TCP/IP INTERFACE		
II	<i>Network Layer</i> (e.g. optical fiber network, mobile network, DSL local network, radio access network, Ethernet, frame relay, ISDN, ATM, etc)	AT&T, BT, NTT, WorldCom, Qwest, Colt, Energis, Vodafone, NTT DoCoMo etc
I	<i>Equipment & Software Layer</i> (e.g. switches, transmission equipment, base stations, routers, servers, CPE, billing software etc)	Nortel, Lucent, Cisco, Ericsson, Nokia, etc

Source: M. Fransman, <http://www.TelecomVisions.com>

The table above dissects the new generation value chain model whereby business services are being offered at the different layers (Fransman, 2002).

He cites transaction cost theory to explain the patterns of relationships in the telecommunications network. Its premise is based on two approaches which companies organize activities:

- 1) internal hierarchical structure that integrates activities in management structure, and
- 2) the market relationship with external firms. Here the company decides to provide or buy services when required and the boundary of the firm is defined by equilibrium between lower transaction costs of internal and the lower agency costs, and economies of scale of outside procurement (Fransman, 2002).

The growth of digital undersea fibre optic cables has enabled the acceleration of business 2.0 a term referred to as Internet-driven businesses. Osterwalder (2004) builds on this by dissecting new telecom 2.0 business models and show how they have spurred new business approaches such as infrastructure sharing, social networking, e-commerce channels, mobile virtual network operators (MVNO). These new generation business models are drivers of the most successful e-businesses in the world today.

2.4 The global telecom dot.com bust of the 2001-2002 and its impacts

It was the famous 'dot com bust' - a period referring to the crash of US NASDAQ tech index in 2001-2 - saw structural shifts in the industry as well as large scale bankruptcies of global telcos, which holds key lessons for new generation investments. Essentially, large scale investments flowed into major undersea cables – most of which were de-linked from sound business and network planning principles, and thus led to a large scale collapse of new major US global telecoms (Townsend, 2003; Luz, 2010). It's important to add that once undersea cables are built, they exist, and even though their owners may go bankrupt (e.g. WorldCom) cable ownership changes and the cable is nearly always operational, a standard feature of their 'business model.'

According to Cheung (2003) there were a number of factors that caused the 2001 dot.com bust slowdown in the global economy, which began during the third quarter of 2000. The telecom industry has been one of the major contributors to this economic downturn. It's important to state the attributes of the telecoms industry is multi-faceted and straddles equipment manufacturing and networks that are the core foundational technologies for global business and service economy.

Among the factors is the capital structure and liquidity, the hyper-competitive market and inevitable market logic that over-supply will create price wars and intense competition leading to lower revenue and thus longer lead times to pay shareholders. Over the years, a huge amount of capital was invested in the telecom industry, resulting in ‘too many companies producing too many products’ – or hyper-competition. The telecoms network became overbuilt, and bandwidth was oversupplied, and it is a key economic principle that more supply than demand will inevitably cause fierce price competition (Cheung, 2003).

Table 4 Key drivers that led to telecommunications bust cycle in 2001

Business draggers	Results
3G license auction bids	Heavy financial burden on 3G telecom operators; financial institutions hesitated to continue to support telecom carriers; triggered the global telecom industry slowdown
Uncertainty about 3G profitability	Created a negative impact on the stock performance of the mobile service industry
Network overbuild and brutal price competition	Investors began to question the validity of the telecom service industry's business model and profitability
Heavy debt among telecom startups and dot.coms	Short of investment capital and most of them end up in bankruptcy which contributed to the tumble of global stock markets
Bad loans by telecom manufacturers	Caused severe financial damage on telecom manufacturers
Second-hand equipment	Worsen the sale of new telecom equipment
B2C and B2B investment cuts	Generated a downward spiral effect on the telecom and related industries
Write-offs on acquisitions	Deepened the financial crisis on the telecom manufacturing industry

Source: Cheung, 2003, Telecommunications Policy, Vol 26.

Cheungs' evidence-based assessment reinforces the thesis of how the negative cycle contributes to negative profit margin dampened by capital spending among telecom service providers. Thus, decreased spending created a downward spiral effect on the telecommunication industry for both service providers and manufacturers. Cheung identifies the other key ‘dragging factors’ which have contributed to the 2001-2002 downturn and bust of the telecommunications sector. They include: *3G licence auctions; uncertain 3G profitability; network over-build and brutal price competition; heavy debt among telecom start-ups and dot.coms, bad loans by telecom vendors; second-hand equipment; B2C and B2B investment spending cuts by corporate America.*

A key factor and catalyst was that the large wave of 3-G auctions in Europe was highly overpriced and speculative and by 2000, European carriers had paid over Euro110 billion for 3G licence fees and were also debt laden. This up-front licence cost was huge even before a cent has been invested in the actual 3-G network rollouts. On the backdrop of lower rate of returns per user, banks hesitated to lend and stockbrokers downgraded future earnings. The other driver was the de-regulation wave of the 1990s introduced massive competition and thus caused excessive overbuild.

Leading Wall Street stockbroker firm Saloman Brothers estimates that telecom operators spent over USD35 billion in 1998-2000 building fibre networks, but managed to achieve only a 5% usage rate. New technology such as fibre enhancement and DWDM routers meant super faster speeds which saw many telcos investing in these to keep abreast of competition. This invariably led to 'broadband price wars' that saw massive reductions of prices for long distance data falling between 20-50 % annually. Furthermore, inefficient business plans and models coupled with corporate governance gaps wiped billions off the Nasdaq stock exchange and saw the inevitable collapse of Worldcom, Global Crossing, Tyco. This led to the major re-organisation of global fibre optic ownership in the 2002 period (Towshead, 2003).

2.5 Business strategy, global alliances and models in undersea cable systems

By the end of the dot.com bust of 2001-2002 many of the larger telecoms behemoths in the US were debt laden. Over USD650 billion of debt had to be written off and some of the biggest names such as Global Crossing, WorldCom and Tyco filed for bankruptcy protection. Many analysts argue that the business model and future planning forecasts were unrealistic and totally wrong. Corporate strategy driven by mergers and acquisitions and pursuit of dominance in the global undersea fibre optic market and corporate governance models biased in favour of executive compensation and inflated bonuses led to this meltdown and bankruptcies (Malecki, 2002).

The funding model of many of the high speed undersea cable assets in the US was mainly by speculative capital. The advent of the dot.com bust and rapid diffusion of the Internet globally and in Asia saw shifts in the transfer of cable ownership to a new generation of investors and operators as well as new global alliances in cable ownership, enabled by trends of convergence and demand for new generation Internet services. Herewith a sample of some of the higher level global cable mergers and acquisitions

a) FLAG NGN is the world's largest global undersea cable system linking Great Britain and Japan by a complex undersea optical fibre cable that will span 27 300 km - more than two-thirds of the earth's circumference. Called the fibre optic link around the globe (FLAG), the backbone of FLAG is third-generation transoceanic optical fibre cable technology. The first two generations carried up to 280 and 560 Mb/s of data per pair of optical fibres respectively. FLAG raises the rate to 5.3 Gb/s. The system will be able to carry 120 000 circuits as 64-kb/s channels on two fibre pairs. So far, 46 international common carriers from Africa, Asia, Australia, Europe, and North America have agreed to buy capacity on FLAG. The US\$1.5 billion project is funded by FLAG Ltd., a consortium consisting of six entities: Nynex Network Systems Co., White Plains, N.Y. (the managing sponsor); Dallah-Al Baraka Groups, Jeddah, Saudi Arabia; Asian Investment Fund of Hong Kong; Telecom Holding Co. of Bangkok, Thailand; Matubeni Corp., Tokyo; and Gulf Associates, New York City. It was bought by Reliance Holdings in 2002.

FLAG's approach in setting up the project was unusual. Most undersea cables have been built by a consortium of international carriers whose purchases of channels, based on projected needs, dictated the capacity of the cable and funded its construction. Instead, FLAG's owners and their lending institutions are furnishing the funds to build the system, and carriers will purchase capacity only when they need it. FLAG NGN was acquired (at a discount) by India's Reliance group in the post-2001 dotcom bust and signalled the entry of Asian investors in the buyout of global undersea cable systems.

SEA-WE- ME 4: The South East Asia-Middle East-West cables system is the most ambitious connecting three continents. On 27 March 2004, a consortium of 16 international telecommunications companies signed construction and maintenance agreements for the new

optical fibre submarine cable system linking South East Asia to Europe via the Indian Sub-Continent and Middle East with Terminal Stations in Singapore, Malaysia, Thailand, Bangladesh, India, Sri Lanka, Pakistan, United Arab Emirates, Saudi Arabia, Egypt, Italy, Tunisia, Algeria and France. The contract is being awarded jointly to Alcatel Submarine Networks, France and Fujitsu Ltd., Japan and the estimated project cost is of the order of USD 500 million. The project will support telephone, Internet, multimedia and various broadband data applications. A SEA-ME-WE 4 Management Committee has been set up to make decisions on issues concerning the project, such as whether it will be possible for new countries to be linked to the project in the future.

SAFE and SAT-3/WASC: The successful African fibre network has been the two segment submarine cable system; SAFE (South Africa - Far East) which links Malaysia and India in the east to South Africa via Mauritius and Reunion and SAT-3/WASC (South Africa Trans-Atlantic - West Africa Submarine Cable) which continues from South Africa to Portugal and Spain in Europe with landings at a number of west and southern African countries. Launched in 2002 and closed consortia model of incumbent telcos and international partners. The original capacity was 20 Gbps and is upgradeable to 120Gbps. The 20Gbps is reportedly fully subscribed and is in the process of being upgraded to 40 Gbps and in 2007 upgraded to 12 Gbps. The submarine cables span a total of 28,000 km and connect the countries of Portugal, Spain (Canary Islands), Senegal, Ghana, Benin, Cote D'Ivoire, Nigeria, Cameroon, Gabon, Angola, South Africa, France (Reunion), Mauritius, India and Malaysia. However, SAT-3/WASC is a closed club model. (Dihlwayo, 2005).

After much public outcry over super high prices and lack of 'open access' from 2006, the political will for a dedicated East Africa undersea cable gained momentum. The Eastern Africa submarine cable system (EASSy) conceptualised as a model that would complement SAT-3/SAFE/WASC and SEA-ME-WE3 to complete a ring of undersea cables around Africa. Due to delays in terms of the model (closed or open) only commenced operations in 2009.

In its delay lag period- the TEAMS cable and private SeaCom cable system connecting the east coast was implemented and operational. However, the SAT-3/WASC club model was the sole undersea cable over a six year period, a monopoly that severely constrained bandwidth access to

SSA, led to high prices, low access and control of gateways (Gillwald 2007; Jagun 2008; Southwood 2006).

Google's UNITY Trans-Pacific cable- A consortium of six international companies announced they have executed agreements to build a high-bandwidth subsea fibre optic cable linking the United States and Japan. The construction of the new Trans-Pacific infrastructure will cost an estimated USD300 million. The new cable system – named Unity – will address broadband demand by providing much needed capacity to sustain the unprecedented growth in data and Internet traffic between Asia and the United States. Unity is expected to initially increase Trans-Pacific lit cable capacity by about 20 %, with the potential to add up to 7.68 Terabits per second (Tbps) of bandwidth across the Pacific. According to the TeleGeography Global Bandwidth Report, 2007, Trans-Pacific bandwidth demand has grown at a compounded annual growth rate (CAGR) of 63.7 % between 2002 and 2007. It is expected to continue to grow strongly from 2008 to 2013, with total demand for capacity doubling roughly every two years. The Unity consortium is a joint effort by Bharti Airtel, Global Transit, Google, KDDI Corporation, Pacnet and SingTel, and it is self-funded. The name Unity was chosen to signify a new type of consortium, born out of *potentially competing systems, to emerge as a system within a system, offering ownership and management of individual fibre pairs*. One can describe the Unity Trans-Pacific cable 2008 as a 'new generation cable system' where competitors can co-own cable and work out complex arrangements regarding access, capacity usage- IRU's, maintenance, etc. For instance the EASSy consortia has an arrangement where owners purchase capacity based on needs and 'unlit fibre' can e-activated based on demand.

Figure 2: Global Undersea cable map showing Africa's poor connectivity

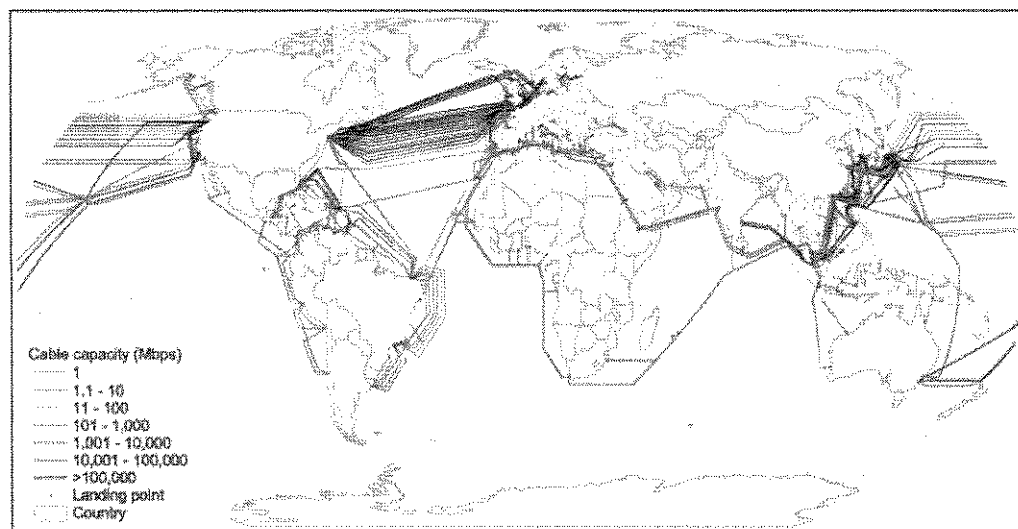


Figure 4. Global submarine telecommunications cables, 2005.

Source: Telegeography, 2006

This figure shows the emerging growth and shift of undersea cable capacity moving towards Asia, Latin America. In 2005, Africa was still very marginal in terms of global undersea connectivity, access and Internet traffic.

2.6 Technology change, fibre optics, convergence and impacts on market structure

Undersea light wave transmission systems have made tremendous progress in both capacity and network architecture since their introduction in the mid 1980s. This technology development has drastically altered the capacity of global telecom networks and overnight increased capacity and generated mega efficiencies. Capacities have grown from 280 Mb/s in the first systems to 40 Gb/s or more for the fourth-generation systems being installed today using wavelength division multiplexing (WDM). Network architectures have progressed from simple point to point links to fully redundant rings and complex trunk and branch architectures. Both technology fibre optic technology and market opportunities indicate that this rapid growth has spurred unprecedented demand for undersea fibre optic cables.

Fibre optic technology, which had been in research and development (R&D) for many years, saw rapid progress of “three generations in five years” during the late 1970s and early 1980s (Hecht

1999). In fact, improvements in cable technology during the 1990s have allowed cable capacity to meet the growing demand for Internet related services. It's the Internet and its global diffusion that has seen rapid development in fibre optics compressed technologies. Optical amplification and dense wavelength division multiplexing (DWDM) have permitted very high capacities on newer cables, already 320 Gbps and soon to reach 1 terabit (TB) per second. As cable capacity has grown, new markets for trading telecommunications capacity on a "spot" or as-needed basis have evolved, largely an outcome of the vast supply of capacity and higher bandwidth. Consequently, pricing per Mbps connecting European cities dropped rapidly in the late 1990s from over USD1,000 per month to below USD100 per month over the life of a 15 to 25-year IRU. It's clear that an over-supply of cables and new fibre optic capacity has introduced significant capacity in the market and brutal price wars. The new wave of undersea cables in Sub-Saharan Africa in 2010 has similarly sparked cable price reductions and broadband retail price wars in domestic markets like Kenya, Ghana and South Africa (see findings section).

Technological change in telecommunications also has several geographical implications. Firstly, proliferation of fibre optic cables has permitted high-quality transmission over long distances and sharp declines in the cost of service. The critical importance of access to new technologies has highlighted the characteristic hierarchical diffusion pattern, beginning first in large cities where the largest markets are found and then extending to progressively smaller places (Wei, 2005).

2.7 Undersea cable business models, funding and revenue streams

Traditionally, the investment strategy and business model of undersea cable investments was based on incumbent operators leasing to private players and customers, particularly large corporations and banks (Malecki, 2002). By the end of the 1980s many transnational firms had moved beyond voice to linked computer terminals for file transfer and message transmission (Hepworth, 1989 cited in Malecki, 2002). Large firms, led by those in banking and finance, normally leased multiple circuits on satellite or cable networks and accounted for substantial proportions of international telecommunications usage (Langdale 1989, cited in Malecki, 2002). Large corporations required security, quality of service, reliability and redundancy and leased circuits assured a firm of a consistent quality of transmission - something not possible on the public networks. Langdale observed that the 1980s as perhaps the peak of leased networks, as

users would be able to take advantage of alternative networks. In fact, the peak was in 2000, the year a steep and steady decline in prices for Internet bandwidth began, with impacts on all forms of communications. This also catalysed new interests in new generation connectivity models.

Table 5: Ownership structure and models of undersea submarine cables

Type	Description	Examples	Advantages	Disadvantages
Club Consortia	Built by consortia – operated as management committee Investors are users of and ownership = percentage of cable capacity	<i>SAT-3/WASC</i> <i>SAFE</i> <i>TAT-14</i>	Consortia have lowest Bandwidth costs for Members	Pricing is structured to protect home markets of operator. Landing station control leads to high interconnect, co-location fees; Owners pay fixed Operational cost regardless of capacity used
Private	Investors views as source of investment; Capacity is owned outright by IRUs;	<i>FLAG NGN</i> <i>Seacom</i> <i>Unity</i> <i>Tyco</i>	Rapid deployment Leaner and effective Management Independence, can Bundle co-location; Access etc	Responsible for full Maintenance costs, Hence high risk for owners, and this means initial pricing is higher
Hybrid or Open	Built by one or more carriers, operated by separate private firms; Private entity takes great risk as it does not have access to retail markets;	<i>C2C cable</i> <i>TEAMS</i> <i>EASSy</i>	Financial risk is spread, and simpler management	Private entity exposed To high risk as landing Stations owned by Competitor. Don't receive capacity at Cost
Co-Builds	Built by two or More carriers.	FLAG REACH WACS	Financial risk is spread; Owners get capacity at cost	Owners compete against each other- too much capacity in market

Source: Jagun (2008), Ramdhani 2010

The Reliance FLAG system was the first private cable system to use a “sponsors’ approach”, soon followed by others such as Southern Cross, linking Australia, New Zealand and the United States. In the sponsors’ approach, one or more private sponsors (usually carriers’ carriers) undertake the construction of the cable and bear all the related risks. The capacity is sold to operators, either through pre-sales or, after final acceptance, at the prevailing market price. Operators can also buy circuits as and when they are needed, according to their short-term needs. The capacity is bought from special purpose companies (SPVs) that is jointly and that serve as the interface among operators, suppliers, and banks (Beaufils 2000, cited in Malecki, 2002).

Co-builds involve two or more carriers’ carriers and hybrid ownership (combinations of private investors and telephone operators) who also evolved during the past several years (TeleGeography, 2005). Since 2000, nearly 90% of total cable capacity has been on what Hsu (2005) calls non-common carrier cables, compared with 22.5% in 1995. The typical contract between a cable owner, who has invested in the construction and laying of the cable, and a customer - usually a telecommunications operator - is an indefeasible right-of-use (IRU) for a fixed period of time, generally 15 years or longer. IRUs, essentially long-term contracts for the right to use a specific amount of transmission capacity, have largely been replaced since 2001 by short-term - usually one-year - leases (TeleGeography, 2006).

For satellites, telecommunications operators own “investment shares” in Intelsat or other international satellite organisations. Operators in turn lease rights to customers, who may be other usually smaller telecom providers, or large companies that lease capacity for dedicated use or more commonly, recently, for VPNs (Paltridge 1999 in Malecki, 2002).

Increasingly, businesses and other customers expect end-to-end connectivity. Traditionally, the terrestrial “backhaul” link that connects a cable landing point to an urban demand centre was the monopoly of the incumbent national telecommunications provider, as is still the case in much of Africa.

2.8 Key drivers for undersea fibre optic cable growth, demand & usage

The growth of global undersea fibre optic cables in the 1990s coincided with the public availability and growth of the World Wide Web (WWW), e-commerce, globalisation and rise of the network economy (Castells 1998; Mansell 2000). This led to massive global investment booms in all segments of the IP based telecoms and cross hybrid backed investment models. For instance, Microsoft backed the Teledesic venture that envisaged over 288 LEO satellites; the newly formed WorldCom, Global Crossing, Tyco invested in global undersea cable systems, and Google's birth in 1998 had signified the Web economy was truly universal. At the heart of this mega investment was the business model on future use of Internet and its converged multimedia services. Fibre optic cables have allowed high quality transmission over long distance and sharp declines in price of services. Global capitals of finance and investment in Europe and North America has driven usage and in hierarchical diffusion and linked to concentrations of population and knowledge base of capital cities.

2.8.1. Banks and integrated Multinational Corporations (MNC)

The digitization of data, audio, voice, video has seen the shift of large corporations to develop their own private networks, based on private lines, and leasing capacity from telecommunication providers. Banks and MNCs buy or lease massive STM core customer easing capacity though inter-organisational links have facilitated global financial integration of key financial hubs of London, New York, Frankfurt etc. Hence, security, reliability and redundancy are core competence requirements. (Ovum, 2010).

2.8.2 Universities and science networks broadband fibre optic requirements

Another driver for undersea cable capacity is the attempt by the high-energy science and physics research community to link scientists around the world. The Standing Committee on Interregional Connectivity of the International Committee for Future Accelerators (ICFA-SCIC) at the European Organisation for Nuclear Research (CERN) annually reviews network status in national networks and their connections with the global physics community (ICFASCIC 2005). They have monitored and pushed to upgrade the status of fibre optic and other networks that make possible international collaboration in "data intensive science" (Newman 2005: 9; Ilyin 2004; Santoro 2004).

Sub-Saharan African university networks are mushrooming and with support from EU-Framework Partnership programs (FP-7), the EU has committed to support numerous programmes such as ERINA, Ubuntunet Alliance and others to ensure the African university and research community fully participates in global science and research networks like GEANT, JNET, EUMEDEC (Pehrson, 2009).

For African universities, long-time shortages of e-journals and library materials have been compounded as dial-up access generally has been the only Internet access available. Steiner et al.(2005) report that “the average African university has bandwidth equivalent to a broadband residential connection available in Europe, pays 50 times more for their bandwidth than their educational counterparts in the rest of the world.” The need for the development of high speed Internet access for African universities has been one of the key drivers for bandwidth.

African universities have been at the forefront of advocating for bandwidth optimisation and access. The formation of of Ubuntunet Alliance connects African universities to global academic communities such as GEANT and DANTE AfriConnect has already secured Euro 15 million from the EU in funding bandwidth. This will enable African universities to access high quality journals and fully arcaded in high tech science and academic communities such as DANTE, ERINA, JANET, GEANT, etc.

2.8.3 Oil and gas industries as drivers for broadband usage in remote sites

Sub-Saharan Africa is a repository for large deposits of oil, gas and natural resources, many of which are largely untapped. The large and growing use of digital technologies in oil and gas exploration has provided a major new market for submarine cables. Early experimentation with three-dimensional (3-D) and four-dimensional (4-D; 3-D over time) seismic visualisation has greatly increased the success rate of drilling and exploration (Heming 1996; Marsh et al. 2003; Wallace, Duberg, and Kirkley 2003).

Although satellite operators promote the use of satellites for analysis of Web-based data (Laborie 2004; Nathan 2004), concerns about security from terrorist threats to oil facilities have pushed applications for remote access and control of high-resolution video, radar, and other surveillance systems beyond the capabilities of satellite communications. Undersea cables are less prone than satellite and microwave systems to service disruptions during storms (T. Davis 2004; Manock 2005 cited in Malecki, 2002).

The recent global commodity boom and high prices of oil in the last decade has seen a boom in significant investments in Africa oil and gas with large deposits of offshore and oil reserves on the west of Africa, Angola, Ghana, Guinea Bissau. Significantly increased FDI investment flows into Sub-Saharan Africa's mineral resources sector has spurred developments in on-site operations and regional headquarters of multinational corporations (MNCs) thus spurring demand for secure remote corporate networks and VPNs (UNECA, 2007; IEA 2008).

Beginning in the North Sea and then in the Gulf of Mexico and the Persian Gulf, fibre optic telecommunications cables connecting to the shore are now standard for offshore oil and gas fields. Indeed, the oil and gas industry represents a major demand for new regional submarine systems, as offshore oil and gas fields are linked to onshore operations centres and thence to global networks (Bax 2005; Wallace, Duberg, and Kirkley 2003).

According to Malecki (2002), a new set of standards, Wellsite Information Transfer StandardsMarkup Language (WITSML), has been created to deal with these data streams. Currently, although new satellites are being planned to serve the growing market for video to mobile phones, reliance on satellites alone is breaking down as mobile operators in Asia and Africa have initiated new submarine cable projects to provide backhaul to international networks. Additional demand for cables comes from the need for international connectivity by carriers in newly deregulated markets and from the international tourist industry, responding to customers' desire for connectivity while travelling (Bax, 2005; Malecki, 2002).

2.9 Sub-Saharan Africa's resource economy and emerging services sector

According to the Africa Development Bank (AfDB, 2007), Africa's economic development and growth future faces a current dilemma and strategic long-term systemic challenges. Being primarily agriculture and resource based, most African economies are dependent on commodity exports - hence volatility.

On the back of continued high-commodity prices, African exports in 2006 topped USD 360.9 billion, up 21% from 2005. This has been the fourth year in a row that Africa's exports grew by more than 20 %. To illustrate this point, in 2006, world exports increased by 15.2%, while Africa's was 21. Despite this steady progress, Africa's share in world exports is rising only marginally and remains close to historic lows. The continent's share of world total exports reached only 2.99% in 2006. Albeit somewhat higher than its lowest record in 1998 of 1.92%, this remains way below the levels of the 1960s and 1970s (above 5 %). It is clear that due to a myriad factors such as the WTO's unfair terms for trade in agriculture and manufacturing, lack of market access to global markets, to the lack of industrial policies and competitiveness, Africa is increasingly being marginalised in the global economy (AfDB 2009, UNECA, 2008) .

Many African governments generated enormous foreign reserves and attracted record levels of Foreign Direct Investment (FDI) during the mineral boom of 2002-2007. The recent Africa Development Bank's High Level Panel (HLP-2008) report praised the high growth rate of many African economies, but cautioned and correctly predicted that, like all cycles, this will not be permanent and unsustainable. It is this realisation that has driven African policy makers and multilateral development banks to develop economic diversification strategies by investing in the services sector (i.e. banking, offshoring, tourism). A robust services sector requires quality broadband infrastructure investment,

At the highest levels in Africa Union (AU) decision making is a commitment to a develop ICT infrastructure and services as well as Science and Technology (S&T) base. The Africa Science and Technology Consolidated Plan of Action, formulated by the New Partnership for Africa's Development (NEPAD and the African Union), the creation of the African Ministerial Council on Science and Technology (AMCOST), and the African Regional Action Plan on the

Knowledge Economy (ARAPKE), are recent examples of Africa's determination to invest in S&T and ICT to achieve growth and development objectives.

2.10. Africa's Infrastructure development challenges and patterns

Infrastructure investment is an important pillar in terms of Africa's development, with vast territorial and landlocked regions that cannot access global markets. For instance, the cost of transporting 1 ton of goods from one city to another in Africa is at least four times more than the equivalent in Latin America (APP, 2010). Similarly, international and regional and national telecommunications backbone development are laden with difficulties with regards to high investment costs, ineffective regulation, monopoly incumbents, policy groupings, the high cost of investment to land-locked countries etc.

The infrastructure mix (i.e. power, roads, ports, telecommunications and urban services) of the continent is massive as are the multi-layered requirements to cover its vast geography and terrain. The New Partnership Africa's Development (NEPAD) of the AU recognises the central importance of infrastructure development for the economic development as well as for *social development*. This was highlighted at the G-8 summit in Canada in 2002 where massive investment funding was confirmed. More recently, the Africa Progress Panel's 2010 report chaired by Kofi Annan shows that countries that have substantially scaled up infrastructure expenditure have seen significant improvements in their own growth and development performance. Infrastructure investments are essential for reducing costs of transport of goods (efficient goods to market), for developing more efficient supply chains and to reduce the cost of telecommunications and broadband for the knowledge economy.

Infrastructure development is a top priority of NEPAD and the African Development Bank. The G8 launched the Infrastructure Consortium for Africa in 2005 to ensure that financing is available for infrastructure, but funding levels, while rising, are still below the levels recommended by the Commission for Africa and the High Level Panel Report of the African Development Bank (HLP report, 2007).

Recently, the Infrastructure Consortium for Africa (ICA) completed the Africa Infrastructure Country Diagnostic (AIDC) which estimated that Africa's infrastructure needs are of the order of USD38 billion per year. The statistics are sobering and show that electricity is available to only 20 of the population; access to piped water connection is 12 and sanitation only 37. However, it notes, that telecommunications is the exception to this 'general pattern' of underfunded infrastructure. Africa has a fastest growing emerging mobile market higher rate of 64 per subscribers per thousand -even higher than South Asia.

A plausible explanation is that the very attractive the high rate of return or ARPU's and profitability of Africa's mobile communications market has ensured it attracted by far the highest FDI investment. Hence a paradox of exceptionally high investment in one sector (i.e. mobile telecom networks) and negligible investment in other social investment priorities (e.g. health, education, ports, etc) is glaring and requires a new approach in mainstreaming developmental finance. (AIDC, 2010)

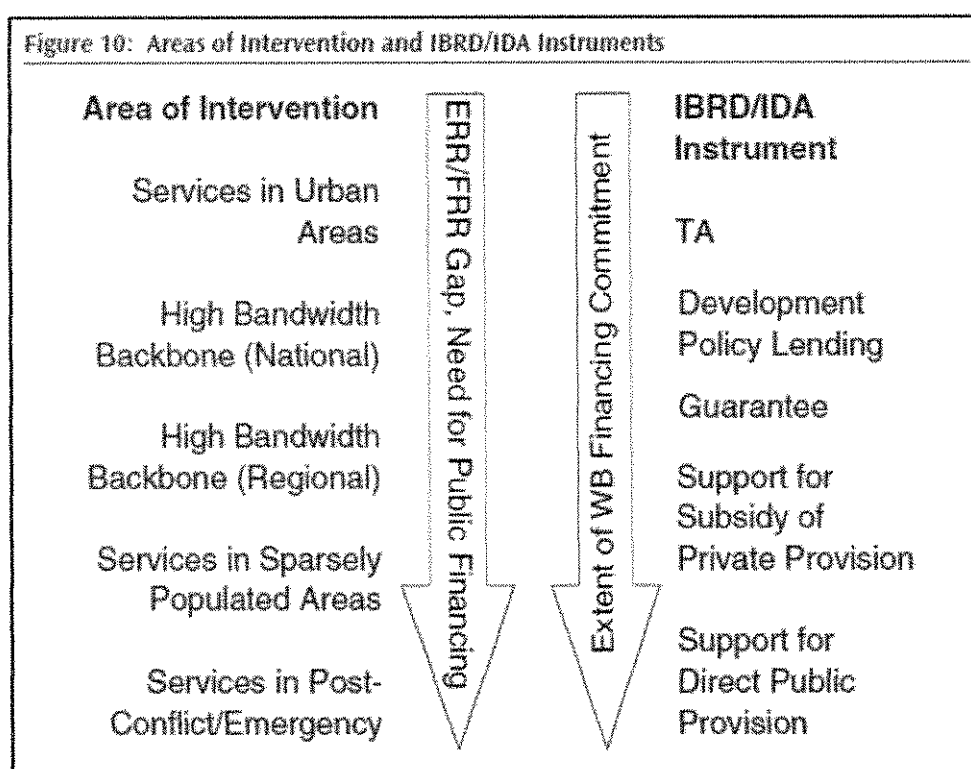
2.10.1 Broadband investment within context of MDGs

This divide is further exacerbated by the fact that access to modern infrastructure in Africa is almost entirely confined to upper-income quartiles, with the implication that 80% of those connected to modern infrastructure services are in the top 40% of distribution of wealth (AIDC, 2010). If the Millennium Development Goals (MDG) were a benchmark for development finance, then African infrastructure development finance patterns should ideally reflect an increased investment in social infrastructure such as piped water, electricity and sanitation. This 'paradox of infrastructure development' or 'broadband vs. bread' dilemma is being vigorously debated within global development circles whereby NGOs are advocating a social development approach to infrastructure investments (ActionAid, Oxfam, 2009). Others have cited that the high prices of mobile and Internet mean that an unusually high proportion of household income is being spent on telecommunication services (Mobile Active, 2009).

These debates are particularly poignant in the context that Africa requires massive foreign investment and investment by MDBs like World Banks and AfDB in several African backbone connectivity undersea cable systems worth billions of dollars- with the risk of overcapacity and

possible billion dollar bankruptcies. Hence, some telcos have been innovative and are exploring infrastructure-sharing by corporates of the 'sunk cost' of core infrastructure, while allowing for 'open access' to essential facilities such as landing stations, international gateways and backhaul access.

Figure 3 World Banks' IFC Telecommunications investment strategy and support



Source: Yep and Meles, World Bank, GICT (2003).

2.11. Old generation African intergovernmental telecom connectivity initiatives

I refer to the 'old generation model' of telecom investment in Sub-Saharan Africa as a descriptor of 'grand inter-governmental initiatives' with large ambitions and diagnoses, but which have largely failed or been perpetually delayed due to dependence on a myriad inter-governmental protocols, funding coordination quotas, and the complexities of continental politics.

Crucially, they did not adhere to dynamic market demand and under-estimated the diverse needs of differentiated consumers (ISPs, corporates, research networks etc) and the end users and customers. In the 1950s-1970s the OAU's vision of Pan Africanism developed long term integrated infrastructure plans to support regional economic development and formed regional economic communities (RECs). Telecommunications infrastructure was a natural monopoly and

mostly owned by national incumbents. The government viewed profits generated for national fiscus, with little incentive for network development, new technologies and customer services.

A series of grand scale projects were conceived to deliver low cost telecom connectivity to Africa and its vast rural regions. Hence, the first major was RASCOM that aimed to form a Pan African low cost satellite connectivity for African operators. COMTEL aimed to connect 21 countries to a regional backbone network. SADC's SRII aimed to invest in regional fibre optic nodes and West Africa's FESTOON network aims to fibre-ring landlocked West African countries (Dihlwayo, 2005)

Table 6: First generation African intergovernmental connectivity initiatives

Telecom Project	Scale and Scope,	Progress & Challenges
1. RASCOM Satellite System	44 members. Alcatel-Spacecom key vendor. Objective is to form a continental - wide satellite system to address high cost of telecommunications within Africa and has to provide services to rural Africa. Investment mode is Build-Operate-Transfer (BOT) model then handover after 5 years, ROR	Lack of funding Started in 1980's. Only launched in 2006 Indian Pan African Network (part of phase 2, 2010)
2. COMESA's COMTEL	21 members in East/Southern Africa Regional backbone network comprising a 16 000 km fibre optic cable, microwave radio with IP/MPLS switching over DWDM, gateways	Slow protocol process; Lack of investment Ericsson as vendor financier pulled out
3. Africa One Project AT&T	Major fibre all around Africa project AT&T as key project lead; Lucent As software provider and Global Crossing as project manager	Postponed to due to Nasdaq dot.com crash of 2001
4. SADC SRII	Part strategic Regional Investment Indicative (RISDP) SRII scheduled to be completed in three phases, having started in 1998 and ending in 2006; Digital fibre nodes in landlocked nations in SADC	Some delays Linked to Nepad broader Uhurunet project

4. West Africa FESTOON Ring System	serve as an auxiliary submarine fibre optic cable link, mostly for countries which do not have SAT-3 landing points To link Namibia, Angola, DRC, Gabon	Delays in funding; Overtaken by new ACE and MAIN One cables that in stream in 2011
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Source: Dihlwayo, 2005

However, due to many factors such as lack of investment appetite, complexities of donor funded investments, inadequate vendor financing and arcane inter-regional political cooperation, most of these projects have stalled.

2.12 Sub-Saharan Africa's dynamic new approach to connectivity initiatives

Sub-Saharan Africa is in a cusp of the most rapid and significant wave of telecommunications investment these past few years. From a diverse funding base (private and public and multilateral) for a variety of infrastructures - undersea cable systems, satellite connectivity and a myriad national backhaul broadband and 'last mile' access solutions and projects (World Bank, 2008; AfDB, 2009; IDRC, 2008).

Historically, most of Sub-Saharan Africa have relied on satellites and Very Small Aperture Terminal (VSAT) earth stations for outbound/inbound connectivity. These have resulted in high prices — though tariffs are in the region of USD 3 000 – USD 5 000 are often lower than SAT-3 and the applications are slow compared to other technologies. Intelsat, the world's largest commercial satellite service provider, provides full coverage in Africa. Thuraya, which has Middle East and North African telecommunications and investment companies as shareholders, gives coverage to North and Central Africa. Google's proposed high-speed satellite Internet project called 'Another Three Billion' or O3B Networks, should be operational by 2010 for close to USD 700 per Mbps per month. Downloading a Web page could therefore take four seconds (AfDB, 2010).

2.13. New Generation telecommunications investment models in SSA

Internet access and broadband rates in Sub-Saharan African are the highest in the world but the potential demand is huge. The International Telecommunication Union (ITU) and the World Bank hold that the cost of a broadband connection is, on average, about USD 110 for 110 kilobits per second. In Europe and Central Asia, the same type of connection costs USD 20 while in Latin America and the Caribbean, it is USD 7. The Middle East and North African countries pay less than USD 30. But potential demand is huge according to the 2010 African Economic Outlook (AEO), a joint African Development Bank-OECD report launched on 24 May in Abidjan at the Annual Meetings of the African Development Bank Group (AfDB).

An IDRC study covering 16 Sub-Saharan countries conducted in 2006-2007 showed that in South Africa, Cameroon, Kenya, Nigeria and Senegal, more than 10% of respondents used the Internet. The development potential is real given that Internet awareness is still very low. In Burkina Faso, Ethiopia, Mozambique, Uganda and Tanzania, fewer than 10% of respondents were aware of the Internet (Gillwald & Stork, 2009).

The rate increased to 30% in Benin, Botswana, Côte d'Ivoire, Ghana and Namibia. The telecommunications sector is investing in international bandwidth to meet this potential demand and has now reached an annual growth rate of 96% of the band - compared to the global average which, according to a 2008 Tele-geography survey, stands at 51%. In the main, connectivity in Africa is provided by ground stations by satellite and satellite dishes of the Very Small Aperture Terminal (VSAT) type. This is expensive, even if the rates - which stand between USD 3,000 and USD 5,000 Mbps per month - are often lower than SAT-3 rates. Hence, there are multi-modal, multi technology approaches to meet connectivity challenges in SSA (AfDB, 2009).

2.14 New waves of undersea cable investments in Sub-Saharan Africa

Two years ago, Sub-Saharan Africa was served by just one cable- SAT-3/SAFE, with an ultimate design capacity of 120 Gbit/s. As at October 2010 five (5) undersea cables connecting African countries such as Ghana and Kenya with Europe and India are under

construction, entering service or becoming operational this year. Costing more than USD2.5 billion, they will boost data capacity to more than 16 terabits a second in 2012.

The new cables coming on stream have had an additional boost with the announcement of two new cables in September 2010. eFive Telecoms has launched a new cable linking South Africa to Nigeria, and Angola to Brazil making it the first African cable to connect to South America. It has raised a USD250 million loan and has already commissioned Alcatel-Lucent to build the cable which will be operational in 2011 (Q3). The LION-2 cable is a R530 million project initiated by France Telecom that will link Madagascar, Reunion, and Mauritius to Kenya.

An unique feature in Sub-Saharan Africa is that more phone operators (fixed and mobile) - as opposed to pure cable companies - are investing in infrastructure, seeking to make money from services they can offer through the digital pipes. It's clear the 'business model' is one in which operators are banking on 'future pent-up growth in Africa, where broadband penetration is currently just a paltry 3.2%. Initiatives are underway in West, East and Southern Africa to develop international networks. But for the moment, eastern and southern and East Africa must content themselves with satellites, and have access to only 0.07% of international bandwidth capacity.

East Africa Submarine Cable (EASSy). EASSy is a 10,000 km undersea cable system which will connect various parts of Sub-Saharan Africa to the rest of the world by this year - mainly Europe and Asia. Interconnection with other undersea international cable systems will enable traffic on EASSy to seamlessly connect to Europe, North and South America, the Middle East and Asia, thereby enhancing the east coast of Africa's connectivity to the global telecommunications network. EASSy is also the truly 'open access' cable allowing smaller players to own portions of the cable. Hence a group of smaller telcos have formed WIOCC- a special purpose vehicle (SPV) that owns 29% of EASSy.

The EASSy project costs R1.74 billion (USD 235) and is being financed by African Development Bank (ADB), European Investment Bank, Germany's development bank KfW and the French development bank AFD respectively. EASSY will link Sudan to South Africa via Djibouti, Somalia, Tanzania, Madagascar and Mozambique. It was designed to link 21 countries along 10,000 kms from Sudan to South Africa by 2008. Rates are expected to increase from USD 500 to USD 1,500 per Mbps per month, due to an open access model enabling all service providers to pay same rates for connection, whether or not they are investors in the project. The undersea project will also land points in Port Sudan, Djibouti, Mogadishu (Somalia), Dar es Salaam (Tanzania), Toliara (Madagascar), Maputo (Mozambique), and Mtunzini in South Africa's KwaZulu-Natal province. Other landlocked countries to benefit are Botswana, Burundi, the Central African Republic, the Democratic Republic of Congo, Chad, Ethiopia, Lesotho, Malawi, Rwanda, Swaziland, Uganda, Zambia, and Zimbabwe.

.Kenya is also working with Etisalat to connect its coastal city of Mombasa to Fujairah in the United Arab Emirates. Alcatel-Lucent has been awarded USD 82 million to lay the 4 500 km fibre optic cable for The East African Marine System (TEAMS). SEACOM and TEAMS began operations in Kenya in the second quarter of 2009 with an 'open access' policy and prices of USD 500 -USD 1 000 per MBPS/month.

The World Bank has allotted USD 424 million to boosting regional networks in eastern and southern Africa under the Regional Communications Infrastructure Programme (RCIP) which it hopes will increase traffic by at least 36 % a year and cut bandwidth costs by a tenth. Kenya, Burundi and Madagascar are involved in the first phase of RCIP, involving USD 164.5 million. By the end of the programme, it is expected that all capitals and major cities in eastern and southern Africa would be linked to competitively priced high bandwidth. The RCIP accounts for more than 10% of total World Bank support to Africa. The year 2010 indeed lived up to its promise to be a mega boom for Africa's West Coast and it is currently the most dynamic undersea cable region in the world. Ghana, Nigeria and Senegal offer the strongest potential demand for international connection- with many in-land nations of West and Central Africa showing pent up demand once backhaul connectivity takes shape.

Globacom's Glo1- the second oldest operator in Nigeria, launched in October 2010, and will connect the city to Accra (Ghana) and Dakar (Senegal). The GL01 project, estimated at USD 150 million was developed by Nigerian telecom operator Globacom and French vendor Alcatel-Lucent. The 9,800 km cable stretches from the UK across West Africa and has landing points in Nigeria, London and Lisbon, connecting 17 countries to the rest of the world. End-to-end testing of Glo-1, conducted in London and Lagos, The USD250 million cable landed in Lagos in September 2009 and Accra in Ghana the following month (increasing fibre optic capacity in that country from 120Gbps to 640Gbps). The cable has ultimate capacity of 2.5Tbps and is expected to provide faster, more reliable Internet services at a lower cost.

Main-One- Owned by Mainstreet Technologies to link Portugal to Lagos and Accra in May 2010. Wholesale prices are expected to stand at USD 200 per Mbps a month. This cable would then be extended to South Africa at a cost of USD 865 million. The first 7,000 km Portugal-Lagos phase of Main One, backed by the Africa Finance Corporation, African Development Bank and some Nigerian banks -- the only one of the five not affiliated to a phone operator -- goes into service this year and promises to operate on an 'open access' basis, which should bring in much needed competition in the closed and arcane West African telecoms.

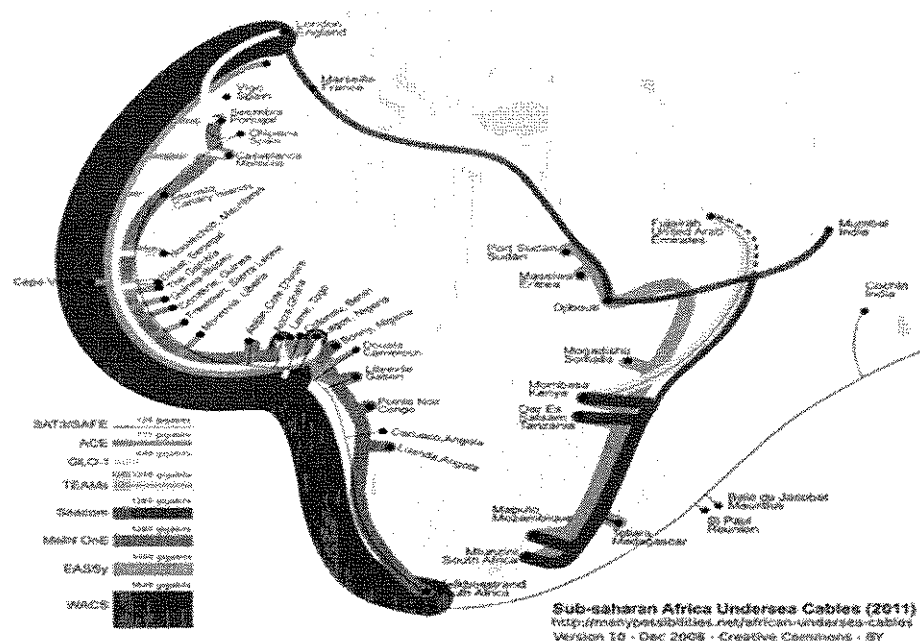
West African Cable System (WACS) is supported by South Africa's biggest operators - MTN, Neotel, Telkom and Vodacom - which manage traffic along the west coast. The docking stations will only be in Accra and Lagos. The USD 600 m West African Cable System (WACS) is in construction. A multinational consortium of telecommunications operators recently signed the cable's construction and maintenance agreement and supply contract, which means it is on track to go into service in February 2011. WACS is a 3,8Tbit/s submarine fibre optic cable that will link countries in Southern Africa, West Africa and Europe, with high-capacity international bandwidth. Planned landing points include SA, Namibia, Angola, the Democratic Republic of Congo, Congo, Canary Islands, Cameroon, Nigeria, Togo, Ghana, Cote d'Ivoire, Cape Verde, Portugal and the UK. The landings in Namibia, the Democratic Republic of the Congo, Congo and Togo will provide the first connections for these countries to a global submarine cable network.

Alcatel-Lucent Submarine Networks has been contracted to supply the 14 000 km system with all associated landing points. The companies that have signed the construction and maintenance agreement include Angola Telecom, Cable & Wireless, MTN, Telecom Namibia, Tata Communications (Neotel), Portugal Telecom, Sotelco, Togo Telecom, Telkom, Vodacom. Significantly, Broadband Infraco, owned by the SA government, had been pursuing its own cable system along the west coast, but recently elected to join the WACS initiative.

Africa Cable Europe (ACE)- France Telecom has announced the new project's backers, mainly operators, have signed an agreement for the construction of the USD 700m (R5,4bn), 5,1Tbit/s, 17 000 km-long system known as the Africa Coast to Europe (ACE) cable. Alcatel-Lucent has been awarded the supply and maintenance contract for the system, with TE SubCom as a subcontractor. ACE will be ready for service in the first half of 2012 and will connect 23 countries, either directly for coastal countries or indirectly through terrestrial links for the landlocked countries Mali and Niger. The proposed submarine cable between the African coast and Europe - known as ACE (Africa Coast to Europe) – and supported by France Telecom and 14 African operators, is expected to link France to Gabon in 2011. This cable will be built by a consortium managed by France Telecom. The system will come on-stream less than a year after the anticipated 2011 completion of the West African Cable System (WACS), which enjoys the backing of most of SA's big telecommunications operators, including MTN, Vodacom and Telkom.

While undersea cable is the preferred digital artery for Africa's broadband future in its offering of high quality, real-time broadband access, quality and redundancy, the satellite market has seen new growth and initiatives. In summary, the total value of undersea and satellite investments in Sub-Saharan Africa in the past 2-3 years have exceeded USD 3.5 billion thus bringing much needed investments, new alliances, and new generation business models. The real challenge will continue to be in the 'last mile' connectivity gap.

Figure 4: New undersea cables systems operational and planned for Africa



Source: Steve Song, www.manypossibilities.net

2.15. Sub-Saharan Africa's terrestrial network investment patterns and challenges

However, the real investment challenges of last mile connectivity rests on the ability to develop backhaul access. In a recent World Bank report on *Broadband in Africa*, Williams et al (2008) dissect some of the structural multi-layered challenges in broadband provision.

The provision and characteristics of broadband connectivity networks involves a complex value chain. This value chain comprises of the following layers: 1) *international connectivity*, 2) *regional connectivity*, 3) *domestic backbone*, 4) *switching/routing*, 5) *access* and 6) *retail services*. A *bottleneck* in one of these may constrain effective functioning of the system.

Williams et al (2008) observe that domestic network development is generally characterised as having 'low-capacity networks', operated by vertically integrated operators (often state owned) and geared for voice services. By contrast, he assesses that other continents have had large scale investment in broadband networks *through competition, vertical disaggregation of networks, entry in downstream market and stimulating roll-out of broadband services* (World Bank, 2008).

According to a recent World Bank AICD ICT study 2009, Africa already has made great strides in widening access to telephone services. Of the total population in those 51 countries, 62.1% (557.2 million people) lived within reach of a global system for a mobile communications (GSM) network as of the third quarter of 2006, leaving 37.9% of the population (340.7 million inhabitants) without access to voice telecommunications. Fully 94.0% (314.6 million) of the urban population met our stated access condition, compared with just 43.1% (242.6 million) of the rural population. To ensure universal voice connectivity in Africa and to operate and maintain the necessary infrastructure would require an average annual investment equivalent to 0.2 % of the combined GDP of the 51 countries. This equates to USD2.1 billion each year, or a total of USD18.7 billion from 2007 through 2015 (AICD, 2009).

While telecom investment in fixed-, mobile and Internet broadband is growing, the reports find that African countries would require universal service and access interventions to reach areas that are uneconomical (InfoDev, 2005). To assess the public funding gap for universal coverage, we divide total investment into two major categories:

- Investment in areas where full coverage is commercially viable and is likely to be funded by the private sector, given efficient and competitive markets. We refer to this as the *efficient-market gap*.
- Investment in areas that lack the potential for full commercial coverage, which we refer to as the *coverage gap*.

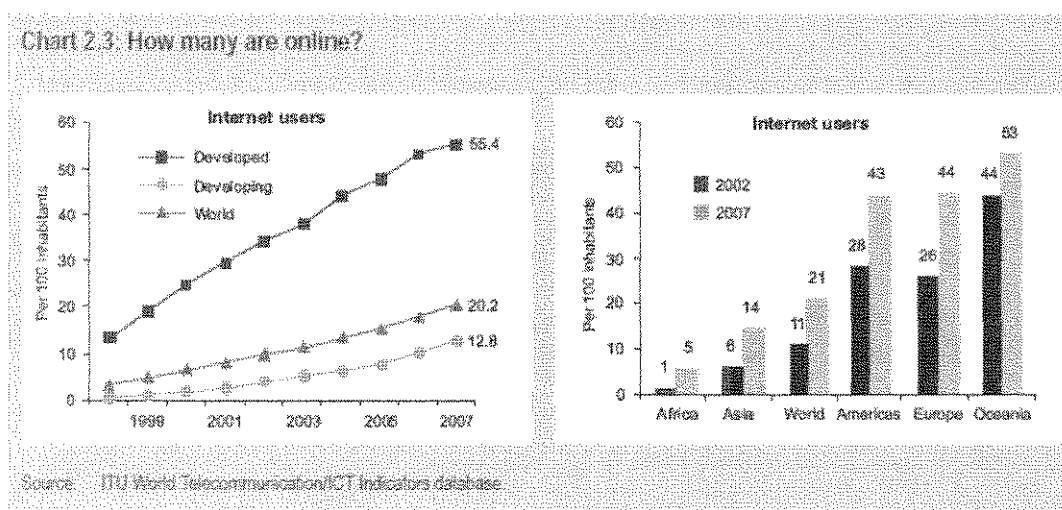
The coverage gap is further broken down into two economic zones: Those areas with enough commercial viability to support the operating costs, but not the capital costs, of ICT infrastructure. We call this the *sustainable coverage gap*.

2.16 Lopsided investments leading to low Internet connectivity and usage

The drivers and features of the dynamic African telecom market has led to a lopsided and ineffective market structure with multiple deficits and negative outcomes.

A recent *ITU Trends in Telecom report 2008* points out that while other developed regions have made strides in broadband access, Africa is the broadband and Internet laggard. According to *ITU's Measuring ICT for Development 2008* report, fixed broadband penetration in 2007 stood at less than 0.2 % in Africa, it had reached much higher levels in Europe (14 %) and the Americas region (11 %). The uptake of fixed broadband is also reflected by the 'penetration gap' that separated the developed from the developing world. Globally, the monthly costs per 100kbit/s for broadband access average around 30% of monthly per capita Gross National Income (GNI). This masks the dismaying disparity between broadband costs between regions per GNI, where it's just 2, 2% in Europe and all the way up to 96% in Africa! The taken below starkly shows Africa's paltry position in broadband access and costs in relations to other regions. (ITU, 2008).

Figure 5 Graph showing global comparison and disparity of Internet users



Source: ITU World telecommunications indicators database, 2007

These statistical observations point to the need for new approaches to the current stultifying situation where anti-competitive behaviour and sub-optimal infrastructure models are stunting

growth. Furthermore, the lack of effective ICT policy as well as institutional (business, and regulatory) shortcomings have contributed to this disconcerting state of broadband and Internet underperformance in Africa (Gillwald, 2009, Currie 2008; Jensen 2005).

2.17 Conclusion of African continental and regional models

A cursory assessment of the various trans-continental projects show an interesting pattern. The high ambitious inter-governmental projects that require political consensus, inter-ministerial protocols and agreements, have been too slow to respond to rapid market needs. Failed examples include the highly ambitious Rascom (satellite), NEPAD's Uhurunet (fibre-cables) and COMESA's Comtel project (regional fibre backhaul) which rely overtly on national government funding guarantees.

They have proven to be too slow, expensive, and riddled with bureaucratic inertia leading to delays and failures of many leading initiatives, providing an uneven burden on some players. Furthermore, the reliance by national governments on traditional monopoly incumbents for income generation has meant that they have been merely cash cows, leaving little incentive for new network investments such as broadband and backhaul access provision (Jensen 2006; Currie, 2008; Infodev, 2008).

By contrast, evidence in the dynamic Sub-Saharan Africa market clearly shows that all the private and commercial models designed to address consumers and market demand and that have *fundable business models* in place have been implemented rapidly. They have generally met key business indicators such as rate of return investment (ROI), and Average Rate Per User (ARPU) statistics – and in many cases are upgrading networks (i.e. Seacom). (Balancing Act, 2010). Commercialisation business models have ensured investing in professional human capital development as well as investing in various layers of the value chain. Examples of familiar successful names in the telecom industry investing in backbone and undersea projects include Pan Am Sat, SEACOM, EASSy, TEAMS, SAT-3/WASC, Glo-1, Ubutunet, MTN, Vodafone, Airtel, Telkom, Etisalat, etc.

However, many recent reports of the ITU African regional forums still highlight the fact that the Sub-Saharan Africa telecom market requires much more investment. (ITU's FTRA 2010; GSR 2010). Despite the dynamic competition and new wave of undersea cable investments, the broader universal service and access gaps persist and the 'socio-economic access gaps' have not been addressed - leaving large segments of the market untouched and under-served. Hence, there is a major focus on new 'regulatory innovations' such as competition, infrastructure sharing, rural universal service funds and Internet exchange points (IXP's) that are being promoted by the ITU in its annual forums such as global symposium for regulators (GSR).

This chapter reviewed the history and evolution of undersea cable network systems, while the following chapter reviews the literature on applicable business models.

CHAPTER 3: LITERATURE REVIEW OF ISSUES IMPACTING ON OPEN ACCESS AND ITS IMPACT ON BROADBAND BUSINESS MODELS

This chapter will cover key issues of the current range of knowledge areas and the body of literature *incorporating theories and concepts on the academic and policy debates on the competition policy, open access, financing telecom infrastructure within the public goods vs. private ownership paradigm*. The author will refine the understanding of the mode, *evolution and investment and funding models* of international Internet backbone and national networks in Sub-Saharan Africa .

The intentions and sequencing of the literature review is to provide a detailed review of key theoretical frameworks and schools of thought/body of knowledge. These will include: 1) economics of networked industries; 2) competition policy and essential facilities doctrine (ECD) argument in telecom; 3) Business models ontology & strategy literature; 4) Infrastructure development approaches. The concept of open access is mainstreamed as an area of analysis and in context of telecom liberalisation in Sub-Saharan Africa.

3.1 ECONOMICS OF NETWORKED INDUSTRIES

Telecommunications academic, Melody (2005) observes that just as electricity, telephone, railroads and highways each provided a stimulus to economic growth and restructuring of societies in the 20th Century, the ICT revolution is in the process of creating a similar transformative paradigm shift for 21st century. According to Melody, the foundation of information societies and network economies will be their new *information infrastructures* which are essentially upgraded, digitised information networks. The telecommunications infrastructure provides the foundation resources that are being transformed into a broadband information infrastructure capable of supporting next generation services that are essential in global trade in services. These On-line resources and journals, universities e-commerce

platforms for SMMEs, e-education, social media and e-government services foster service delivery and promote democracy (Melody, 2005).

Melody (2005:5) further elucidates that as infrastructure services are essential to economic activity and civil life, there has been a 'strong public interest' in ensuring they are made as widely accessible as possible under reasonable terms and conditions. Hence, this led to governments supplying infrastructure directly, and subjected privately owned infrastructure providers to direct government regulation. They are called 'public utilities as they are 'business affected with a public interest' and are the driving force for new approaches and business models in telecom infrastructure provision.

3.1.1. Natural monopoly effect and telecommunications network regulation

Telecommunication has always been a public utility and natural monopoly, and until the era of deregulation in the 1990s has largely been state-owned and essential in the provision of social goods. In order to realise the benefits of inherent network economies (*economies of scale, scope, joint production, pooled services*), Trebing (cited in Melody, 2001) argues that effective coordination of consumer requirements and the planning-operations of networks will be crucial in the response of natural utility strategies. Hence these 'natural monopolies' are referred given that they generate externalities from the provision of public goods (WDR, 2005,).

In conceptualising network regulation, a common feature of infrastructure industries such as railroad, gas and power utilities, is that they are all networks and have common features. Hence special problems arise from the inter-dependence of providers contributing to provision of network facilities. These include: *standardisation, coordination, interconnection, pricing and distribution of costs and revenues* among the different parties providing portions of integrated network services. The significant economies of scale in networks invariably makes it difficult for smaller networks to compete with larger ones, and for competition in network markets to be sustainable. With regards to telecom services, there is increasingly value to users in larger networks; this creates a positive feedback effect that tends to multiply larger network advantages, often enforcing monopolies (Melody, 2005, Hernandez, 2007; 2010).

Proponents of ‘network externality’ argue that benefits need to be extended beyond what the market can provide, and universal service contributes to total economic welfare benefit many times the cost of the network extension. Another spin off of natural monopoly behaviour is that they extended their reach in all directions and that the primary objective of preventing others from supplying regions or services, even when monopolies had no intention of supplying them. Consequently, the debate on undersea cable access and international connectivity needs to be extended beyond the essential facility argument and to include elements of a ‘public good’ approach. The definition of information infrastructure as public good has rapidly evolved. Trebing (2001) observes that:

‘...Public utilities are complex systems of supply that are an integral part of national and global infrastructures. There are major social gains associated with the proper employment of these systems of supply since they provide platforms for promoting growth in national productivity and real incomes...’ (in Melody, 2003)

In the past decade or so of globalisation of telecommunications and information services, the trade in service dimension has grown, with major growth in cross border trade and traffic as well as massive FDI flows and privatisations in the sector.

3.1.2 Regulation and Regulatory Governance in an era of deregulation

Many of the rationales for regulation are rooted in public policy theory and regulation theory in domains of economics and political science theory. Justifications range from technical to economic and social, and are generally motivated by the need to preserve and promote the ‘public interest’. In some circumstances, there may be ‘market failure’ or absence of effective markets (Baldwin, Cave, 1999). Regulatory governance has emerged as a recent body of knowledge that is located in the context of 1980s and 1990s liberalisation and de-regulation and within the context of restructuring the public sector in developing nations. New concepts such as ‘regulatory state’ ‘regulatory space’ and ‘regulatory capture’ are phenomena that have entered public policy discourse.

Minogue proposes that an analysis is required of the ‘formal rules that govern relationships in the private and public sectors, the broader framework of state-market relations, and drawing on disciplinary contributions that range from economics, law, politics, public policy and management.

Table 7 Rationales for regulating

Rationale	Main aims of regulation	Example
Monopolies and natural monopolies	Counter tendency to raise prices and lower output. Harness benefits of scale economics Identify areas genuinely monopolistic	Utilities
Windfall Profits	Transfer benefits of windfalls from firms to consumers and taxpayers	Firm discovers unusually cheap source of supply
Externalities	Compel producer or consumer to bear full costs of production rather than pass on to third parties or society Inform consumers to allow market to operate	Pollution of river by factory.
Information Inadequacies	Ensure socially desired (or protect minimal) level of 'essential service.'	Pharmaceuticals, food labelling
Continuity and availability of service	Prevent anti-competitive behaviour.	Transport services to remote regions.
Anti-competitive and anti-competitive behaviour	Share costs where benefits of activity are shared but free, but free-rider problems exists.	Below-cost pricing in transport
Predatory pricing		Defence and security services Health services.
Public goods and moral hazard	Protect vulnerable interests where market fails to do so.	Health and Safety at Work
Unequal bargaining power	Public interest allocation of scarce commodities.	Petrol shortage
Scarcity and rationing	Distribute according to public interest.	Victim protection.
Distribution justice and social policy	Secure efficient production where transaction costs prevent market from obtaining network gains or efficiencies of scale.	Disparate production in agriculture and fisheries.
Rationalisation and Coordination	Protect interests of future generations	Environment
Planning		

Source: Baldwin, R and Cave, 1999, Oxford

Malone (2008, as cited in Minogue) critiques the regulatory state model as being foisted on countries as part of reforms and this dilutes democracy. Extensive delegation of policymaking powers to non-majoritarian institutions such as regulatory bodies, tribunals, commissions, and other adjudicative agencies intrinsic to the public sector have seen a 'disconnect between policy intent and implementation'. The concern is that these may become 'dangerously independent' of political process and may lack accountability. African telecom reforms in the past decade have exhibited this feature, with newly formed regulators caught between the need to protect the incumbent monopoly while licensing new operators to foreign owned entities.

Malone (2008) proposes the following benchmarks for effective regulatory states to include: 1) the extent to which decisions are designated to an independent agent; 2) nature of the structure of governance; 3) rules that specify the procedural framework; 4) scope for political principals to overrule consultative processes; 5) relative autonomy of financial resources and 6) extent of ex-post monitoring, e.g. legislative oversight, citizens' complaints procedure etc. This new approach in regulatory governance - particularly the separation of powers between policy makers and regulations - have been a key institutional innovation in the telecom sector regulation over the past decade (Melody, 1997).

3.2 Competition policy and the regulation of essential facilities

Various economic theories or schools of thought inform competition policies which in turn determine the *level of competition, market structure and the regulatory approach*. Essentially, two schools that have dominated the debates are the Neo-classical and Heterodox schools (i.e. Schumpeterian and Resources Based Perspective). McNulty observes that classical economists such as Adam Smith and David Hume view competition as a 'force where resources could be allocated to their 'best', once prices are at their 'natural' level, and at this level economic stability and welfare were attained (in Baloyi, Mohamed; 2007).

Neo-classical economists further contend that a key effect of 'perfect competition' is that it eradicates the abuse of market power as 'no single firm has influence over price and output' and any contrary is a result of anti-competitive behaviour or firms operating in a monopolistically competitive setting.

Another effect, they argue is that it promotes 'allocative efficiency' as price is equal to marginal cost and this enhances societal welfare (in Baloyi, Mohamed, CISD, 2007). Monopoly control of 'essential facilities such as international gateways (IGW's) has had the effect of eroding key pillars of fair competition such as allocative efficiency and innovation gains. Generally, this approach to be 'idealistic' as in the real world, monopoly corporate power in telecom in Africa has abused power, dominated pricing and controlled access.

The other major school is the heterodox school which includes the Schumpeterian and Resource Based Perspective (RBP) schools. Both believe competition is a dynamic phenomenon and are rooted in Coase's economic theory of the firm. According to Baloyi & Mohamed (CSID, 2007), this approach has the following distinct positive goods' provision features; *1) asymmetry in information and knowledge, 2) competition generates dynamism in markets and thus no static equilibrium, 3) dynamic efficiency enhances performance and social welfare, and 4) structure is an outcome of conduct and firm behaviour.* In large conglomerates competition is not an exclusively market phenomenon, but resides within internal operations of the firm- hence the 'theory of the firm' approach is used to explain anomalies. Group level strategy and divisions often override the possibilities of units within firms to adopt competitive modes.

Essentially, Coase argues that the firm can be used alternatively to the market in efficient organisation and coordination of resources and economic activities (Conner, 1991, in ...). The researcher posits that the owners of the SAT-3/WASC undersea club cable exhibited a strategy (2002-2008) as a 'cluster of firms' defined their market through detailed coordination of resources and activities.

One can argue that the 'club consortia model' of the SAT-3/WASC cable exhibit this model of defining the Africa backbone market through monopoly provision of a scarce input, while corporate strategy focused on extracting monopoly profit by denying access (ownership and access to facilities) to those customers and downstream competitors who are willing and able to purchase capacity (even though vast capacity was indeed available).

Schumpeter argues that the over-riding purpose of the firm is taking advantage of competitive opportunities through *new innovations in product quality, product differentiation, efficient and effective firm organisation*. The contention is that firms that are ‘constantly innovative will prosper and enjoy abnormal profits’. Hence, the Shumpeterian theory of ‘creative destruction’ is often referred to in business cycle models - a reference to his belief that new rounds of innovation will provide the customer with new products and hence perpetually sustain business cycles logic of growth. Meanwhile, Penrose, a leading thinker of the heterodox Resource Based Perspective (RBP) believes that the firm’s purpose is to shield it from market uncertainty and rooted in the Coasian notion that firms innovate, create management teams, and need to coordinate resources to maximise a firm’s profitability. Chandler, one of the leading thinkers of modern business enterprises, contends that the ‘*visible hand of management replaced the invisible hand of the market*’ and this emergence of a ‘management class’ oversaw the coordination of activities and resources for present and future use, hence the firm’s competitive advantage is based on management techniques employed to coordinate firm activities (in Baloyi, Mohamed, 2007).

In line with this thinking, Kregal (2006) further articulates that the external environment is so uncertain, it generates dynamism in the system and firms have to minimise uncertainties (especially regulatory uncertainty to generate profits). Innovation generates longevity of dominance and if new players enter the market through competition or copy innovations, it will end abnormal profits. Hence for these companies (often monopolies and oligopolies), competition is a ‘destabilizing factor’ and not bound by specific equilibrium and limits the firm’s competition, constantly needing to re-configuring the market.

3.2.1 Competition policy as regulatory remedies and tools

Competition policy is the overall legal and regulatory framework and designed to promote fair and equitable economic development and prevent abuse of market power. It is a rules based system designed to promote sustainable competition. Together with sector utility regulation, they act in concert to coordinate and generally promote sustainable competition.

In the context of liberalisation and deregulation, regulatory jurisdictions need to promote both sustainable and effective competition. According to the World Bank, a central question in competition policy is:

Will a given practice, transaction, or business acquisition reduce competition or increase market power in a given market? It thus proposes the following set of parameters to assess market abuse:

- Define the relevant market or markets;
- Assess the level of competition in the market, without the behaviour or act in question; and
- Assess the level of competition in the market, with the behaviour or act in question.

It is clear that there is an inextricable link between the level of competition in a market depends on the structure of the market. The number of players and market structure (monopoly, oligopoly, or competition) has impact on input costs and distribution, prices, access, availability. An important test is to assess the nature of effective competition in the market and whether it meets the conditions of *effective competition*. Further important considerations should include:

- Whether any firms in the market have *market power*, and the impact of the trade practice or business acquisition in question on market power;
- In particular, whether any firms in the market have a *dominant position or significant market power* in the market;
- Any barriers to entry or exit and the potential for competition from new entrants;
- The role of any essential facilities.

There is a logical process in determining market power. The first step in any competition analysis is to define the relevant market. (Kekana, 2008).

The purpose of market definition is to determine the boundaries of a given market. Only then will it be possible to analyse the prospects for competition in the market, opportunities for particular firms to acquire and exercise market power, and implications

for consumer welfare (World Bank, 2009). For competition purposes, a market includes all those suppliers, and buyers, among whom there is close competition, that is:

- All those goods or services that are close substitutes in the eyes of buyers, and;
- All those suppliers who produce (or could easily switch to produce) those goods or services.

The SSNIP or hypothetical monopolist test defines a market as:

The smallest group of products and the smallest geographical area in which a hypothetical monopoly could successfully implement a small but significant and non-transitory increase in price (or SSNIP) (Kekana, 2008.)

Applying this market analysis principle to the monopoly situation in international long distance market in Sub-Saharan Africa, the control of gateways by monopoly incumbents through the SAT-3/WASC over six years exhibit these features. Monopoly control of national landing stations. It exercised power, extracted monopoly profit, high prices (increasing input costs) and led to the perverse situation of underutilisation of capacity that was in high demand (Jensen 2006, Jagun 2008).

Price regulation

In a utility industry, regulators have been set up to regulate in the public interest and telecommunications have an economic rationale. Firstly, markets are monopolistic when they have differentiated goods, imperfect competition, barriers to entry exists, and one/few price setting firms. Hence, unregulated markets with monopolistic suppliers (i.e. Telecom utilities) can lead to incentives for abuse of market power, market dominance, incentives to increase prices, 'excess' returns for firms and misallocation of resources (ICT Regulation toolkit, InfoDev, 2006).

Pricing issues are central to essential facilities negotiations. Monopoly power can be exercised in a number of ways. According to Grout (2003) 'conventional access pricing' rules make entry for new players difficult.

The potential entrant has to meet, in the form of an access charge, both the monopolist's marginal cost of the essential facility and the customer's contribution to the monopolist's common cost, and then cover the entrant's own cost before they can profitably enter the market. Once up-front cost of entry is calculated, it is often difficult to compete in the presence of such an access pricing regime. This model has been the de facto strategy used by monopoly incumbents in SSA.

It is clear that that given the high sunk cost of telecoms broadband infrastructure and New Generation Networks NGNs and backhaul fibre, it makes sense for regulators to promote open access infrastructure-sharing that balances the dynamics of supply-side and demand-side features of infrastructure. However, key variables such as price regulation, access conditions, the levels of elasticity and access in manner that incentives of new generation of investment, with the overall society objective of expanding access to all in an information economy.

3.3 The Essential Facilities Doctrine (EFD) in telecoms regulation

The Essential Facilities Doctrine (EFD) has emerged as a key issue in competition policy and telecommunications regulation and has taken on expanded significance in an era of competition. According to OECD (2004), Essential Facilities Doctrine (EFD) specifies when the owners of an essential or bottleneck facility is mandated to provide access to that facility at a reasonable prices. Typical examples are when a railroad must provide access to a rival rail or when electricity transmissions networks opened to rival providers. The concept of essential facilities requires that there be two markets – an upstream market and a downstream market. Typically, one firm is active in both markets and other firms are active or need to participate in downstream markets. Typical cases are when downstream competitors wish to buy an input from an integrated firm- but are refused.

This can be applied when both state and private parties own public infrastructure and may also apply when private parties own key infrastructure. In this sense, economic regulation typically takes the rely on or apply competition law, sector regulation such as pricing regulation to effect the ESD. The essential facility argument is directly relevant to the Sub-Saharan Africa case of international gateways owned by national telecom incumbents of the SAT-3/WASC cable. National operators owned international gateways landing stations as well as competed with customers in downstream retail markets. This is cause for the EFD to be applied.

The principles of essential facilities and non-discriminatory pricing have been well established in the WTO Telecoms liberalisation directive/schedule four (4) of 1997 and which most WTO members use in their jurisdictions. While there is a dominant view that access to infrastructure is an essential to competition, the analysts' cautionary approach is that unfettered access to essential facilities of the incumbent may provide lack of incentives to invest in new generation networks. This is the kernel of the current 'network neutrality debates and in some cases provide disincentives for incumbents to invest in new generation networks.

3.3.1 Critiques of essential facilities doctrine application in judicial cases

Alternative perspectives have emerged with regards to the current mode of judicial application of the EFD in telecoms. Kekana (2008) observes that the presence of potential substitutes which would negate the determination that the facility is essential since potential competitors provide competitive constraints for those requiring access. In this sense, he argues that the current jurisdictional approach has been narrowly (mis) applied- and that ex-post regulation and doctrine of essential facilities is ill-defined. He observes that courts have confined their supply-side 'substitutability' when confronted with alleged denial of access to an essential facility, and as such proposes potential constraints to demand and supply-side.

Kekana's (2008) core contention is that potential substitutes would negate a determination that a facility is essential and that the constituent element of duplicability entails the degree to which there exists supply-side substitutability regarding access. Hence, a duplicable facility is devoid of the element of essentiality (Kekana, 2008). Extending this logic in the rapidly competitive international interconnectivity and undersea cable market in Sub-Saharan Africa, landing stations are classified as 'essential' and to what degree access would be given and by whom.

Kekana's critique is that the current mode of application of the EFD is merely reduced to an analysis of the degree of 'substitution elasticity of physical infrastructure.' This approach, he argues is a simplistic analysis and clearly conceals the critical role of 'demand-side' considerations- whose importance grows in a robustly competitive backbone infrastructure market. Hence, he argues for composite consideration of both supply and demand-side in essential facilities for the justification of initial adoption of the doctrine within anti-trust/competition policy.

This perspective dovetails with legal academic Areeda (1989), who postulates that the EFD has taken on a life of its own.... 'that the Essential Facilities Doctrine is both harmful and should be abandoned....competitive problems can be effectively addressed by forcing the monopolist to deal, traditional doctrine to deal is sufficient to the task..' (cited in Kekana, 2008). They argue that essential facilities be retained within anti-trust law and its application. He criticises the manner in which courts in the US have entertained litigious seeking to use the doctrine in the hope of mandatory sharing of infrastructure. Furthermore, they critique that the six principles of essential facilities do not adequately detail the nature and type of infrastructure to which these principles ought to apply, and on which courts can rely.

They advocate that it's an opportune time for the definition to undergo a 'robust analysis' which delineates those infrastructure 'where mandated access serves a particular *societal benefit* - and for those infrastructure in which it would serve to deter private investment in similar infrastructure, fuelled with apprehension that cost recovery would be significantly curtailed by the mandated access remedy typifying the essential facilities doctrine.

A 2010 broadband status report by Harvard's Berkman Centre comparison in OECD countries reported that FCC in the US has been hesitant to promote open access due to the lobby of the incumbents (AT&T, Sprint, Verizon) who argue that it's a disincentive for new generation network investments. This is borne out by statistics showing that the US is No. 14 in OECD rankings in terms of broadband connectivity and usage (Harvard's Berkman Centre, 2010).

3.3.2 Characterisation of infrastructure within infrastructure theory

The critics of the mainstream view of essential facilities judicial applications, such as Kekana, advocate for a clear regulatory and legal oversight through: 1) detailing and delineating the appropriate infrastructure candidates for mandated access; 2) a definitional criteria would provide much needed consolidated appreciation of demand-side considerations; and 3) reconfigured definitional criteria would be presented in a manner which accords with competition policy. Frishmann thus calls for 're-visiting' infrastructure theory in both supply and demand led criteria in judicial application.

Lipky, Sidak (2006) (in Kekana, 2008) further observes that one of the salient features of an infrastructure to be designed as an 'essential facility' is that it should exhibit a degree of uniqueness. But Kekana takes it a step further by arguing that they merely offer an identification process to test supply side substitution elasticity is too narrow a focus and calls for a more dynamic appreciation of the 'interpretative contours of essential facilities doctrine' (Kekana: 12).

3.3.2.1 Demand-side considerations for open access

As elaborated, Frischmann has advanced a dynamic ‘demand-side analysis’ in the essential facilities debate and proposes the commons management systems as a methodology. By exploring the relationship between infrastructure and attainment of positive externalities in an open access environment, this creates ‘societal demand’ because of its nature and the provision of optimal infrastructure may not appropriately be realized if reliant on purely market mechanisms and does not ‘precisely quantify the degree of societal aggregate demand and consequential benefits which accrue from accessing such infrastructure (Frischmann, 2003).

It is important to point out that this judicial legal observation by Frischmann resonates with contemporary policies of universal service and access to under-served areas that are contained in telecoms license obligations in most jurisdictions. This is also relevant in the new context of changed funding models of multilateral development agencies such as the World Bank which is insisting on open access and universal service policies and programmes as essential part of telecoms investment and funding (World Bank RCIP, 2007; Infodev, 2008). Hence, a robust regulatory debate on new universal service models and whether they should be also be part of broadband roll-outs is also timely and relevant (Infodev, 2009, FTRA 2009).

Above all, Frischmann (cited in Kekana, 2008) advances a refreshing view of infrastructure theory that is grounded in the quest to find new contours of EFD with a view to advancing more workable definitional criteria for mandated access. By classifying them as *public, private and social* – a typology that at once gives regulators and courts a system of definitions - it also acknowledges the dynamism and variations as well overlapping the nature of the definitions. In context of rapid deregulation many private owners may own core infrastructure- deemed essential for the public good. This trend is applying itself in new generation broadband networks that are deemed as ‘essential’ for nations’ competitiveness.

In developing a 'commons management system', he espouses the following: 1) the resource must be non-rivalrous, 2) social demand must be driven primarily by 'downstream productive activity' that requires the resources as an input; 3) that the resource may be used as an input into a wide range of good and services, (private, and non-market).

In essence, he argues that non-rival consumption of the resource ensures a marginal benefit to be derived with increased consumption, through the marginal benefit not at the expense of incurring marginal cost for its realisation. The kernel of this is that cost-benefits are complicated, and with capacity constraints there will be marginal cost to realize marginal benefit of accessing the resource. When congestion is reached, this marginal cost will exhibit and when access is contested by many users, it becomes partially rivalrous and the user will then be willing to incur marginal costs.

When demand for the resources is driven by downstream productive activity (i.e. retail Internet), this requires access to the resource (i.e. wholesale broadband) as an input (Kekana, 2008).

Frischmann differentiates between: a) *consumption goods*- those goods consumed directly by the end user to generate private benefits and b) *intermediate goods*- those goods used as inputs to generate other goods and their marginal benefits are not internalised but benefits are realised somewhere further downstream. He believes that this higher degree of 'positive externalities' to society (public good discourse) exhibits non-rivalry where goods and services are intermediate and exists high variance of goods in downstream markets as a result of access. Thus, they should be subject to a 'commons management system' premised on principles of open access, transparency, non-discrimination and equitable conditions of access to infrastructure (in Kekana, 2008).

Melody (2003) succinctly describes the telecoms infrastructure as a 'foundational resource' that is being transformed into a broadband information infrastructure capable of supporting next generation Internet services.

It is these services, he argues, that will be the drivers of the information society and bring the paradigm shift towards information societies. Therefore, adopting an open commons

system has many implications for the information society development of regions like Sub-Saharan Africa where wholesale broadband can be classified as intermediate goods so essential to many downstream value added services (e-commerce, business process off-shoring, e-education, e-health etc).

It is clearly evident from many current academic and industry reports that the access pricing models affect the prices (downward trends) the nature and diffusion and the Internet uptake in Sub-Saharan Africa (Gillwald 2009; Balancing Act 2009).

Refusal to deal has also emerged as a key issue with regards to pricing to essential facilities regulation. Upstream monopolists that do not have an obligation to deal (supply downstream rivals) are not required to provide a margin to downstream competitors by leaving a sufficient gap between wholesale and retail margins.

This is a price squeeze approach. Opponents of the price squeeze theory such as Sidak (2008), argue that anti-price squeeze rules in US jurisdiction would deter investment and deter upstream suppliers from voluntarily supplying inputs to efficient competitors, thus reducing retail price competition. Furthermore, he argues that process squeezes are really a regulatory problem and not readily handled by courts, as demand and supply factors change over time. His proposition and observations is correct and rooted in evidence by a recent OECD broadband comparison report that proves that the US lags behind many OECD countries and ranks only 12 in terms of broadband penetration (OECD, 2010).

Crotty (cited in Baloyi, Mohamed, 2008) further observes that competition can be destructive and argues that this is due to the side effects of liberalisation and de-regulation of global trade and finance that have undermined core national industries like autos, electronics, aircrafts etc. The Resource Based Perspective (RBP) can provide a clearer lens in understanding corporate behaviour practices through globalisation theory as it locates competition policy as part of broader national development plans of countries. This approach is more relevant to developing regions like Africa where markets are not developed and where public utilities like information infrastructure provision are not universal, still unaffordable and lead to exclusion.

She contends that these industries are ‘natural oligopolies’ and they have the following characteristics: 1) large economies of scale and scope at plant level ; 2) large economies on the firm as a whole due to superior distribution and supplier networks; 3) specificity and irreversibility of assets thus making them (assets) immobile (in Baloyi, Mohamed, 2007). Melody (2005) takes a counterview and observes that the experience of competition in infrastructure industries about a century ago, especially in the US, led to major instabilities of price and prices, destructive competition and monopoly or collusive oligopoly, leaving many segments of the population without service. In many ways the African Internet backbone market represents this ‘market failure’. Bain’s hypothesis further develops the neo-classical notion of competition through his *Structure Conduct Performance (SCP)* theory in which he correlates market structure to firm conduct and performance. He contends that firms conduct is dependent on market structure in which it exists, is an indicator of market power and then also determines firm’s performance. One can thus infer that monopoly incumbents’ telcos’ use of club consortia models such as Telkom SA, Angola Telecoms, Sonatel, Nitel & Glocom in Nigeria exhibited this SCP theory in their approach to dominate access to lucrative input resources like wholesale broadband (Jagun 2008).

3.4 Open access and infrastructure sharing

A landmark ruling by Indian regulator TRAI in 2007 on access to essential landing facilities at International Cable Landing Stations provides wide-ranging reforms with regards to access to international essential facilities. In context of their need to promote lead destination on business process outsourcing and ITES market, declared all facilities to be open to whoever needed access for their business operations (TRAI, 2007).

The emergence of numerous undersea fibre cables in Africa has again focused the debate on open access and fair competition in the sector. Esselaar, Gillwald and Sutherland (2007) posit that for effective and fair competition in broadband and network, operators should have access to:

- International Gateways (IGWs);
- International Landing Stations (ILSs);

- Backhaul access networks and active and passive components of the network

An ITU Best Practice guide on Infrastructure sharing released at its 2008 Global Symposium for Regulators (GSR) is timely. It concluded that infrastructure sharing could be a logical business model that operators could employ in the (cost effective) provision of infrastructure deployment, in particular broadband access networks. The ITU report identified the following key regulatory strategies:

- Reasonable terms and conditions;
- Pricing and efficient use of resources;
- Scarce resources and licensing;
- Conditions for sharing and interconnection;
- Establishing an infrastructure one-stop shop;
- Improving transparency and info sharing;
- Dispute resolution mechanism;
- Universal access;
- Sharing with other market players and industries

3.5. Public Goods approach and discourse of the information society (IS)

The concept of Global Public Goods (GPG) recently gained prominence in global development policy in a UNDP book - *Global Public Goods- International Co-operation in the 21st Century* (Kaul et al 1999). Its objectives is to provide the conceptual framework of re-introducing 'public goods' into global development discourse in the context of discontent with globalisation (i.e. US/EU financial crisis) and argues that public goods needs to 'plug the gaps' and, crucially, these require pragmatic policy approaches.

Accuosto, M and Johnson, N (2005) introduce the debate within the context of the recent ITU WSIS debate on funding information society, by describing Global Public Goods as when every member of society derives benefit from the provision of the good.

They should have the potential to be consumed by all regardless of whether the 'end user has paid for them or not. If consumed by many people (or countries) without being depleted, it is *non-rival* in consumption and if no one can be prevented from the good, it is non-excludable. Classifying the Internet as a public good has an interesting and dynamic discourse. For instance, the latest UN ITU broadband development commission referred to broadband as a General Purpose technology (GPT), but promotes the private sector as the most viable mechanism to deliver broadband for all. Many universal service programmes still oblige the state owned telecommunications utilities to roll out services in unviable areas (Kaul, 1999; ITU, 2010).

Externalities are closely linked to global public goods and are essentially the positive or negative effects arising from actions not borne by them. 'Public bads' can result from such externalities and hence the need for public goods is proposed to correct the negative. Crucially, globalisation generates negative and positive externalities and are borne by people in other countries and so GPGs are essentially cross border externalities (e.g. climate change, unfair trade, etc).

3.5.1 The Internet as a global public good

The classification of GPG varies with on whether they are thematic. Gardiner, Le Goulven 2001) classify them sectorally- as environmental, economic (trade and finance) and institutional (knowledge, governance). Ferroni (2002) proposes that 'international public goods include knowledge, standards, and rules required to address challenges, institutions that monitor and benefits that arise are shared indiscriminately by nations. He distinguishes between core public goods (*knowledge, research into technology for the public domain*) and complementary. One can conclude that international Internet connectivity is a 'complementary public good' and a crucial input for generation of knowledge in the 21st Century (in Karl, I, UNDP, 1999).

A poignant observation about GPGs is made in the UN General Secretary's Millennium report regarding the Internet and the information network:

“Information is different. Not only is it available for multiple uses, it becomes more valuable the more its used....We in policy making should understand how the economics of information differs from economics of scarce physical goods- use it to advance our policy goals. (UNDP, 1999).

It is thus significant that the UNDP's Office of Development Studies' paper *Profiling Status of Global Public Goods* (2002) argues that global connectivity for information sharing and knowledge should be a public good...and that the Internet is a principal building block of global connectivity in that it has a 'dimension of publicness.' Other public goods benefits and attributes of cyberspace are in its capacity to generate positive externalities, including provision of low cost services like tele-medicine, tele-education etc.

Conversely, negative externalities of the Internet are spamming, computer viruses, pornography and negative gender and racial stereotyping in cyberspace. These key global Internet policy issues are being deliberated in the post-WSIS International Governance Forum (IGF), the multi-stakeholder forum endorsed by the ITU and that gathers annually to discuss core global Internet themes such as *Internet governance (ICANN), Internet security and privacy, access and connectivity, content and multilingualism etc*- issues with a global public good provision ethos.

Global Public Goods debates assumed particular prominence during the UN World Summit on Information Society (WSIS) Tunis (2005) Plan of Action (POA). A series of robust debates on the nature of responsibility and mechanism created sharply differing options. Financing the information society generated perspectives on the Information and ICT as 'public goods' has with whether information- the Internet are global good. The implication for policy makers those at intergovernmental level is whether It funding access and connectivity in Africa. It is a surprise than that African with the, lowest penetration rates underserved in telecom and universal service and paying highest prices for telecom and Internet generated models testing the hypothesis of public good nature of information and info society.

O'Siochru (2005) takes a 'middle road approach' and argues that the 'public goods' approach to ICTs can offer a rationale for open access. He contends that the global communications network is not a 'pure' public good, but has one of its characteristics. That is, communications and uses of information can be enjoyed by all, without depletion, and indeed its value to each rises as more users join, thus generating 'externalities' that can be charged by the supplier and spill-over into general benefits. He points out that the infrastructure itself is not a global public good, in that it is not difficult to exclude people from using it, and there are limits to usage and need for (high) cost maintenance. It is this argument that is generally used by telecom operators who have rates of 'churn' when customers become uneconomical.

3.5.1 Expanding the 'social value and openness' of the Internet

The researcher further articulates that if more people can access the information network at a reasonable cost, it has immense social and market benefits. For instance, leading open source researcher, Rishab Ghosh (2005) argues that global movement towards openness where new trends in open standards and interoperability (open network architecture), open source software (OSS) and Open Education Resources' (OER) technologies contribute to open innovation, it has significantly increased the social, economic and innovation value of the Internet (enhancing its 'public good value').

For instance, Internet users can download free and open source software, students can access and contribute to Wikipedia, researchers can access open access journals. Access to e-government services can lead to service delivery and accountability of public officials and it can promote public participation – thus enhancing e-democracy. This leads to online transactions multiplying, and the value of the network is thus significantly increased, often referred to 'the positive network effect' (Benkler, 2006).

Sadly, in context of Africa's low Internet usage rates (> 5%) and paltry-low broadband rates of a measly 0.2%, the public value benefits of the Internet are increasingly being denied to hundreds of millions of Africans. Hence, open access, stimulating demand and investment, coupled with fair competition and universal service can expand the public good provision of Internet in Africa.

3.6 BUSINESS MODEL ONTOLOGY AND BUSINESS STRATEGY

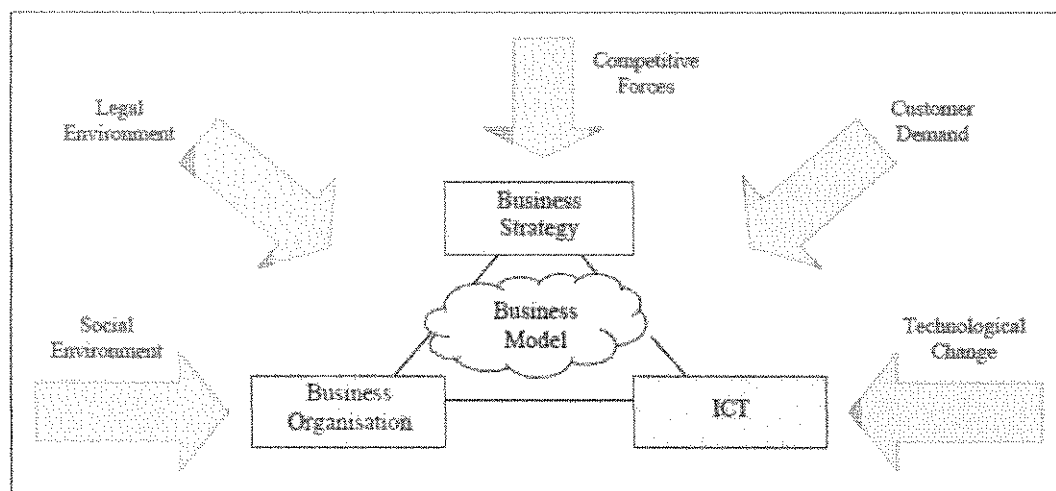
This section focuses on the area of business models ontology of Osterwalder (2004, 2005) and BCG's product portfolio matrix as tools/ approaches to the essential need for a business models to help us understand telecommunication firm strategies in the broadband market. Essentially, a business model is a conceptual tool containing a set of *objects, concepts and their relationships* with the objective to express the business logic of a specific firm. Therefore we must consider which concepts and relationships allow a simplified description and representation of what value is provided to customers, how this is done and with which financial consequences.

According to Osterwalder (2005), a business model seeks to describe a process of an organisation's offer within a value chain, processes and operations. In the context of information economy and Web 2.0 business world, the boundaries of the business model (i.e. what you do and how you do it) is in constant flux and evolution.

Osterwalder further unpacks the concept and articulates that

‘....a business model is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams...’ (Osterwalder, 2005, p 5)

Figure 6: Environment, Business Models, Strategy, Process



Source: Osterwalder, 2004, pp:16

The above diagram by Osterwalder (2004) shows the environment within which the business model is operational and its interface between the 'golden triangle' of business strategy, business organisation and ICT systems. As explained by Petrovic (cited in Pigneur, 2004) a business model describes the logic of a business system for creating value that lies behind the actual processes (Petrovic, 2001). It can be seen as a detailed conceptualisation of an enterprise's strategy at an abstract level, which serves as a base for the implementation of business processes.

Table 8: Hamels business model components

	Name	Description
Elements	Core Strategy	This element defines the overall business mission, which captures what the business model is designed to accomplish. Further, it defines the product and market scope and specifies in what segments the company competes. Finally, it outlines how the firm competes differently than its competitors.
	Strategic Resources	This element contains the core competencies of a firm. In other words, what a firm knows, its skills and unique capabilities. Then it specifies the strategic assets, such as infrastructure, brands and patents. Last, this element outlines the core processes of the firm; it explains what people actually do.
	Customer Interface	This element is composed of fulfillment and support, which refers to the way the firm goes to market and reaches its customers (e.g. channels). Second, information and insight defines all the knowledge that is collected from and used on behalf of the customer. Third, the relationship dynamics refer to the nature of the interaction between the producer and the customer. Finally, the pricing structure explains what you charge the customer for and how you do this.
	Value Network	The value network outlines the network that surrounds the firm and complements and amplifies the firm's resources. It is composed of suppliers, partners and coalitions. Partners typically supply critical complements to a final product or solution, whereas coalitions represent alliances with like-minded competitors.
Connections	Configuration	This connection refers to the unique way in which competencies, assets, and processes are combined and interrelated in support of a particular strategy.
	Customer Benefits	This link intermediates between the core strategy and the customer interface. It defines the particular bundle of benefits that is actually being offered to the customer.
	Company Boundaries	This bridge refers to the decisions that have been made about what the firm does and what it contracts out the value network.

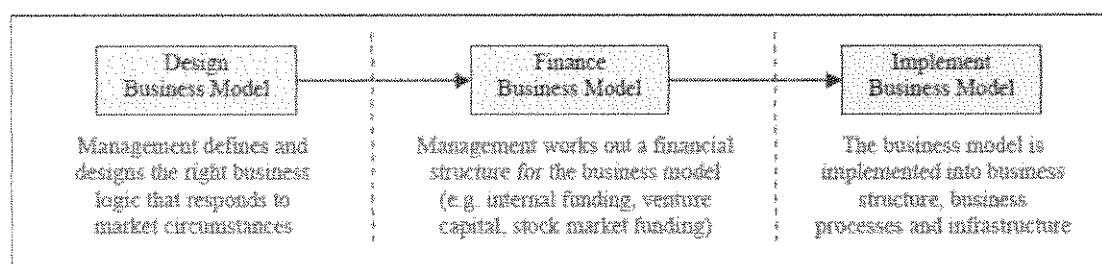
Source: Osterwalder (2004), pp 33

Many authors tried to identify the elements composing a business model. The one developed by management consultant Gary Hamel is often cited as one of the most comprehensive for its clarity in defining the key 'elements' and their connections in the business enterprise.

A commonly quoted definition by Timmers (1998) defines a business model as an architecture of the product, service and information flows, including a description of the various business actors and their roles, a description of the potential benefits for the various business actors, and a description of the sources of revenues.

Osterwalder adopts a similar definition which states that a business model provides a description of the roles and relationships of a company, its customer, partners and suppliers, as well as the flows of goods, information and money among these parties and the main benefits for those involved, in particular.

Figure 7: Business models steps approach



Source: Osterwalder, (2005, p 14).

The figure above describes the step by step process of the business model from design to finance and implementation. The business design strategy translates a strategy into a business design blueprint. The process entails: 1) designing a business model; 2) financing the business model and 3) implementation of the business model.

The rise of New Generation Network (NGN) investments by telecoms operators as well as convergence has seen many operators evolving into vertically integrated operators (Gillwald, 2008). This will mean that as they develop new strategies and services in the telecoms value chain, the process of arriving at business models and financing them will change significantly (Osterwalder, 2004).

From the financing of international Internet connectivity (via undersea cables) through private equity and development banks to backhaul access to funding of metro-fibre rings and SDH networks to last mile connectivity solutions, a new approach in business design models and implementation is at play.

The researcher will utilise Osterwalders' (2005) Business Models Building Block (BMBB) that comprises the key clusters of a large business and breaks them down into constituent blocks as a tool to dissect business strategy and operations (see table below).

Table 9 The Nine Building blocks of a business model

Pillar	Business Model Building Block	Description
Product	Value Proposition	Gives an overall view of a company's bundle of products and services.
Customer Interface	Target Customer	Describes the segments of customers a company wants to offer value to.
	Distribution Channel	Describes the various means of the company to get in touch with its customers.
	Relationship	Explains the kind of links a company establishes between itself and its different customer segments.
Infrastructure Management	Value Configuration	Describes the arrangement of activities and resources.
	Core Competency	Outlines the competencies necessary to execute the company's business model.
	Partner Network	Portrays the network of cooperative agreements with other companies necessary to efficiently offer and commercialize value.
Financial Aspects	Cost Structure	Sums up the monetary consequences of the means employed in the business model.
	Revenue Model	Describes the way a company makes money through a variety of revenue flows.

Source: Osterwalder, 2005, p 18)

In explaining new business models in the IT industry, Osterwalder identifies ICT's impact on business as fourfold. Firstly, he proffers that affordable ICTs have reduced transaction and coordination costs in transaction cost economies (Coase theory), meaning that the disintegration of traditional models into complex networks of independent parts such as e-Business and e-Commerce has made possible a new set of new products and services that are offered by multiple companies. Thirdly, ICTs have made IT accessible to each customer through multiple channels and finally the Web's new pricing mechanisms have found their way in business practices (Verma and Varna, cited in Osterwalder 2004).

Rapid diffusion of new technologies and convergence of telecommunication, IT and media developed new Web 2.0 applications, mega phenomena of social networks and the new media have dramatically altered offerings, services and adjusted business models. These have driven business models and informed funding models (Melody, Fransman) and rapidly altered the ICT value chain of telecommunications.

In December 2010 a group of Russian investors led by Goldman Sachs valued Facebook network (with over 500 million users) at USD50 billion dollars - proof that content, social applications will drive the broadband business models.

In applying this model in the competitive global and Africa-wide broadband Internet environment driven by broadband inter-connectivity, I have detailed the broader macros trends as follows:

Table 10 Key trends impacting on business models

Cluster	New trends impacting on broadband ecosystem in Africa (Osterwalder model, 2004)
Technological Change	• Convergence and IP based New Generation Networks; • Fibre optics compressions and DWDM fibre revolutionised broadband service capacity • Digital Terrestrial TV. Mobi.tv and spectrum efficiencies;
Customer Demand	• Mobile workforce driving demand for multi-device platforms; • Cloud computing and virtualization services new drivers
Competitive Forces	• Infrastructure and service based competition; • Competition in international connectivity
Legal Environment	• Convergence legislation – ECAAct of 2006 • Regulatory innovations – open access, ULL and infrastructure sharing to drive new businesses; • Essential facility access to landing stations, gateways, etc
Social Environment	• Social media transformation - facebook, twitter, you tube; • Peer production and user generated content; • Youth generation- General X key innovators and consumers of new innovations.

Adapted from: Osterwalder (2004)

3.6.1 Boston Consulting Groups (BCG) product portfolio mix

The Boston Consultancy Group (BCG) framework is a widely known model for analysing corporate strategy - the Boston Consulting Group (BCG) product portfolio matrix.

A key thesis of the famed BCG product portfolio matrix is that for most products, growth-rates closely correspond with certain stages of the life cycle. The conceptual distinction is that each stage typically is attributed with characteristics in addition to growth rates. Examples are customer adoption rates and the nature of competition. The emphasis on life cycle stage is not inconsistent with BCG's strict emphasis on market growth. An observation in the competitive telecoms market (and rapidly evolving technology) states that if both the product life cycle and market share have major significance, then business strategy of these telco owners of broadband infrastructure would need new approaches.

However, this business-level strategy is of interest to strategic units in multi-business firms, or to single business firms. Although business-level strategy centres on the concept of "competing," it is important to stress that it encompasses all the functional areas of the business such as operations, marketing, distribution, R&D, finance.

Product life cycle and market share theory

The concept of the product life cycle is well established (Fox, 1973,). For the early stages (introductory and growth), theorists generally lay emphasis on strategic actions aimed at gaining a strong competitive foothold, *such as aggressive pricing, building capacity, heavy marketing expenditures, and product R&D*. For the later stages (maturity and decline), the emphasis is on extending/expanding the product category and seeking efficiencies *via adding channels, broadening the product line, vertically integrating, avoiding price cuts, and so on* (These observations require consistent scrutiny over industries and can be tested in telecoms, cable and broadband business in developing and emerging markets such as Sub-Saharan Africa).

There are common threads, but there also are various prescriptive consistencies among life cycle theorists. For example, Wasson (1974) calls for cost cutting accompanied by price cutting in the maturity stage, whereas Fox (1973) encourages price maintenance. Clifford (1971) claims that "vigorous" advertising and sales efforts are crucial in the growth stage, yet Patton says that "marketing steps to the centre of the stage" during the maturity stage. There are some unresolved differences among theorists, but there also are confusing prescriptive positions taken by theorists. For example, Wasson encourages 'mature businesses' to seek new markets, product expansions, product improvements, and cost reductions. This array of suggestions is so encompassing as to leave the strategist with little sense of priorities, or any sense of what might actually work.

Market share has generally been identified as the factor affecting the performance of business units. Although it is possible for businesses to have (or buy) more market share than is optimal (Fruhan, 1972), the weight of evidence indicates that high share businesses have significantly higher earnings than low share businesses (Chevalier, 1972; Schoeffler et al., 1974). Hofer (1975) endorses the importance of market share by listing it as dominant among all the organisational attributes he would include in contingency models for all except brand new businesses. However, very little systematic research has been conducted on different strategies for different share positions.

3.7 Conclusion conceptual framework for analysing undersea cable business models

The selection and scope of the literature review chosen seeks outlines key intersection of economic theories (i.e. resource based perspective) and competition policy its impact on business models (Osterwalder, 2004; BCG 1979) as cogent frameworks to better understand how open access principles and models are catalysing new regulations and business strategies in the dynamic broadband / telecommunications sector.

By utilising new research on the 'economics of networked industries' and info-infrastructures (new generation networks) it deepens the understanding of the dynamic relationship between regulating ICT infrastructure and services in the public interest. The research locates open

access in new public policy issues such as addressing market power, regulating essential facilities, and fair competition – while also identifying ‘market failure and making recommendations. (Melody, 2002)

By utilising ‘new regulatory approaches’ to infrastructure and service based competition, such as open access, facilities based competition, and ‘infrastructure sharing’ it would provide a nuanced understanding of corporate behaviour and strategies by cable owners and telcos investors. New approaches to regulation include clearer definitions of Significant Market Power (SMP) in new generation network operators (leased lines, international leased lines, local loops etc). The researcher believes that this is how its impact on ‘public interest objectives’ such as pricing, affordability, universality as well as dynamic efficiencies such as innovation and development is achieved. By dissecting the business models and strategies of national/ international operators each with different goals, shareholders, strategies, models etc, the research will shed light on the strategies of various cable owners, operators and their strategic interventions (finance, regulatory, marketing, product innovation).

By analysing the ‘open access’ consortia WIOCC within EASSy consortia as well as Seacom's current model, and comparing them to other cable systems, it will dissect the initial impacts of competition in the undersea fibre cable market and also the national broadband downstream markets in Sub-Saharan Africa and East Coast in particular. The research outcomes will assist decision makers, policy makers, regulators and investors with a refined information for decision making in the context of the dynamic and fast changing global discourse on the Internet and broadband and its importance in knowledge society development.

Finally, it is my contention that the heterodox theoretical perspective of the resource based perspective and public goods approach provides a coherent understanding of the intersection. The researcher believes that the traditional neo-classical approach is inappropriate in assessing the dynamic and self interest nature of corporate behaviour and the ideal ‘price mechanism’ of supply and demand does not necessarily mean optimal market structure nor does it contribute to new innovation nor add to social and economic welfare. The Resource Based Perspective –with its dynamic appreciation of ‘supply and demand-side elasticities’, its use of relevant social

regulation perspective, and its corporate and firm theory explanations- in my view - provides a more robust and contextual understanding of the broadband access and undersea cable markets and broadband development at national and local level in Sub-Saharan Africa .

Undersea cable systems and landing stations (LS) represents key and critical 'input resources' for the internet and broadband community and industry. By declaring them open access sites, it will have the effect of stimulating dynamic competition and regulatory innovation. Investors and operators who have and plan to invest hundreds of millions of dollars in 'sunk infrastructure' require regulatory certainty. Public interest requires a competent and independent regulator to navigate multiple interest and regulate in the public interest.

CHAPTER 4: RESEARCH METHODOLOGY AND METHODS

This chapter details the methodology that has been employed in the study. The key areas discussed in the study under the research design are the approaches to qualitative methodology analysis framework as reflected in this study. More specifically, it details the critical approach to alternative knowledge claims and utilises content analysis and critical discourse and their reasons. Data collection methods employed will be interview methods – both semi-structured and structured - and its use is explained.

4.1 Research strategy and design

This section describes the research methodology and design in terms of the population, sampling and administration of research instruments, data collection procedures and description of techniques used in data analysis. By using this set of design mix and methods, the researcher will be able to answer the research hypothesis and questions and achieve its overall research objectives. The conceptual perspective of the study is based on qualitative research that includes designs, techniques and measures that do not produce discrete numerical data. In order to achieve the research objectives, the research design was based on the descriptive and diagnostic approach.

4.1.2 Research techniques

According to Neuman (1999) the qualitative researcher develops theory during the data collection process. This is an inductive method and means that theory can be built from data or be grounded in data. The researcher uses this approach as qualitative research is more flexible and allows for data and theory to interact. It also allows the researcher to be open to the unexpected, and, to an extent, be willing to change the direction and focus of the research project

4.2 Qualitative methodology approach

A *qualitative methodology* will be employed. It is an approach where the researcher uses theoretical frameworks that seek to find answers to hypothesis through theory. These draw upon disciplines of political science, public policy, economics and management theory. The reason for using a qualitative approach is generally to use theory to test phenomena. According to Creswell (2003) qualitative research generally encompasses knowledge claims based primarily

on constructivist perspective or advocacy/participatory perspective (political, policy, issue-orientated, change orientated). Some of the key characteristics of qualitative studies include:

- Constructivist and advocacy driven;
- Open ended questions;
- Emerging approaches and collect participants meanings;
- Focus on a single concept of phenomena;
- Validates accuracy of findings and makes interpretations of data;
- Creates an agenda for change/ reform and collaborates with participants.

Qualitative studies invariably have multiple perspectives. Guba and Lincoln (2003) and Creswell (cited in Leedy and Ormrod,) observe that there isn't a single, ultimate truth, but instead multiple perspectives held by different individuals. Leedy and Ormrod (2005) further assess that when little information exists on a topic, when variables are unknown and when a relevant theory base is missing, a qualitative study can help define what is important – that is, what is needed to be studied. In addition, there is a range of strategies of inquiry chosen that will have impacts on research design and procedures. Creswell (2003) unpacks that these perspectives range from post-modern thinking (Denzin & Lincoln, 2001), to ideological perspectives (Lather, 1999), to philosophical stances (Schwandt, 2000).

I will enunciate upon the qualitative methodology because it best suits my question and research strategy and enquiry. Furthermore, this method's use of research instruments such as in-depth interviews, questionnaire design focus groups and content analysis is ideally suited to answer my hypothesis and identified research questions.

4.3 RESEARCH METHODS and DATA COLLECTION

4.3.1 Introduction

This study relied on the two complementary sources of data: primary and secondary. In order to situate the study theoretically and generate the conceptual framework with which to work on the primary sources, secondary data was consulted and analysed to provide the initial data for the

study. Secondary evidence was collected from a wide array of sources such as annual reports of telecommunications companies, industry websites, corporate research reports, consumer reports and regulatory reports. These were accessed from libraries, websites and resource centres. Documents provide an exact and unobtrusive source of information and can be subjective to biased interpretation by the researcher and may be difficult to assess (Dobson, W, 2002).

4.3.2 The Interview method

The interview method is the core of information sourcing and information gathering. The form and content of questioning has been identified due to the nature of the complexities involved in the process of garnering information from multi-stakeholder sources, as probing questions will reveal deeper knowledge and nuances in the industry. The researcher utilised an interview schedule as it provided the researcher with the tool to manage the interview process, ensure flexibility in terms of timing and venues of the interview. The data collected from the sources and interviews was qualitatively analysed and coded to come with clear understandable statements, analyses and conclusion. By counterchecking, comparing, contrasting and corroborating the information collected from the various sources, the researcher was able to ensure that its linked to the theoretical framework, research objectives, research questions and hypothesis, thus ensuring coherency.

4.3.2.1 Key informant interviews

The key informant interview process is generally utilised to collect data from persons who are considered to hold crucial and relevant information. For this study, a range of experts amongst key stakeholders was identified. This included key professional experts from commercial telecommunications and ICT analysts, a regulator, regulatory executives from leading telecommunications companies, a consumer group, a development banker and an Internet service provider.

The interview schedule and content covered diverse topics that were interlinked to the overall research strategy. These included competition policy, regulatory strategy, infrastructure funding models, emerging themes in ICT for development. By adopting a semi-structured approach in the interview, the interviewees were able to freely express their deepest thoughts and to articulate

cogently, and in most cases speaking beyond their formal roles and positions. This robust and active participation and free flow conversation positioned the researcher in playing a role of a guiding catalyst and the knowledge and data generated were highly relevant, contextual and correct, strategic and insightful. The research technique employed involved a detailed study of a wide range of source documentation including documents, journals in telecommunications policy and business strategy, e-lists and discussion forums, commissioned reports by government and industry, NGO advocacy reports, online Web forums, formal UN and government policy documentation, etc.

4.3.3 Sampling

Purposive sampling allows a researcher to use cases that have the required information with respect to the objectives of the study. Therefore, subjects are chosen according to skills and experience as they possess a number of required characteristics including expert knowledge, industry statistics, tacit knowledge and inner circle networks in the telecommunications and ICT sector in Sub-Saharan Africa. . For this study, the sample of key informants consists of: World Bank, Afrispar, Telkom SA, Seacom, Neotel, MTN, ICASA, Afrispa, Altech, WIOCC Special Purpose Vehicle, Balancing Act, APC, 2 telecommunications and ICT analysts, a telecommunications lawyer, an EU funded ICT research programme and TENET network users. They constituted 17 interviews.

Interviews were not chronological or very formal. The researcher created a relaxed and cordial, yet professional and business-like approach for the interview processes. By using this approach the interviewees were keen to offer unique perspectives and assessments of the topic (Cresswell, 2003).

4.3.4 Case study method

Yin (1994) defines a case study as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.” It relies on multiple sources of evidence, requiring data to converge in a triangulated fashion.

Yin goes further to say that gathering evidence for a case study often involves techniques used by historians but can also utilise direct observation and systematic interviewing as additional sources of evidence.

A wide range of data collection methods are used in case study research. To gather information and make observations an important principle of data collection is to have multiple sources of evidence (which stems from the principle of triangulation mentioned earlier). The second principle is the creation of a case study database consisting of notes, documents, narratives and answers to questions and lastly the maintenance of a credible chain of evidence by the researcher. These are all important for the reliability of the information generated and the validity of the research outcome (Stake, Yin 1994).

Leedy and Ormrod (2005) assert that researchers may focus on a single case as it unique or have exceptional qualities and can promote understanding or inform practice for similar situations. Researchers may study two or more cases - often cases that are different in certain ways - to make comparisons, build theory, or propose generalisations; such an approach is called *collective* case study. They further assert that in a case study, the researcher collects extensive data on the individuals, programmes, and/or events on which the investigation is focused. These data often include observations, interviews, documents (e.g. newspaper articles), past records and audio visual materials. In many instances, the researcher may spend an extended period of time on site and interact regularly with people who are being studied. The researcher also records details about the context surrounding the case, historical, economic and social, that have bearing on the situation.

By partially analysing the WIOCC special purpose vehicle within the EASSy cable system model, the case study approach is used as a unit of analysis is relevant as it will compare how this unique club model compares with emerging open and hybrid model. Key data on ownership structure, consortia model, bandwidth capacity, pricing and maintenance and wholesale strategies are analysed. By utilising the case study approach, the researcher asserts that it will give a bounded and comprehensive view of the entity being studied.

Leedy and Ormrod (2003) identify following scope for the study:

- *Rationale for studying the case* - how it will contribute to a better knowledge;
- *Detailed description of the facts* - collection of key facts, stats, documentation;
- *Description of the data collected* - explanation of data studied;
- *Discussion of the patterns found* - identify themes, trends, and patterns;
- *Connection to the larger scheme of things* - finally, how it will connect to the larger scheme of things (i.e. how SAT-3/WASC case and its lessons fit in the emerging Internet backbone market in Africa and the impact of/on the policy and regulatory environment.)

4.3.5 In-depth interviews

In choosing types of organisations and experts as subjects to be interviewed, the researcher has chosen the stakeholder cluster approach that represents key stakeholders in the broadband telecoms sector in Africa. These include vertically integrated operators, ISPs, University research networks, funders and private investors, policy makers/regulators as well consumer groups, policy analysts, and NGOs. The reason is that these groups *have differing and divergent interests in Africa's broadband connectivity sector* and their various roles as input producers, users, funders, regulators and intermediaries will allow for unique perspectives, thus significantly enriching the research enquiry process.

4.3.6. Questionnaire design

The questionnaire that was distributed and administered is attached as appendix A.

The face-to face methodology is useful as it stimulates discussion by group members who are specialists in their field and has the effect of unlocking different perspectives on the same

topics- thus enhancing and enriching the researcher's overall knowledge and understanding of the intricacies of the topic.

4.3.6.1 Interview method

Interviews are a useful data collection technique and can unveil key information and subject matter knowledge that common documentation and readings cannot. Professional people are passionate about their area of interest and the interview provides the space for detailed discussion as well as gives the researcher access to latest trends and 'thinking and perspectives (Creswell, 2003). The researcher will ask permission of interviewees to be recorded who may need assurance on confidential information.

Online interviews may be used if key identified respondents are geographically far away and located in other cities and countries. In this context great care and consideration will be taken in the development of online questionnaires. The same applies for the telephonic interviews and in some cases virtual video and call conferences. The researcher will be the key driver and primary instrument of the research project. The entire process of information seeking, literature review identification and development, data collection and collation will be done by him. All interviews will be recorded (mp3, smartphone), transcribed verbatim and copious notes will be taken of all interviews and the researcher relives the actual interview process.

In some cases, unstructured, open-ended questions will be used in order to get a plethora of information from the experience and perceptions for all participants. The researcher will adopt a participative approach. This is informed by the deep and intimate experience and observation the researcher has of the ICT and telecommunications sector in Africa.

4.3.7. Data analysis

It is important to outline the scope and sequence of the data analysis that will be used as they have a bearing on the subject matter and the flow of the information and its presentation. Cresswell and Stake (cited in Leedey and Ormrod, 2005) assert that data analysis typically follows the following steps:

- i. Organisation of details about the case; *specific facts about the case are arranged in sequence;*
- ii. Categorisation of data: *categories identified as to cluster information into meaningful groups and themes;*
- iii. Interpretation of single instances: *specific bits of documents, occurrences, and other bits of data are examined for the specific meanings they might have in relation to the case;*
- iv. Identification of patterns: The data and their interpretation are scrutinised for underlying themes and other patterns that characterise the case more broadly than a single piece of information can reveal;
- v. Synthesis and generalisations: An overall portrait of the case is constructed and conclusions drawn that may have implications beyond the case that has been studied.

ICT regulation in the digital economy is very dynamic due to the rapid proliferation of new technologies and its immediate impact on regulation and its ability to change industry trends and market structure. Hence, there is an overflow of information, industry reports, documentation, and new regulatory directives on any given week. This makes the process of data analysis a dynamic one and researcher is to 'continuously scan the market and integrated new information for analysis that is timely and relevant.

The researcher also utilised the 'contrast contexts' approach as expounded by Neuman (1999). By using 'ideal types' to interpret data that is sensitive to context and cultural meaning of members and generally do not test hypotheses or create generalised theory, but use the ideal type to bring out the specifics of each case and to emphasise the impact of the unique context. Neuman (1999) further adds that ideal types are also used as analogies to organise qualitative data and that researchers use them to communicate ideas and to facilitate logical comparisons. Analogies transmit information about patterns in data by referring to something that is already known or an experience that is familiar to the reader. The benefits of analogies is that they can describe relationships buried deep within many details and are a shorthand method for seeing patterns in a maze of specific events (Neuman, 1999, p:469).

4.4.8 Data validation procedures

According to Perakyla and Leninger (1994), it is possible to ensure validity of qualitative data if the researcher follows procedures that minimise biases. In this study, several strategies were used to ensure accuracy of the findings. Data collected through various techniques such as interviews were triangulated to ensure that coherent approach to themes is being built. According to Neuman (1999), triangulation of theory occurs when a researcher uses multiple theoretical perspectives in the planning stages of the research, or when interpreting data.

4.3.9 Data processing and analysis

Once interviews were conducted from key informants and interviewees and qualitatively analysed, interviews were summarised and coded to come with clear statements and interpreted and analysed accordingly. Descriptive data and evidence relating to each of the research questions were classified into distinctive classes based on their common qualitative characteristics. Results were shared with respondents in a narrative manner.

4.3.10 Scope and limitations

There have been numerous limitations. The first limitation is the ever changing statistics on broadband data. The second is that corporate secrecy and integrity was often cited as reason for not providing full data on broadband figures and actual investments. Finally, distance was a limitation as some interviewees were overseas. The researcher addressed this shortcoming by using Skype and call conference technologies.

CHAPTER 5: FINDINGS IN RELATION TO BROADBAND MARKET POST COMPETITION IN UNDERSEA CABLE SYSTEMS IN Sub-Saharan AFRICA

5.1. Introduction to findings and observations

The year 2010 could be described as the ‘year of the international Internet connectivity boom’ for Sub-Saharan Africa with five (5) undersea cables operational by December 2010. This has introduced mass wholesale broadband access resulting in drastically reduced prices and the ‘broadband price wars’. A significant impact of this broadband boom is the significantly changing *market structure* and ‘state of play’ of broadband in domestic markets. This has seen the emergence of new generation players, innovative regulatory mechanisms, business opportunities in various levels of the IP based network resulting in new business strategies and robust competition in downstream markets (content and applications).

1. Firstly - Major price reductions have been observed with competition in undersea cable markets in east and west coasts with the proverbial ‘broadband prices wars’ in domestic markets (Kenya Synovate). In 2010, the price of wholesale broadband STM and E-1 lines dropped significantly – from USD3000 to USD1000 – an average of 46% reductions. Price reductions to consumers have spurred vigorous competition in the ISP market retail offerings to reach low baselines pricing in order to capture mass markets.

2. Secondly, the promotion of ‘open access’ policies has spurred both new investors and new kinds of investments in under cable as well as domestic broadband consortia markets. The approach of the ‘broadband ecosystem’ is evident as combination of supply and demand-side factors driving national broadband policies and strategies. This has attracted massive investments from both private capital investments (telcos, vendor financiers, private equity) as well as multilateral development banks (MDBs) such as the

World Bank (IBRD), the IFC, DBSA and EIB – whose loan conditions require clear socio –economic development outcomes.

3. Thirdly, an *interventionist role by governments* in promoting and actively participating in broadband development as a stimulant to growth is evident. While developed nations like the US, Finland, UK, Australia have billion dollar broadband stimulus packages, developing nations like South Africa, Malaysia and others have elements of these - such as setting up of wholesale broadband operators to achieve broadband penetration. Given Africa's lack of national universal transmission networks coverage and perennial high communication costs which make services like BPO uncompetitive, states like South Africa have taken a proactive approach by forming its own national broadband entity - Broadband Infraco.

4. *New regulatory innovations* such as open access principles have stimulated new broadband investment at international and local levels. These innovations have seen a flurry of new enterprises and 'new generation broadband providers' mushroom and multiply. Examples include the state funded 'wholesale broadband operators' to new generation fibre leasing/ third party providers entering the domestic telecoms market. This injection of billions of dollars in national fibre investments in many Africa countries- from South Africa to even landlocked Burundi - i.e. Burundi Broadband System (BBS) - is testament to the hypothesis that open access principles, if applied correctly, can incentivise 'national broadband investments' (Jensen, 2005; Southwood 2010).

5. *Infrastructure sharing* has also emerged as a 'necessary new business strategy' adopted by many operators in their national broadband rollouts. Operators are in rapid transition to 'vertical operators' - by offering data driven services across the value chain. Driven by cost-sharing imperatives, infrastructure is jointly being built/owned by competitors as the cost of adding additional capacity is marginal. And fibre networks can be outlayed in other national infrastructure such as electricity utilities, oil pipelines, railways and roads –thus making it more feasible. It is also observed that infrastructure-

sharing is being actively promoted by intergovernmental bodies such as the ITU, CRASA, CTO.

Infrastructure sharing is clearly a viable and sensible approach that has been largely adopted to reduce costs in an industry where high licensing fees and operational & maintaining wireless of NGN based networks are exorbitant. Hence, cost sharing to build national broadband networks (as in South Africa) or sharing mobile base stations (SA, Tanzania, Uganda) is increasingly being adopted and becoming the de facto norm.

6. Finally, *the nature, scale, scope and funding mix of telecommunications financing* is rapidly changing. MDB funding from IFC, AfDB, EIB, World Bank has been granted where socio-economic impacts can be proven (i.e. rural area roll-outs, cost based pricing etc). There massive inflows of large of private equity capital . An example, Seacom is fully funded by private capital funds such as *Venfin, Blackstone group, Shanduka, Convergence partners and Aga Khan Investment Promotion Services (IPS)*.

FINDING 01:

5.2. Price Impact of undersea cable competition on wholesale broadband

5.2.1 Broadband price reduction outcomes

The advent of competition in Sub-Saharan Africa through introduction of several cables has had downward pressure on price competition resulting in 'broadband wars' in most African countries. The table below provides a rough estimate of industry prices around Q2/3 2010 (interview with leading wholesale cable operator)

Table 11: Broadband wholesale price reductions, Q2/3, 2010

Terms (x-axis) & Product (y-axis) Matrix	Anchor Tenant IRU once off (USD)	1 st tier customers STM-1 line once-off pricing	3 Year Lease (USD pm)	4 Year Lease (USD pm)	5 Year Lease (USD pm)

		(USD)			
STM-1 line	3,500,000	3,500,000	82,639	65,625	55,417
STM-4 Discount multiplier 0.85	11,900,000	2,975,000	280,972	223,125	188,417
STM-4 to STM-16 Discount 0.80					
STM-16 Discount multiplier	38,080,000	2,380,000	899,111	714,000	602,933
STM-64 Discount multiplier 0.70					
STM-64 Price	106,624,000	1,666,000	2,517,511	1,999,200	1,688,213

Source: South Africa Wholesale broadband provider, 2010

(General summary of market information extrapolated from wholesale broadband operator. Undisclosed market information, not available to the general public. Discounts of up to 20% are offered either to anchor tenants or to multiple circuits for buyers of multiple circuits.)

In terms of international comparison, these prices are notably still significantly higher compared with prices for instance on cables connecting Europe and the USA and other economic regions in the country.

The reason for this is that actual traffic volumes between SA and Europe are still only a fraction of traffic between other regions. *For instance, aggregated SA long distance traffic levels are 1/400th that of the UK and 1/600th that of the USA.* It is not possible for SA to achieve the economies of scale that have been created in these markets, even in the long run, although the differences in price are likely to come down significantly.

However, the shift has started. Back in 2005, an STM-1 service cost approximately USD800,000 per month. More recently, STM-1 prices have come down from approx USD200,000 per month in Q4 2008 to approximately USD150,000 by Q4 2009 to approx USD90,000 in 2010 (e.g. USD82,639 based on 3yr lease), or about 10% of prices only a few years ago (Source: Telegeography). This clearly shows a downward trend in price offerings for STM-64 lines and the emergence of new service level agreements.

Higher end capacities such as STM-4 to STM-64 that were not previously sold or readily available and the introduction of wholesale pricing on these services is a relatively recent phenomenon. Unfortunately historic prices are not available for these services. This suggests that the era of wholesale pricing for high end capacity will have significant impact on lower access and pricing.

Competition in the undersea cable market and access to essential facilities has seen a steady update of users. Seacom has full capacity leasing upfront purchase of fibre capacity. ISP's reduced costs (from USD 5000 - USD 1000), increase users per bits, broadband usage mybroadband.co.za) Until the landing of SEACOM access to these gateways had to be obtained from Telkom due to the monopoly on the landing rights for the SAT-3 cable. Neotel has the landing rights for SEACOM (and EASSy as well). This means open access to the SEACOM and EASSy cable systems at the landing stations, whereby Neotel cannot refuse access, but does determine the cost of interconnection. SEACOM (has) been licensed in SA and EASSY (either has or is likely to) be licensed, which means they can pick up traffic from inside the SA borders and carry this directly onto the cable from Johannesburg to inter-city POPs and national markets.

The effect of this is (a) to drive down interconnection costs, (b) add to competition on the international cables themselves due to the fact that more operators can connect internationally more easily and (c) drive massive wholesale broadband price decreases. The new West African WACS cable will further contribute to this effect. Already it has driven down the cost of international connectivity significantly in East Africa (see figure below), and is likely to continue to drive price reductions for the foreseeable future.

Figure 8: Effect of Seacom on broadband in East Africa (IT Web, Oct 2010)



	Pre SEACOM market ITW 2009 data (Mbps)	Since SEACOM... * (Mbps)	Growth *
Tanzania	■ 520 (2008)	■ 3,500 (2010)	± 520 %
Kenya	■ 1,421 (2008)	■ 6,500 (2010)	± 400 %
Uganda	■ 369 (2008)	■ 1100 (2010)	± 300 %
Mozambique	■ 72 (2006)	■ 750 (2010)	± 1000 %
South Africa	■ 3,380 (2007)	■ 25,000 (2010)	± 700 %

*Underlying assumption (based on historical results) is that the amount of capacity purchased by SEACOM by a country's CSPs (Communication Service Providers) is the amount that they intend to sell in that year and hence reflects relatively accurate market usage in 2010

Note: Growth % reflects growth from the Pre SEACOM data point date in parenthesis to 2010

ITWeb events 4

Source: Aidan Baigie, Seacom, January 2011

With new cable systems competing next year (SAT-3, SEACOM, EASSy, ACE and WACS, EIG) *price competition*, together with the bundling of national and international bandwidth will be very high and margins will be under significant pressure. Cables will independently light up capacity gradually, as demand grows, and although they will attempt to control supply by limiting the amount of capacity lit, the level of control over supply will be very low.

The extent of ‘Buyer Power’ (Porter’s model) will be exceptionally high given the actual level of demand (which in the case of SA and most of SSA is growing off a very low base and is still relatively low compared to the cost of building these cable systems).

5.2.2 Seacom and EASSy - strategic competition and differentiation

After years of lack of backbone in East African international connectivity, the advent of the private cable *Seacom* in July 2009 has injected much activity and competition – invariably leading to price reductions. *Seacom* adopted a quick ‘first entry dominant’ strategy in the east coast has developed a smart approach by riding on its ‘first mover advantage’ strategy through aggressive marketing to corporate clients. It has also won large business in the wholesale leasing market through its use of offering customers indefeasible rights of use for international links. By tying up relationships with new entrants to the wholesale market, it hopes to form contracts with open access fibres developers to provide ‘last mile corporate fibre connectivity in major metro areas.

EASSy’s entrance into the regional market in July 2010 was welcomed and through ‘intensified competition it has upped customer services as first tier broadband price wars. A clear ‘product/service differentiation strategy’ is evident whereby the focus of these cable operators and providers is on better technology and service rather than just the wholesale price factor. Furthermore, the EASSy ownership model and the inclusion of smaller operators through WIOCC SPV (which owns 29%) has a system of ‘equity pricing’ that allowed smaller players from landlocked countries to purchase wholesale bandwidth. This SPV is a ‘key institutional enabler’ which has made broadband Internet accessible and available at cost to all African nations- irrespective of geography.

Table 12: Product / service differentiation between Seacom and EASSy cables

SEACOM cable (private)	EASSy Cable (consortia)
○ Privately owned (private equity) ○ High cost (USD 650 M) translates to pressure for profits/dividends; ○ No redundancy; ○ Linkages to new entrants to the national wholesale market; ○ Open access and pricing model; ○ Adoption of new IP based technology - thus offering IP NAP and MPLS services to clients; ○ Recent moves into metro fibre connectivity (secondary services); ○ Provider to National Research networks (Ubuntunet)	○ Club operator model (telcos); ○ Fully funded by cash flows and less pressure for profit; ○ Scalability - Selling as capacity for everyone: entry level capacity –E1 (2Mbps) to STM64 / 10Gbps; ○ Flexible contract terms; ○ Development agenda for Africa- raised USD 75 million from IFC; ○ Price – linked to developmental mandate of World Bank; ○ Backhaul network – linked to 21 countries in Africa; ○ Collapsed ring configuration- ensuring redundancy.

Source: Author, 2010

The robust competition in Sub-Saharan Africa's eastern seaboard between EASSy and Seacom & TEAMS (and now Orange Telecom LION-2) is set to continue with further (positive) downstream effects and impacts such as effect of lower prices, better Quality of Service (QoS) and event new technologies.

5.2.1.3 Broadband Internet retail price competition in selected operators

Drivers behind this mainly include availability of ADSL through more local access points, which has vastly improved over the years. Parallel to this, wireless broadband has also taken off and has eaten into fixed broadband share; in fact today it constitutes about

60-70% of the market (BMI 2010). At the high end ADSL prices have not come down, although bandwidth offerings and usage caps (nationally and internationally) have grown significantly. This has paved the way for lower end packages to be introduced to the broader market, such as the R99/month limited use packages you see on offer today.

Further to this, Telkom SA has also levelled the playing field on the wholesale side, by allowing other licensed operators to *on-sell and re-bundle ADSL packages* at price levels similar to what Telkom SA can offer to the market at a retail level. This had a significant effect on competition on the retail side, which if combined with the competition driven by the mobile operators using 3G/HSPA as a competing technology and broadband offerings, perhaps had the strongest impact on the level of competition, and resulting impact on prices, on broadband offerings in the SA consumer market.

5.3.2.3 Nigeria's broadband price reductions

In Nigeria, although WACS' proposition has not yet come to fruition, the two undersea cables, Main One and Glo-One, are already bringing down the existing pricing model by reducing communications' cost by 50 %. Before Main One cable commenced commercial operations, telecoms operators and Internet Service Providers (ISPs) bought 1 megabyte of bandwidth capacity for as much as USD2,400. In the United States, the same megabyte per second costs USD3.33 and in Japan USD0.27 while in Kenya it is USD600 (Business Day Nigeria, October 2010).

More Nigerian homes will have access to cheaper Internet services by 2012 as the country's bandwidth market is expected to witness explosive price wars occasioned by heightened competition in the submarine cable market, analysts have predicted. It is expected that the price of bandwidth will fall from USD2, 400 to USD10 per megabyte as the number of submarine cables increase. According to them, Nigeria recorded a 5,400% increase in Internet users from 2000 to 2009, indicating triple digit annual growth rates. Furthermore, it is indicative of the enormous potential in the growth of the Internet market representing huge business prospects waiting to be harnessed, if only the necessary regulatory push and implementation of Internet-based initiatives are made.

Finding 02:**5.3 INFRASTRUCTURE SHARING SPURRING NEW BUSINESS MODELS AT NATIONAL LEVEL.****5.3.1 Emergence of ‘shared Infrastructure’ consortia’ The WIOCC case**

Shared infrastructure consortia is a new category of business that is being pioneered in large undersea fibre cable projects (i.e. WACS, EASSy) and this model is being replicated in national broadband rollouts. By maximising the utilisation of built infrastructure (co-building) operators are saving costs, and allowing them to focus better on their core (i.e. network equipment, enhanced customer satisfaction, increase subscriber base and profit returns)

a) WIOCC open access SPV within EASSy cable system:

WIOCC is a sub-consortium of 14 shareholders within the ‘open access’ EASSY submarine marine cable system that launched in June 2010. It owns 29% and represents smaller operators from landlocked based countries. Funded mainly by a range of developmental finance institutions such World Bank, EIB, KfW, and other investors such as WB have injected about USD70 million – with pre-assessment grant condition that development objectives of open access, fair access to all as well as a cost based pricing policy.

5.3.2 Burundi Broadband Systems’ (BBS) national broadband roll-out

The WIOCC SPV- open access model in turn spurred the formation of an innovative national consortium- the Burundi Broadband System (BBS). This constitutes operators - *Onatel Burundi (incumbent) & U-COM Burundi, Africell, and V-Tel and Econet* as well Mobile operators *Onamob and Leo*. The BBS is building a national 1000km fibre optic network. Its formation has attracted capital funding from the World Bank for national coverage through 26 nodes on the roads network. Effectively, the World Bank portion of the funding is paying to connect the smaller ‘uneconomical towns- thus playing a universal service function.

The funding of the BBS is a unique national backbone development investment arrangement for a landlocked country. Essentially, it is a 20 year concessional loan agreement and operated through a Private Public Partnership (PPP) agreement with a direct USD10.5m grant from its RCIP programme designed to spur developmental orientated infrastructure financing.

A positive dimension that has been observed in the BBS project is the degree of 'policy and regulatory innovation' and roles played by the Burundi government via a catalytic partnership that has incentivised the development of the national BBS by giving valuable 3G spectrum to all operators of the consortium. Clearly, this win-win scenario of the policy maker (i.e. Burundi government) spurring new market investment in the backbone market that would under normal market circumstances not roll out a national network. It has spurred competition among operators who clearly co-operate on backbone development and compete in the services market (voice, data).

5.3.3. Commercial infrastructure sharing

Spurred by the need for mass cost savings, and examples of major undersea fibre like EASSy and WACS, the upshot is the growth of commercial infrastructure sharing between 'competitor operators' in national markets. The drive for cost reduction imperatives has seen independent operators enter the market, build and co-own infrastructure (i.e. mobile towers, etc) then lease them to operators. By sharing of sunk infrastructure, they come together to build a common backbone and massive cost savings as operators are relieved of the sole and onerous burden of expensive sunk costs'.

It also makes sense as Environmental Impact Assessments (EIAs) are costly and infrastructure sharing thus reduces compliance and transaction costs. These business strategies are being driven by 'commercial objectives' and imperatives such as the steady decline of ARPUs in the mobile voice sector and the growth of broadband and data services and content applications as the 'next wave' of profitable revenue streams.

With the growth of mobile TV, social gaming and social media applications, infrastructure sharing is the driver of business models of mobile operators who play in the media rich content space to avoid balance sheets saddled with debt from expensive infrastructure roll-outs.

5.3.3.1 West African Cable System (WACS)

The best example is the process of forming the West African Cable Consortium (WACS) which brought together incumbents with diverse interests - Telkom, SNO Neotel, Telkom and Vodacom. State owned Broadband Infraco also joined the consortia and hence WACS is an example of direct competitors coming together to pool investment funding and share backbone infrastructure resources.

5.3.3.2. MTN/Vodacom/ Neotel in South Africa

Sharing costs of trenching and project management, one of the largest examples of infrastructure sharing is South Africa's. MTN/Vodacom and Neotel came together in March 2009 to build a R1.75 billion, 5000 km national fibre network to compete with Telkom's only national fibre owned network.. However, they will provide their own fibres and electronic transmission network.

- Neotel estimates that the cost savings amount to R400 million.

5.3.3.3 Cell C's national 4G broadband roll-out

In October 2010, SA's third mobile operator Cell C sold its base stations to American Tower Corporation (ATC) for a USD220 million and lease back only what is considered strategic for its operations. In doing so, Cell C frees up its balance sheet and instead invests capital (from the sale of its base stations) in improving its services, speed, its 4G broadband roll out and marketing plan. Base stations in Nigeria are mostly MTN diesel and solar powered and are normally required for 24/7 functionality.

The recently announced joint venture in South Africa of *FibreCo*, *Cell C* and *Internet Solutions-3* to build a new national fibre network at a cost of R5 billion signals the 'confidence and buoyancy' of pent up demand for broadband.

5.3.3.4. Price impacts in Kenya Education network community KENET

The advent of three undersea cable systems has brought down prices dramatically in Kenya. The national research network KENET had previously signed a two-year VSAT contract with a supplier for 200 Mbps of capacity. Though the contract became effective in January 2009, the resources that were to be made available by means of a World Bank grant to improve Internet capacity at the universities, were delayed. Regardless, KENET managed to negotiate with the provider for half of the anticipated capacity with fibre-meaning and KENET would remain active with 100 Mbps VSAT and 100 Mbps equivalent, by way of fibre. Thus, KENET would have 350-Mbps capacity on fibre and 100-Mbps capacity on VSAT plus an additional 155 Mbps via a KENET-owned link to the UbuntuNet router in London connecting KENET to GÉANT and allowing for peering via UbuntuNet.

Since that expansion, KENET went from 12 Mbps in 2008 on VSAT to 450 Mbps on VSAT plus fibre in 2009, to more than 600 Mbps combined capacity in 2010—all in a span of 18 months. Usage has peaked, and the need for additional capacity is anticipated due to users' increased awareness of better speeds.

5.4 Emergence of third party providers and dark fibre operators

Massive international broadband rollout in local markets has not only catalysed a dynamic and competitive market but has created spaces for new kinds of operators - 'trusted third party operators'. These typically *are carriers' carriers, alternative infrastructure providers and dark fibre operators*. They are playing specific functional roles in the multi-layered and competitive broadband networks and markets, and adding new dynamism.

- (a) Carriers' carriers: These operators provide wholesale capacity to other operators and normally form separate infrastructure companies whose sole function is wholesale provision by providing links between countries and nationally.
- (b) Examples include the formation of Kenya Data Network (KDN) in Kenya which provides wholesale bandwidth to Kenyan telecommunications market (ISPs, operators) and a small shareholding in the TEAMS cable system.

(b) Alternative infrastructure providers: These are typical national utilities and parastatals such as electricity, transport, gas and road link networks. When they are required to build their own fibre, they merely add fibre to an existing network (e.g. electricity pylons) and thus have national reach.

(c) Dark Fibre operators: They are specialised groups in companies that specialise in 'digging trenches and laying fibre'. Operators are then able to buy dark fibre only as and when required and light fibre (i.e. making it operational). A South African company, Dark Fibre Africa (DFA), has emerged as an operator that sells dark fibre capacity and physical infrastructure on behalf of those without capacity. Its network licence allows it to get 'rights of way' and build routes and networks.

The attractiveness of the proposition is that operators making use of dark fibre operator services save on upfront sunk costs and thus free up capital expenditure for more core competitive areas such as marketing, content development innovations and customer services in the competitive downstream retail markets.

5.5. Rise of second tier players and data hosting entities

A significant court case was South Africa's high court ruling on Altech SA Pty that allows for VANS to self provide networks. This has seen a trend whereby various VANS' players have signed interconnect agreements with Telkom and mobile operators. ICASA's interconnect reduction regulations made a number of Least Cost Routing (LCR) players uncompetitive. At the same time, new entrants to the alternative voice market such as Vox, Internet Solutions and ECN Telecom are making limited impact on the voice market. Many of these second tier operators are building components of their own networks in lucrative metro areas (fibre optic, microwave etc) through infrastructure sharing agreements.

Another lucrative spin off market that has been created by broadband abundance from the massive inflows of fibre and broadband – through new operators - is the growth of co-location hosting centres.

Terraco has emerged as a major data hosting centre. *MetrofibreTM networkx* is a new open access provider that is specifically targeting building last mile fibre optic nodes to base stations, and linking customer enterprise premises etc. These two entities are an example of the new kinds of data operators created to respond to rapid inflow of broadband, decentralisation of data warehousing because fibre and increase in Metropolitan POP's secondary market.

5.6 The state intervention model and case of Broadband Infraco

The growth and competition in undersea cable systems has also drastically altered domestic market interventions and redefined roles of state owned enterprises. South Africa's perennially high communication costs (through monopoly, oligopoly and a high interconnection cost regime) has prompted its government to set up a new entity *Broadband Infraco*. Kenya's approach has been market driven whereby a new operator KDN was formed as a second national wholesale operator offering open access services to operators.

In South Africa, *Broadband Infraco* was formed to provide national backhaul access and international gateway facilities at cheap costs to first tier operators by normalising market efficiency, reduce market failure by owning (and making available infrastructure) in national backbone (owning 5 POP's) and international connectivity (through WACS cable system) at reduced-wholesale prices. As a state owned entity (Schedule 2) it operates under the Public Finance Management Act (PFMA, 1999). It operates an I-ECNS licence allows it to only provide network services and not other services (capacity, value-added, Internet), Hence, it primarily sells wholesale capacity on its fibre optic network.

Finding 03:

5.7 New regulatory incentives stimulating national broadband roll outs

Open access principles and models in the telecoms sector in SSA have initiated a 'quiet revolution' in terms of new regulations. New generation convergence legislation and regulation has been the framework in which the telecommunications sector has been

regulated. South Africa has pioneered ‘convergence legislation’ with the enactment of the ECACT 2006 and a converged regulator (ICASA Act of 2000). The Kenyan Communications Commission (CCK) has been proactive governing telecom competition by utilising interconnection and essential facilities rules.)

5.7.1 New generation essential facility regulations

Telco incumbents’ control of essential facilities in Sub-Saharan Africa (landing stations, core network, local loop) is still dominant but waning. The opening up of international landing stations has generally been welcomed and has seen competitors gain first tier access. In Kenya, operators like KDN have access to Seacom and TEAMS cables and in Nigeria the ACE cable and Neotel in South Africa has access to Seacom and EASSy cables.

However, *wholesale facilities leasing and local loop unbundling* is still a challenge. South Africa’s ICASA regulator has been proactive in identifying operators that have Significant Market Power (SMP).

They are now obliged to provide wholesale rates to their operators when leasing facilities in both end-to-end leased lines and other wholesale services (international leased lines). This will have a significant impact on ‘fair play and competition at domestic level’. Open access principles have catalysed new approaches to regulation of essential facilities - principles that acknowledge the multi-layered passive and active components in new generation networks. This is exemplified in the South Africa’s Government Gazette No.30612 which issued its latest list of essential facilities as contained in Section 43 (8) (a) of the Act and includes:

- Co-location space;
- Land based fibre optic cables;
- Main distribution frame;
- Backhaul circuit;
- Cable landing station;
- Earth station;
- International gateways and Undersea-based fibre optic cables;

Finding 04:**5.8 Diverse telecommunications funding mix of development and private capital**

The research found that an intensive debate on infrastructure financing in SSA is suggesting that telecommunications funding occupies a unique space in development funding by virtue of its status as a utility or public good and its service function - driven by profit maximisation. Telecoms investments growing at 15% per annum and major projects will require funding from development financing institutions as well as private capital markets (banks, private equity funds etc). Findings a complex and dynamic mix by policy makers, bankers and recipients to find the correct mix and approach is in constant evolution. While IFC and AfDB extended large funds into telecoms, the private sector should self-fund most of its own investments while the IFC is focusing on investment models that plug the 'universal service gap' in viable areas and has economic development targets.

5.8.1 Multilateral Development financing shifts in telecommunications funding

Multilateral development finance is increasingly playing a key role in financing telecommunications in developing regions. Development institutions like the World Bank, (IFC), AfDB, and DBSA are government backed finance houses whose core mandate is to provide long term capital, policy advice, and technical assistance to governments and the private sector in developing countries. Their core mandate has been large scale development finance - mainly infrastructure like roads, housing, railways etc.

There has been major growth of financing and loans to the private sector since the 1990s and since then it has increased ten-fold, from USD4 billion to over USD40 billion per year. Growth has increased at a rapid and significant rate and been driven mainly by the World Bank's private sector funding arm - the International Finance Corporation (IFC).

In the past two decades, there has been a clear trend reflected by growth in the private sector finance where multilateral development banks such as World Bank, IFC, EIB, EBRD) are promoting the private sector as the engine of economic development. By

extension, this has seen the rapid lending of MD loans to private sector companies across the world, particularly in developing regions and benefiting Multinational Corporations (MNCs).

5.8.3 Vendor finance models of Chinese investment

Another finding is the new strategy adopted by some of the largest and most profitable telecoms equipment makers to ‘lock in’ their products and technology in national broadband rollouts. With hundreds of billions of dollars in reserves and cash pile, Chinese government state owned enterprises (SOE) are investing heavily in developing regions like Sub-Saharan Africa. As part of their global economic strategy, Chinese mega state owned corporations play a key role in fully funding capital infrastructure and risk capital for its corporations. In exchange, for low cost loans, recipient governments in Sub-Saharan Africa are obliged to use Chinese firms (ZTE, Hauwei etc) in their implementation. Telecommunications financing typically takes the form of vendor based, backed by a Chinese bank. In October 2010, the South African mobile operator Cell C secured a R1.8 billion development loan (TechCentral, 10.10.2010). But Cell C had to sub-contract the Hauwei Chinese telecoms equipment manufacturer to build its 4G fibre networks.

Table 13: Private Capital investment in SSA telecoms and broadband projects

Funder / Investor	Ownership in projects	Value
Convergence	Seacom, Fibreco,	USD 75 million
Aga Khan /IPS	Seacom	USD 225 million
VenFin	Seacom,	USD 125
Blackstone Capital	Seacom	USD 125 million

Source: Author research, 2010

Finally, we are witnessing a more robust approach to social regulation in the telecommunications sector whereby governments are taking a more integrated approach towards infrastructure and utility regulation. Given that large parts of Sub-Saharan Africa

are without infrastructure, especially in rural areas, governments are adopting an integrated development approach.

CHAPTER 6 ANALYSIS OF FINDINGS ON UNDERSEA CABLE IMPACTS ON PRICING AND ACCESS

The research question attempted to answer the models of international cable systems and impact on broadband and Internet development in SSA at various levels. The vast literature review confirms the inter-relationships with key themes. The dynamics of *economics of network regulation* is competitive, intelligent, and that access to new generation networks and layers (thematic issues drive 21st Century network development) as espoused by Melody is evident in the broadband market in Africa, with multi-level reforms in all layers of new generation networks.

The recent global financial downturn had a ‘moderate effect’ on the telecoms industry. The telecoms and ICT market are largely robust with fundamental business models in place that will ride out the worst of the financial crisis. In fact, the new social media revolution, Web 2.0 technologies and content rich drive more demand for new media and broadband networks, the fundamentals of and broadband media rich future and knowledge society will robust to new growth- and avoid dot.com busts of a decade ago (ITU, 2009). The advent of multi-billion dollar loans and ‘quantitative easing’ (USA injection of USD600 billion) has seen a steady stream of hot portfolio investments flow into emerging markets. Sub-Saharan Africa has been the star in terms of attracting FDI funding in the telecoms sector and the proliferation of undersea cables (7), with up to 11 cables by 2013, as well as investments in telecommunications assets such as base stations, point of presence (POPs) all of which confirm its ‘last frontier telecommunications status’ (Telecommunications analyst respondent 3).

The rise of emerging groupings such as G-77 and BRICSA group of nations are fast emerging as key drivers of key economic and political reforms.

These ‘emerging nations’ are sites of inward and outward bound investments by new multi-nationals who are competing ‘head on’ with MNCs from USA and Europe. Moreover, emerging markets are the ‘engines of GDP growth and subscriber growth’. Key demographics such as age and youth as well as a lack of infrastructure will continue to be attractive for future Foreign Direct Investments (FDIs).

However, there are risks in the telecommunications sector through marked slowdown in revenue growth globally. In some cases the hallmarks of the faced ‘dot-com bust’ is evident with intensive price competition among undersea cable systems and at broadband retail level. Even in mobile, these changes highlight a decreased ARPU outlook in the future forecast period to average USD138 per year by 2015 (Ovum, 2010). The ARPU drop is the result of price competition and penetration of telecoms in rural areas of emerging markets, and gradual market maturation. And while prices have come down due to the financial downturn or broadband price wars, it will be difficult to increase them once the market normalises, hence a low return system that will pay off time lags for those operators and ISP’s offering broadband packages (Academic respondent 1).

6.1 Business strategy and new models in broadband

At the heart of the business strategy and new models of the many businesses (international and national) in the globally competitive telecoms business, wholesale broadband has had a ‘disruptive effect’ on the market. This has seen the introduction of new kinds of operators and players across the value chain. For instance, Seacom an undersea cable operator has had a disruptive effect on the undersea cable market by injecting competition and adopting the ‘first mover’ advantage as per the BCG matrix. As a cable system, it is now offering IP services and marketing services and entering alliances with national IT market of many countries (Seacom respondent 1).

In line with the business model thesis advanced by Osterwalder (2004), entities like Telkom SA and Nitel Nigeria – as traditional ‘monopoly incumbent operators’ – are competing in international interconnectivity and broadband access as ‘monopolist- co-owners of cables’ (SAT-3WASC, EASSy, WACS and Glo-1). By using the ‘value –

chain' analysis as advanced by Fransman (2002), we find these incumbent operators now participate in all layers of the New Generation Networks (NGNs) – i.e. *wholesale broadband, international long distance, national long-distance, mobile, data services (i.e. VPNs), mobile and retail broadband*. Hence, their approach to owning undersea-cables (via the club consortia model) makes sense for them from a business strategy and business model perspective (Osterwalder 2004). They view undersea cables and landing stations as a 'critical inputs'. Hence ownership of this 'wholesale resource at cost' will ensure a 'reliable, secure bandwidth supply' so as to extract maximum gains (pricing) further down the downstream telecoms retail-customer value chain (World Bank respondent, 2010).

By contrast *Seacom*, as a private cable venture is a purely profit model and prepared to sell wholesale bandwidth to anyone in the market. Its IP based network and shareholder investment requires a full rate of return cycle of between 3-5 years. At a cost of USD600 million this is significant and means that 'wholesale broadband pricing will come down in only a few years after the 'lag effect of price reductions' filters through. In my view, it has adopted the BCG product portfolio mix approach by its diverse product offering and market share increase as core business strategy. This is evident via new IP based services and customer offerings (IP MPLS) and innovative Service Level Agreements (SLAs) with national operators and even large metros in Africa. In essence it is using its 'first mover advantage' to maximise market growth and relaying on partnerships for sustained customer base.

6.1.2 The rise of super regional telecommunications in international connectivity

At a global level, the historically dominant first tier global telcos like AT&T, BT, Orange have led in terms of their economic power and global reach both as multinational corporations (MNCs) and as telecoms/IT 'providers of choice for other global MNCs. The shift to developing regions' MNCs is now evident in the global telecoms market. These include Tata, MTN, Singtel, Telkom, DiData, Bharti, China mobile, etc.

An unique observation of this ‘business cycle’ is that these regional super operators are largely a) cash flush and huge cash reserves and growing subscriber they are 2) acquisition hungry and searching and buying equity and take-overs in emerging markets; 3) investing in the best technology and marketing ; 4) have huge R&D investments etc. (Altech respondent, 2010).

According to the Neotel telco respondent 1, the Tata Group takes a strategic and mature approach to global undersea cables. The Tata Group is a global tier ISP which runs many ISPs and owns many international fibre cables. Its approach is regional and investment in fibre cables is part of global strategy of owning first tier POPs in key geographic regions.

By investing in first tier infrastructure such as international POP circuits it manages its own global data traffic, and one can deduce that Tata (Neotel) pursues both an ownership and first tier access strategy with regards to global international connectivity circuits. This helps explain that it is a landing station for both Seacom and SAT-3 (both competitors) and a joint investor in the new WACS cable. When observing Tata and Neotel’s global and regional strategy one can deduce that it is consistent with the theme of ‘emerging powers of BRIC countries and the global ambitions and penetration of their MNCs (Actmael, 2007).

The MTN group is an ‘African mobile champion’ with operations in 23 countries in Africa and seven in the Middle East. Respondent views the mobile voice market as a maturing one- even in emerging markets and believes the future is pinned on mobile applications, content and broadband data. Thus, many mobile operators hold that bandwidth as a new data and business proposition. Hence, the MTN group is investing intensively and heavily in national data networks in Africa (SA, Nigeria, Uganda, etc); some undersea cable models (WACS, EASSy etc) and may even unbundle its international operations and list on the Dubai global stock exchange to raise capital for future networks and acquisitions.

The growth of new tier fibre operators such as Dark Fibre Africa (DFA) and FibreCo as well as their Africa wide plans and ambitions suggests there is appetite for capital and investment in national broadband roll-outs. However, there is a 'moderate danger' that oversupply of international Internet connectivity will lead to hyper-competition in SSA, as price wars may mean some cables owners may be unviable and even lead to bankruptcy.

According to the World Bank respondent, undersea cables will always remain operational as they will generate business for any new cable owner'. Given SSA's low broadband Internet penetration of only 5%, these 'first generation investments are guaranteed.' However, Respondent 1 from civil society cautions that market overcapacity may result due to the broadband investment boom and will straddle the sector with debt, and this should be avoided. She suggests tighter social regulations that promote infrastructure sharing, access and rural universal service projects.

6.1.3 Differentiation and sustaining profitability

Another observation is that vertically integrated telco operators and mobile fixed differentiation is falling in terms of infrastructure. Co-investments in sunk infrastructure makes sense as they will compete in new models. A new trend comes in the form of offerings in managed and professional services. Some are developing. Examples include Bharti and IBM in CRM billing cooperation agreements (Telecoms analyst respondent)

Integrating an IT services model within the operator model

New IT innovations and trends such as cloud computing offer new generation opportunities for telcos. By owning global and regional networks, the take up is of investments in regional and metro data hosting centres - close to core customers – especially multinational corporations. By allowing data centres closer to customers, it enforces security policies and improves content access and network latency. We are witnessing centralisation at regional level. In recent months we have seen major investments by operators like MTN in data centres as well as the emergence of *MetroFx*,

Access, Leequid, Helios Towers corporations - all examples of new uni-product and service lines and businesses being formed as a result of international broadband investment and flows.

The core function of telcos has been connectivity via VPN services to clients, we are observe optimising assets to develop services that will deliver critical applications cross multiple enterprise locations to office-bound, remote users

While it remains the core function of telcos - especially incumbents - there are opportunities to develop long-term differentiation in areas such as *customer support, network integration, consulting and outsourcing service* by building stronger relationships with clients (government, MNCs, research networks) based on inside knowledge of core customers. (*Ovum, Q3, 2010*).

In Kenya, CEO, Bob Collymore adopted a particularly aggressive tone in expanding market share and dealing with regulators. In an interview with *Balancing Act* in February 2011, he stated:

*".....We have 77% of the market by subscriber numbers in Kenya. Our ARPU is higher than anyone else's. But 77% market share is not sustainable. We do have 'significant market power' but we feel that's because everyone else was very incompetent. There was no consistent management at the number two operator. **We're OK with losing market share (faced with unrealistically low rates) and focusing on Nairobi and high-income communities. The people in remote districts are receiving calls (more than making them). If rates decline, why should I continue to do that?**"*
[Emphasis added in bold by author.]

A contextual interpretation of the statement shows how competitive mobile operators in Africa are and also that they are willing to force governments (and regulators) to raise prices or threaten to withdraw network development in rural areas. This dilemma is increasingly being faced in Africa and would require quality regulation and oversight. In South Africa and parts of SSA, we see the approach of Seacom and Neotel and even Telkom Business as bringing in new value added chains. There have been many

casualties in the ‘overcrowded VANS market whose core value proposition is eroding due to regulatory changes in interconnection and consolidations at the bottom end of the VANS market. Corporate strategies that utilise IP based NGNs or 21st Century networks are consistent with the business model ontology and its evolution thesis where new application of IT services in the value chain will be the key driver of new business. (Osterwalder, 2004).

6.1.4 Capacitating research & education networks and expanding access in SSA

Another positive outcome of new international interconnectivity is that most African universities and national research and education networks (NRENs) will access low cost bandwidth. The formation of the *Ubuntunet Alliance* as a continental network has lauded the positive impact of new undersea cables on their business models. Many NRENs such as SA’s TENET buy bulk wholesale capacity as regional consortia- thus reducing costs and billing services. The academic and research community in SSA have access to global networks like GEANT, JANET and students can access thousands of e- journals (TENET respondent 1).

South Africa’s Tertiary Education Network (TENET), a leading national non-profit research network in Africa with a customer base of 23 HEI’s TENET model, is instructive. Its decision to choose Seacom cable over Telkom is instructive on the different strategies adopted by cable owners because Telkom was ‘inflexible’ in terms of its SLAs and wanted to provide full end to end services (ISP, Billing etc) while Tenet only required access to the underling infrastructure as it had its own CRM and IT billing systems. It only required underlying infrastructure services of Telkom and access to first tier capacity (i.e. SMT lines), (TENET respondent, 2010).

Seacom’s offering to TENET was much more attractive and it won a USD20 million contract T-1 line 20 year IRU on Seacom Capacity, while DST providing light capacity and six fibre pairs access @ R 8.1 million Mtunzuni at a USD3million discount – thus on very favourable terms.

It has managed to pass on these discounts to its university clients. The Dept of Science and Technology's (DST) grant funding component no capital redemption capacity required and the only need to cover operational costs. Hence, TENET's buying STM-4 lines on Seacom also ensures WACS (redundant capacity) and uses the Seacom backhaul access and POPs (via Neotel).

This model may be used by EU funded broadband and the Ubuntunet Alliances AfriConnect 15 million Euros upfront- allow for NRENs to find balance 25% or 3 million Euros for tier 1 capacity so that regional universities can access wholesale broadband. Likewise, the KENET in Kenya has witnessed significant price reductions in a short time period in broadband access to universities and greatly increased wide-scale provision of broadband and e-education services to Kenyan universities.

We thus can observe that QoS and SLA flexibility will be competitive advantages and criteria such as cable operators compete for national and regional customers.

6.1.5 Broadband stimulus and return of the state in the economy

With regards to the resurgence of the developmental state and active role of SOEs in context of stimulus packages, South Africa's Broadband Infraco is model is unique. It is a self-funding, non profit model which is exclusively a wholesale and not a retail competitor. Respond the SOE model is one make sense and government requires low cost wholesale broadband for several national initiatives and priorities. It has laid over 15 000 kms of backbone networks and developing three first tier POPs in major metros and ISPs able to lease from Data Centres.

The 'developmental argument' is that Broadband Infraco is supporting government's national developmental technology priority projects – such as the mega astronomy SKA project in the Karoo, estimated at a cost of R15 billion. Shareholder in WACS for international long distance wholesale access bring competition into the market, SOEs have the dual function of developmental and lowering the input costs. This is a key logic

of a ‘developmental state approach which envisages a smart approach of government intervention in the economy (Evans, cited in Edighedi, 2010).

Low levels of development/competition in national backbones

According to telecoms analyst 1, those countries with low overall competition at a wholesale and retail level don’t incentivise national roll out. When operators are dependent on a single carrier for wholesale bandwidth traffic, there is no incentive to compete on price. Recommend the competitive access to local loop and international gateway (as is currently happening with SAT-3).

Table 3 Barriers prevent investment in national backbone networks in SSA

KEY BARRIER	ISSUES WITHIN IDENTIFIED BARRIER
1. Lack of Investment	National incumbent operator responsible for investment- but don’t have the resources to do so. Meanwhile, others may have the money and resources, but regulations prevent them from building...
2. Lack of skills and capacity and trust	Incumbent may build and operate an existing network, but don’t have the skills, IT expertise and operational management team to manage.
3. Restricting network use and opportunities to aggregate (Scanbi,	Where mobile operators are allowed to build networks, not allowed to sell capacity to third parties like operators = traffic unable to aggregate to national networks and thus inefficient.
4. Alternative infrastructure carriers restricted	Most African countries have utility providers (rail, electricity, gas). These companies use fibre for internal networks (Eskom-Infracore). But not allowed to lease wholesale capacity to outside players (ISP’s) leading to spare alternative capacity underutilized..

5.Lack of clear ground rules and regulations;	Once competition is open in the domestic market, there is lack of rules and regulations on infrastructure sharing (passive, active, collocation) letting monopoly to continue
6. Absence of infrastructure sharing policies	Little incentive to share infrastructure...shared infrastructure can make it cheaper for all operators to benefit (as in SA where Neotel, Telkom, Vodacom) building own national fibre-network. Local governments needs to be incentivized

Source: Southwood, R (2010), p 4

6.2 New generation ICT policy and regulations promoting competition:

International telecommunications is an international business and is subject to global regulation and law under the UN and ITU. The undersea cable system business is thus subject to international law and UN jurisdiction protocols. As an international agreement, it is firstly subject to a commercial arrangement between parties, and at operational level, governed by inter-governmental protocols such as the Law of the Seas and thus not subject to national jurisdictions (Neotel respondent 1, 2010).

However, there are high regulatory compliance costs in this business. Firstly, environmental Impact Assessments (EIAs) are a major regulatory concern for environmental agencies who want less development and construction in ecologically sensitive zones. And seashore beds and earthquakes and tsunamis can have a major effect on undersea cable systems. For instance, the EU regulations on essential facilities are very stringent and ‘pro-competitive.’ They allow access but under a very expensive ‘cross-connect’ regulations regime. Operator respondent 1 says that the EU definition of access to international cable essential facilities (i.e. Segments S and T) is not on a wholesale cost basis as carriers charge each other as European telecoms operators, and is significantly higher for international players. This invariably excludes many outside telcos from developing regions to effectively compete in the EU regional-international connectivity market. This may fall foul of the WTO MFN principles and could be subject of competitions investigations and rulings.

In an era of converged technologies, governments are expanding the roles of regulators to address the complex needs of regulating broadcasting content, IT, telecommunications and the Internet. The move towards converged regulators means a single agency (ITU, GSR 2010). Another key trend in ICT regulators' mandate in co-jurisdiction matters and co-regulation with competition regulators and the challenges of overlapping functions and capacity. The research has identified that co-regulation and building capacity in ICT regulator in regulation competition will key challenges in the near future for most Sub-Saharan countries. Ex-anti relaxation and ex-post remedies and strategies (pg 11, gsr-2010).

6.2.1 Vertical and horizontal integration by operators

Mobile operator respondent 1 also suggests that regulations should make it easier for operators and calls for regulatory forbearance and incentives. He believes that national telecom legislation is still restrictive- such as control of gateways; no convergence legislation and a monopoly incumbent PTT regime that is under political pressure to maintain backhaul access. This is because the monopoly PTT is a traditional cash cow for state fiscus. He counter argues by observing that the 'costs of doing business' for telcos in SSA is very high. These include licence fees, taxation, spectrum fees, penalties, universal service fund obligations etc. Mobile respondent 1 further observes that mobile operators are the largest contributions to the fiscus in most SSA African countries.

6.2.2 Interconnection and facilities leasing trends

Basically, the leasing of interconnection and facilities involves the linking of two or more electronic communications networks or services. The purpose is to allow the customers of one network or service provider to have access to the customers or services of another network or service provider. In South Africa, interconnection and facilities leasing are dealt with separately yet similarly in the EC Act. The EC Act sets out the principle of open access and leaves most of the process to be regulated by ICASA.

Regulator respondent 1 observes that the principle of open access is inherent in South Africa's ECA Act legislation. Section 37(1) of the EC Act provides that every licensee must interconnect on request, on terms negotiated, unless the request is unreasonable. Section 43(1) provides that every ECNS licensee must provide facilities on request, on terms negotiated, unless the request is unreasonable. The advent of competition has introduced a dynamic and fast changing telecoms market in South Africa and a more robust independent thinking by the regulator, ICASA. In South Africa, facilities' leasing guidelines were proposed in 2010 and are designed to allow licensed telecoms operators access to Telecoms local loop. However, the Significant Market Power (SMP) definition is also fast changing and many of their telecoms operators, especially mobile and larger first tier ISPs, including Vodacom, MTN, Neotel, Internet Solutions etc are developing SMP power in various segments.

Entrenched monopolies in network industries are well resourced and take a long term view- particularly as investments in new generation networks are high cost and the advent of hyper-competition means traditional stable income streams are now subject to a high degree of competition. For instance, the BT Group (formerly British Telecom) started unbundling its local-loop assets in the 1980s and had only managed to provide access on 105 000 lines by the turn of the century. Hence, there will be a long lead time before local loop unbundling is fully competitive in many African jurisdictions (ICT/Telecoms analyst 2).

In terms of the Electronic Communications Act, the local loop is considered an "essential facility". Effectively, essential facilities include any bit of telecoms infrastructure that is required to provide services to customers. Undersea cables and the local loop are specifically mentioned in the act. Hence, South Africa's ECA Act of 2006 may act as a key convergence legislation and a role model for other jurisdictions in SSA, particularly with regards to local loop and undersea cables as a new 'essential facilities' discourse. Fortunately, the ECA Act of 2006 also promotes non-discriminatory access. It is suggested that sections 37(6) and 43(7) should indicate that interconnection and facilities leasing

must be non-discriminatory in all respects (including, but not limited to price) when compared to the licensee itself or its affiliates.

According to telecommunications lawyer respondent 1, as written, the provisions allow licensees to discriminate in their own favour except in respect of “technical standards and quality”. In the context of interconnection and facilities’ leasing, entities should not be able to discriminate in their own favour at all. Thus, section 37(6) and section 43(7) should be amended to state that the agreement must not “in any way be discriminatory to the comparable network services provided by such licensee to itself or an affiliate.” The real challenge is how independent regulators research complex regulatory topics and set the framework for regulations. It is clear that from ICASA’s own experience, the road to a regime of fair facilities leasing and ‘open access to infrastructure will be long-winding, complex and subject to many litigation cases.

According to telecoms operator respondent 2, interconnection in IP based networks is now a transit issue and new like network integrity etc. Interconnect asymmetry and pricing- ICASA needs monitoring both wholesale and retail financials. Consumer issues are increasingly focused on consumer rights and SA and Africa have many anti-competitive practices regarding: 1) bundling of products and services; 2) channel control and distribution and wholesale distribution of telecoms services. This respondent predicts that public interest regulation and greater consumer protection legislation will define the telecommunications regulatory space over the next few years.

According to regulatory respondent 1, the Altech case of 2008 opened the floodgates with up to 400 new licensees. But the unintended consequence has been less capacity for adjudication in hyper-competitive environment? Is it really optimal competition or does it increase the regulatory burden given the many disputes in the marketplace? The unintended outcome of VANS licensing was that it enables you to run a network and provides service, with minimal licensing costs, thus adding to a ‘chaotic marketplace where most licensees are unviable’ (Regulatory Respondent 1).

6.3 Infrastructure financing and finance for development paradox in telecom

According to Action Aid, the *selection, monitoring and evaluation procedures* have largely prioritised commercial rather than social and environmental returns. Moreover, they have failed to demonstrate sufficient ‘additionally’ for the financing and invariably led to the risk of replicating the activities of private financial institutions. (DBSA respondent, 2010)

The ‘inherent contradiction’ of massive MDI lending to private sector (profit making) and expecting ‘developmental returns’ is subject of robust debate by pro-poor advocates such as Action Aid International, Global Campaign Against Poverty (GCAP), Oxfam etc. In recent ground-breaking reports, key areas for MDB finance reform that is developmentally driven. It is imperative that MDB’s private sector activities and funding thereof focus on a support country-owned development plans,

By extension, this meant that ‘socially aware’ private sector should be promoted - one where their activities have to ensure that their activities support, not replace national efforts. Also, that fall within the Paris Declaration on Aid Effectiveness (2005) and Accra Agenda for Action (2008) that frameworks for MDB’s (AfDB, DBSA, IFC) that will be able to ‘direct publically backed finances for the private and provide effective, developmentally oriented funding frameworks. Another criticism is that MDB’s are adopting a strictly ‘investment climate approach’ has promoted policies to attract investment and FDI, even though the basic assumption that FDI is good for development and thus the more if it the better, is a dubious assumption, because studies have shown that it can stifle development(Christian Aid, 2008). This leads to inappropriate remedies such as reducing the role of the private sector in the economy, even though there is no ‘universally accepted norm’ on which model is best.

6.3.1 World Banks IFC and AfDB’s funding strategy in telecommunications

According to Development finance institution respondent 1, the IFC funding strategy is adopting a ‘balancing act’ as it invests in models with ‘least disruptions to market’.

Hence, its investment in EASSy submarine cable was not only financial, but included policy preparations and advisory services. Hence, the World Bank's new Regional Communications Information Programme (RCIP) in SSA incorporates issues of 'open access' models as well integrates socio-economic outcomes (universal service, low cost pricing) as key components and pre-requisites of project funding.

However, an interesting observation by the World Bank respondent is that he also believes a 'paradox exists between the 2 tier ownership system of EASSY and WIOCC – cable needs a ROR model and WIOCC pricing is cost based'. He contends that this may create some 'challenges further downstream as competition intensifies for regional customers'. It will be up to the consortia management committees to agree and resolve pricing disputes. (World Bank respondent, 2010)

The AfDB's Information and Communication Technology Strategy (ICT) which sets out regional and national infrastructure as its first priority. This includes international connectivity to the rest of the world, regional backhaul links that interconnect countries, national backbones that extend access beyond major cities, and last-mile connectivity to rural and underserved communities. Regional infrastructure is also the focus of NEPAD's medium-to-long-term strategic framework, where the AfDB has been designated a lead agency.

In recent past, it has invested USD 61 million in the *Main One Cable* company for the undersea-cable project; extended a USD30 million loan to *Helios Towers* corporation in Nigeria roll out of mobile towers; and USD25 million loan to *New Dawn Satellite* project. Prior to these investments, the AfDB had approved investments in three private sector ICT projects. The first was Euro 13 million partial guarantee to MTN Cameroon to cover the loan extended by local commercial banks in Cameroon and Gabon. MTN contributed to the rapid growth in GSM usage by both businesses and the public at large.

This was followed by a USD 50 million senior loan to the RASCOM Telecommunications Satellite Project, which involves the construction and launch of an earth-orbiting satellite system to provide point-to-multi-point telecommunications

services throughout Africa with strong focus on intra-African connectivity and rural communications. This was followed by a USD 14.5 million loan to the East African Submarine Cable System (EASSy), which is an initiative to construct and operate a submarine fibre optic cable along the east coast of Africa to connect 20 coastal and land-locked countries to one another and to the rest of the world.

6.3.2 MDB's and the duplication telecommunications funding

However, detractors in civil society claim that another factor on MDB's lending model is that its business models is geared towards meeting the changing... market demand for capital. This has an unintended consequence of focussing MDB activities in areas that are already favoured by investors, which do not necessarily match sectors that investment would reap the highest returns for sustainable development and poverty reduction.

Another controversial area they often critique is in the 'free-riding approach' whereby MDB's like World Bank provide policy advise to governments on areas such as regulation and private sector reform. For instance, the IFC has an expanded its 'advisory services' portfolio approaching USD 1 billion and a staff of 1262. While acknowledging lack of policy capacity in Sub-Saharan Africa, the net effect is the creation of a 'dependency syndrome and weakening state capacity. And although policy and corporate advise is provided cost-free to recipients through donor agency trust funds, studies have shown that technical assistance (TA) as a 'free good' severely weakens ownership by the recipients of advise received.

As the political and developmental reform push at the G-8 and G-20, G 77 deepens in 2011, global International Financial Institutions (IFI's) reform within the broader G-20 discussions and as new regulations on finance emerge, we will see new policy reforms in line with new social regulation of in global development funding. These will be discussed at the 10 year review conference in 2012 of the Monterrey Development financing summit which was held in 2002. In the context of IFI reforms, there will be pressure on development funding to be linked to real MDG and developmental outcomes s (esp. as the MDG targets end in 2015).

6.3.1.2 Telecommunications financing will become mixed and multi-modal

Given new global trends in development financing reforms (World Bank IFC, AfDB etc); the rise of Chinese state owned infrastructure funding model as well as the rush of 'private equity into Sub-Saharan Africa'. We will anticipate see intensive competition for African telecom assets and Internet markets. My view is this will see new kinds of innovative financing models and trends and alliances. These include:

Consolidations: An increase in telecom and cable asset consolidations through mergers or takeovers

Broadband Vendor Financing: A new wave of Chinese driven vendor based investment models and broadband rollout programmes is being rapidly rolled out in many parts of Africa, especially East and Central Africa. The model is vastly different from the normal rules debt and equity finance often provided by MDB's and merchant banks. Rapid successes and a low cost option is being seen as an increasingly attractive proposition in the market place.

The emerging global broadband ecosystem and developmental approach is gaining support, especially since the ITU has set up the broadband commission for development and its initiatives and policy recommendations will filter at national and regional level. The ICT for Development agenda will continue to make inroads and bodies like the UN, ITU as well as host of developmental NGO initiatives will see the momentum for new approaches to e-inclusion, Broadband and ICT's will be central. But the core focus would be on only the 'universal access' (infrastructure) element. We will expect to see much new research, small scale innovations, social entrepreneur will emerge to provide 'bottom of pyramid' models and solutions. (APC, 2010)

CHAPTER 7 CONCLUSIONS AND RECOMMENDATIONS

7.1. Introduction

In chapter five and six the various areas of the research problem was assessed through detailed findings and an analysis. From an application of the conceptual approach and analysis of findings it is possible to draw several conclusions and make recommendations.

Infrastructure funding and finance for development are critical in meeting development objectives of regions, UN's MDG's and ranks high on the UN's Development agenda. Leading multilateral forums such as the G-20, the UN and Annual WB and IMF meetings, are promoting the MDG's as key developmental targets for infrastructure projects. The recent global financial crisis has significantly altering aid and development aid industry is injecting new approaches which will invariably change the rules of the funding approach to utilities such as electricity, roads, telecommunications etc.

Although the growth of new undersea cable systems in Africa are largely been funded by operators and private investors, we observe that the 'real access gap' is in the national backbone access and 'last mile' that would and roll-out in SSA will require significant public and multilateral banking loans and finance. It is at this level that we will experience significant activity in new generation regulations, new business models as well as new approaches to development finance in telecom.,

Observable trends in the Broadband economy developments in Africa:

- Increased speculative capital or 'bail out package & hot money' will flow into Sub-Saharan Africa markets but there will be tighter regulation on investment flows;
- A more substantive and interventionist role by the state and SOE's in core utility services like broadband backbone development will be more prominent;
- Consolidation of undersea cable systems may lead to some bankruptcies- especially in the West African market
- Broadband wars in national markets will intensify with further price reductions and there will be casualties amongst large and smaller licensees;

Some of the criticisms by global civil society and developmental NGOs is that the current paradigm of MDB funding is inadequate, inappropriate and not sufficiently ‘developmentally driven.’ A recent report by Action Aid cites the problematic areas as:

- Multilateral Development Banks (MDB’s) have used an ‘investment climate approach’ to the private sector which has *meant prioritising/ attracting private sector investment rather than focussing on private sector activities that will most add to sustainable development* and reducing poverty;
- They have adopted a banking model which has focussed *MDB activities in areas which are already favoured by investors rather than focus on sustainable development*. The telecom sector is especially one where ‘overflow of private capital have high ROI’s and dividends;
- Used policy advice to promote narrow perspective on private sector, especially ‘market- access’ and favourable investment regimes. The telecom liberalisation model has been promoted through this approach

7.2.1 Continuation of ICT Policy development in Sub-Saharan Africa

Sub-Saharan Africa is still the region with the largest challenge in reaching universal service targets and network roll outs in rural areas. Hence, ICT policy development will continue through existing regional for such as the African Union Ministerial, AMCOST and AUC. NEPAD’s e-Africa Commission- tasked with the roll out of the of the Uhurunet cable systems would continue. The regional telecom bodies such as CRASA, COMTEL, WACRA will continue to develop, monitor and build capacity programmes for regional regulators. The real challenges will be for national governments, regulators and businesses and academia to work more coherently in terms of delivering on key UN WSIS mandates on ICT connectivity and rural development programmes in Africa. Policy is not enough.

7.2.2. New Generation ICT regulation and its impacts in SSA

With regards to regulation, the challenge will be to bridge the ‘policy- institutional disconnect’ in most African telecom jurisdictions. This presents new opportunities for African regulations to build new capacity in regulating complex new convergence systems like NGN’s as well as and intensive competition. The significant momentum generated by the ITU through its global dialogues in the past year such as such as the UN ITU/UNESCO Commission on Broadband Development, its annual Global Symposium for Regulators (CSR) and the annual ITU Forum for Telecom Regulators in Africa (FTRA) have been very positive. They have identified new generation ‘open access and infrastructure sharing’ (i.e. to international landing stations, gateways) as areas for action and implementation. My observation is that these This will have a knock on effect and achieve more competition and many SSA regulators will require better institutional capacity, skills and knowledge for this era.

Key identifiable trends include:

- Regulatory reforms should and will continue especially on open access, but will need to be more balanced, as network operators will seek regulatory redress or withdraw investment in sunk broadband networks;
- Digital dividend emanating from digital TV and freeing spectrum resources will see more opportunities for broadband operators;
- Municipal and rural broadband development will grow and be integrated with Local Economic Development (LED) providing SME opportunities;

7.2.3. Infrastructure development funding and changing role MDB’s

The current paradigm of Multilateral Development Banks (MDI’s) funding of World Bank, IFC, AfDB in extending risk free large loans to the private sector has been controversial and not sufficiently focussed on sustainable development and poverty reduction.

This has promoted the rise of many civil society formations like Oxfam, Christian Aid, Action Aid and Greenpeace who have gained public policy traction in recent years in by advocating for transparency and public participation and oversight of large scale in development loans.

My prediction is that there will be an increase in telecom infrastructure funding to national backbone and broadband developments, especially in land-locked countries in Africa. However, this will see new funding partnerships with private sector, operators in finding optimal funding mix that ensures viability of investment while ensuring important socio-economic outcomes. A focus on universal service funds will also come under the spotlight. In this area, we are set to see more regional oversight bodies such as the African Union (AU), SADC and COMESA in terms of demanding more developmental terms and outcomes of large scale infrastructure projects. Examples will include that large telecom infrastructure projects empower local entities and SME's in strengthen local and regional supply chains and jobs.

7.2.4 Influence of consumers, users and research networks in Africa

We have seen the rise of consumer groups and non-governmental organisations ngo's at national, global and regional level. One of the most recent examples include the rise of National Research and education Networks (NREN's) who have successfully lobbies for quality wholesale broadband pricing. We will see an growing influence and buying power of NREN's nationally and this will extend services and e-education to higher education institutions in Africa. The introduction of new consumer protection legislations in many African countries is a welcome development and will go a long way in protecting consumer rights will see a closer cooperation amongst telecom sector regulators and national bodies like consumer and competition commissions.

Another trend is the growth and influence of NGO's such as APC and Afrsipa – who have been visible in education and awareness of Internet rights, users, broadband development as well as content regulations issues on ICT and gender and ICT and consumer rights.

- Increase in content regulation, especially privacy and security public policy ;

- A new definition of 'SMP' will re-define competition paradigm' in distinct areas of the value chains; thus contours of regulatory intervention;

We will also witness a more robust role for 'developmental and advocacy type of ngos' that will play that will monitor large scale infrastructure projects funded by MDB's like the World Bank, AfDB. They will use media and on-line discussion forums, blogs and social media to promote advocacy positions and lobby government, UN and other regulators.

7.2.5. Information society development and universal access

With regards to the information society development, it is clear that the momentum generated by the recent twin ITU World Summits on Information Society (WSIS) and the subsequent IGF's have generated high level of global and national awareness, debate in ICT policy paradigms. Indeed, some of the WSIS Plan of Actions for LDC's has catalysed significant growth of new undersea cable systems in Africa has been a boon of activity and growth of new initiatives and enterprises. It is clear that wholesale and retail pricing have been drastically reduced and many new smaller ISP have grown and that usage has increased.

Key trends in future:

- Universal service and access will continue to be a key challenge for African telecom sector and 'new generation approaches' to spending US Funds will need to be implemented for rural areas;
- Broadband will be declared a *public good and General Purpose Technology* and Internet as a fundamental human right.

However, the real challenge for SSA countries is to maintain the momentum and increase connectivity to underserved and poor areas where the 'market activity' is largely non-existent. While many studies, conferences and workshops and much donor monies have been invested in a variety of universal service policies, projects and programmes, the results have been largely disappointing. While many regulators have collected hundreds of millions of dollars in universal service funds, many of these have not been invested in under-served and rural areas. Hence, new approaches and innovations to universal service roll outs are required.

7.3 Recommendations for further research

I would recommend the following areas for further research:

- Analyse *new generation communications sector regulation* and its relationship to general competition and consumer protection policies;
- Conduct an analysis on new '*over-capacity of fibre problem*' in Africa and role of policy makers and regulators can play to open access to smaller players;
- Conduct a policy analysis study on progress in Sub-Saharan Africa with regards to meeting ITU's WSIS Plans of Action (POA) and *connectivity and access targets*;
- Conduct a detailed research on *integrating socio-economic and universal service outcomes* for large scale continental connectivity telecommunications projects;
- Conduct research into the universal service models and look into new innovative approaches in extending *network extension to underserved and rural areas in Africa*;
- Conduct research on new generation convergence policy and content regulation promote *local African content & innovations in the global information economy*.

Finally, my perspective is that the combination of the growth of undersea-cable systems ('inflow') has catalysed new investment in new national backbone development ('diffusion') through lower prices and increased access. This trend in the broadband value chain has generated new business models and strategies by all players in the chain – operators, private players, academic research networks, service providers. Moreover, they have in turn catalysed new innovation and approaches in ICT regulation such as open access and interconnection. New financing relationships are being developed and new business models and are partnerships emerging in Sub-Saharan Africa. But the imperative must be one of inclusion and access.

Overall the findings indicate that this proposition has merit. In an information society with empowered and educated users and consumers- and with the political power of social media in recent 'peoples power' uprisings in North Africa, where mobiles and social media catalysed uprisings, we shall see African consumers and citizens who will be proactive, and advocate for better societies, through good governance, transparency and accountability. This is indeed an historical moment for all stakeholders to develop an information society in SSA that is *inclusive, affordable, innovative* and above all rooted in the principles of access, gender equity and a human rights culture, and one that is intrinsically both democratic and developmental.

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APPENDIX 1: QUESTIONNAIRE

Thank you for agreeing to participate in this research. As was explained in an earlier email, this research is a pre-requisite for the interviewer, Ashraf Patel to attain the degree Masters in ICT Policy and Regulation Management (ICTPRM).

The research will focus on investigating the Undersea cable market in Sub-Saharan Africa with specific focus on the various business models impacting on price and availability and impact on broadband development in Africa . This questionnaire is aimed at collecting data based on the answers given by respondents (such as yourself) who have experience and expert knowledge in this field. To facilitate this, please answer the questions based on your perceptions and knowledge of the ICT and telecom sector in SSA.

Although the completed research falls under the ownership of P&DM, Wits University, the findings are for public domain and as such, you as a respondent, will have full access to the consolidated findings, should you so wish.

RESPONDENTS DETAILS:

Name: _____

Title: _____

Role within the Telecom and ICT sector (please tick appropriate box)

Undersea Cable owner and operators	
Public Interest (regulator, consumer group)	
User (Internet service provider)	
Academic researcher	
Funder and financial advisory	

Interview questions

1. What are the key policy and regulatory issues that constrain the development of broadband access, availability and affordability in Africa? Please elaborate.
2. Do you think the deployment of up to six (6) new undersea cables in Africa will lead to overinvestment with the risk of over-capacity and lead to some becoming non-viable, leading to bankruptcy? Please elaborate in detail.
3. The SAT-3/WASC cable was for six years the only undersea cable (closed) and widely cited as the source of Africa's high cost of communication. Please comment in detail.
4. What are some of the immediate pricing impacts and effects since new undersea cable systems (i.e. Seacom, EASSy, TEAMS) commenced their service offerings? Please also comment on their models (i.e. open, hybrid etc) and how these have impacted on broadband uptake.
5. Open Access investment models are being proposed for emerging undersea cables in Africa. What is your understanding of open access and how do you think it will lead to both affordable broadband and more competition?
6. Essential facilities is a new regulatory mechanism aimed at promoting competition and infrastructure sharing (thus driving cost and hence prices). What kind of mechanisms are required and how should it be implemented?
7. Backhaul national backbone development to landlocked countries in Africa still remains a major challenge. What optimal role should regulators and infrastructure providers play in addressing this critical infrastructure gap?

APPENDIX 2: LIST OF INTERVIEWS

Person and Title	Organisation and Title	Type
1.Tracey Cohen	Regulatory Affairs executive NEOTEL	Operators and Cable owner
2. Mark Williams	Regional Telecom advisor, WORLD BANK	Development funder
3. Abi Jagun	Senior researcher University of Strathclyde	Academic
4. Russel Southwood	Director BALANCING ACT	Telecom analyst
5. Zolisa Masiza	Regulatory executive MTN Africa	Operators and cable owner
6. Johan Meyer	Senior Manager: Telkom SA	Operators and cable owner
7.Suveer Ramdhani	Product manager SEACOM Pty.	Operator
8.Joe Makafola	Regulatory executive Altech	Operator and cable owner
10.Jack Nel	Advisor BROADBAND INFRACO	Wholesale broadband provider
11.Chose Choeu	Regulatory executive ESKOM	Electricity utility
12. Duncan Martin	Senior manager TENET	Research Network
13.Erik Osiakwan	Manager AFRISPA	Inter Service Provider body
14. Dr Hillary Tarus	Manager WIOCC Pty Ltd	Special Purpose Vehicle
15.Nadia Bulbulia	Ex- Councillor, ICASA	Regulator
16.George Fingers	Senior Manager- DBSA	Funding institution