

Fibre Optics Communication in Nigeria and a Wider Internet Penetration: The Nexus

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Abstract

This paper examines the relationship between fibre optics communication and internet penetration in Nigeria. Relating internet penetration in terms of fibre optics growth, the paper seeks to establish the prospects of increased fibre optics growth as a precursor for internet penetration in Nigeria. By way of descriptive analysis, predicated on empirical evidence, the paper posits that the growth of fibre optics in the country will have a far-reaching positive effect on the access to information of citizens through the internet. In view of its favourable impacts as exemplified in the improvement in the access to information, improved mental capacity of citizenry and improved rural area coverage, this paper submits that fibre optics portends a greater avenue for the intellectual development of citizens through greater access to the internet in the hinder lands.

Keywords: *communication, internet, penetration, fibre optics, intellectual development, wider internet coverage.*

1. Introduction

The Nigerian communication industry has been confronted by two disturbing issues over the years. The challenges relates to the low penetration of fibre optics and poor internet usage. While the former has remained fairly stagnant even with the approval of four fiber optic cable landing points in four coastal states to ensure widespread penetration of high capacity internet bandwidths in the country in 2015 [1], the latter continues to fluctuate due to low penetration in the hinterlands.

Indeed, Nigeria has more than enough broadband capacities which ought to have translated to high internet access by its citizenry with the several submarine cables in the country presently, yet, less than 10 percent of the total broadband capabilities from the cable operators is being utilized in a country of more than 182 million persons, [2]. Fibre optic cables allows businesses to communicate and collaborate in ways that were never before imagined and

has turned the world into a small market place. Even though fibre optics connects businesses and people to the global market, it has not been fully tapped into in the country as internet connectivity continues to fluctuate. This has a far reaching effect on the quick access to information by majorly the rural populace who are left out of the current gains of broadband outreach.

Hence, Nigeria, as the most populous country in the continent, has not fully embraced fibre optic cables which would have accelerated broadband infrastructure and increased the rate of access to information in the hinder lands, and boost the country's telecommunication sector in the process.

Better fibre optics system in the country would open up opportunities for citizens to contribute meaningfully to economic growth, and help to revitalize a moribund economy while increasing access to information

Scholars world over have attributed inadequate high capacity of fibre optics as one of the underlying factors that hinders the growth of broadband in the country. Rather than focus on reaching the hinter lands, fibre optic based broadband network operators have concentrated on high profit areas in the country at the expense of less densely concentrated areas. Since profit is their propelling force, they have based their focus on major primary urban areas and capital cities and intercity routes at the deterrent of core rural areas with individuals who are cut-off from the outside world, [3].

Due to high cost of network construction and operation, fibre optics backbone network infrastructure in the country is characterized by widespread networks owned and operated by vertically integrated operators who focus more on voice networks. This is fingered as one of the underlying causes of poor fibre optics network and market development in the country [4].

Researchers have affirmed that the lack of a pragmatic information and communication technology, national policy and failing infrastructure amongst other factors have affected broadband penetration in the country. Analyst have also laid the blame on the high cost of internet

facilities, inadequate bandwidth capacity supply to final consumers and low penetration of internet in rural areas as the bane of fibre optic growth and internet development in the country [5], [6].

Submarine cables came to be as a result of the need to provide the needed internet capacity that would carry the growing demand for cheap and affordable internet in the country. Submarine fibre optic cables are laid under the sea between land-based stations to carry telecommunication signals across stretches of ocean. They are designed to provide high speed, reliable and unlimited bandwidth capacity for communications. The availability of these cables in remote areas would aid the quick spread of the internet in the country, but sadly, this has not been the case [7], [8].

2. Methodology

Qualitative and exploratory approach is used in this paper to qualitatively explore its subject matter. Scholarly and empirical evidence were used in a descriptive manner to support existing facts. The basis of analysis was carefully designed and systematically followed under select key points and sub key points to address the hidden aspects of the paper's objective

3. Related Materials

Two key issues form the basis of this paper. These are fibre optics communication and internet penetration in Nigeria. Following is an attempt to explain the contextual meaning of these concepts in the study.

3.1 Fibre Optics Communication in Nigeria

Fibre optics communication is a form of technology that use light energy in the transfer of information from one place to another optical fibre. Optical fibre is a form of dielectric cylindrical waveguide made of silicon dioxide. The waveguide uses the principle of total internal reflection to transmit digital information generated by telephone systems, computer systems and cable television companies. The core of the waveguide has a refractive index that is a little greater than that of the outer medium, that is, the first layer around the core so that light pulses is guided along the axis of the fibre by total internal reflection [9]. Total internal reflection occurs when the incident light is reflected off the boundary so that light can travel from a denser medium to a less dense medium. The use of long strands or other material such as glass to wipe light off from one end of the medium to the other is the basis for the use of optical fibre in this dispensation. Optical fibres are used in communication systems and micro-surgeries [10]. Fiber optic communication systems consists of an optical transmitter that help to change

optical signal for transmission through the optical fibre; a cable that has several bundles of optical fibres, optical amplifiers to boost the power of the optical signal, and an optical receiver that help to reconvert the received optical signal back to the original transmitted electrical signal. Fig. 1 gives a simplified description of a basic fibre optic communication system

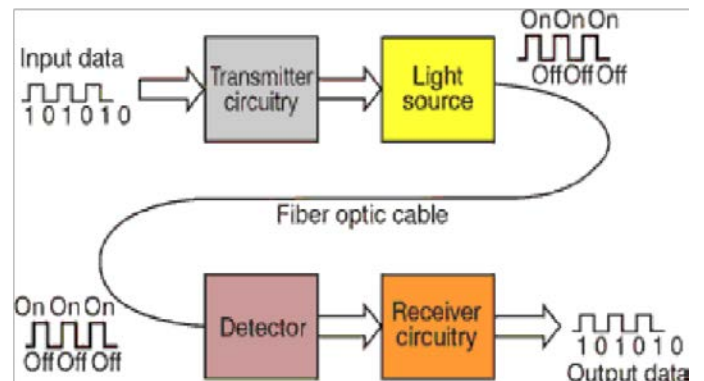


Fig.1 Basic Fibre Optics Communication System [9]

There has been an increasingly rapid commercial and consumer demand for fibre optic technology due to its role in linking up remote areas and increasing their access to information. Increase in internet demand has also been a driving force behind the widespread use of fibre optics communication as fibre optics help in the transmission of required information capacity that is larger than both wireless connections and the copper cable. With advancement in technology which the fibre optics system presents, more data is conveyed through a single optical fibre system over long distances. The transmission capacity in optical communication networks are significantly improved using wavelength division multiplexing [11]. Fiber optics communication is definitely the future of data communication. The evolution of fibre optic communication has been driven by advancement in technology and increased demand for fiber optic communication. It is expected to continue into the future, with the development of new and more advanced communication technology [12]

3.2 The Internet and its usage in Nigeria

The internet is a massive networking infrastructure that connects millions of computer users together globally through a network where other computers are able to communicate with one another. Internet access in Nigeria has grown exponentially in recent years, particularly after the introduction of mobile phone data and fixed wireless access services in July 2007. In 2015, internet penetration stood at 43.4% up from 40.7% in 2014. The number of active mobile phone subscribers also increased from

almost zero in 2000 to over 128.6 million subscribers or 91.9% penetration in February 2013 as reported by the Nigerian Communications Commission (NCC). The latest International Telecommunication Union (ITU) data notes nearly 113 million mobile phone subscriptions and a mobile phone penetration rate of 68% in 2012, up from 57% in 2011[13]. Mobile Internet subscriptions have also steadily increased in the past few years, reaching a penetration rate of 26% in 2012 according to an October 2012 report published by iHub Research. Nigerian Communications Commission reported 63,474,364 mobile Internet subscriptions in February 2014. As of June, 2016, the country has 97,210,000 Internet users representing 52.0% of the population estimated to be 186,879,760. 16,000,000 of the total population, representing 8.6% have functional Facebook account. [14].

In Nigeria, a large urban-rural divide characterizes access to information and communication technology. According to a Gallup poll published in August 2012, 39% of urban dwellers in Nigerian said that they had used the Internet in the last week, compared with only 16% of those living in rural areas. High costs is another major impediment to Internet access, although increased competition among service providers has made the cost of access more affordable for many Nigerians [15]. However, recent information about a possible increase in the amount of internet data bundle may scuttle the successes recorded so far.

In addition to cost, epileptic power supply continue to disrupt service and access, with many users reporting the need to use private generators to stay online during outages. While the country’s electricity supply improved notably in 2012, it saw a huge decline in 2013 and with the spate of vandalism going on in the Niger Delta region of the country presently, the country may be in for severe power challenges even as Nigeria is still reportedly the largest importer of private power generators in Africa despite the country’s status as an oil-rich country.

Table 1: Nigerian Home Internet use via any device

Year	Internet Users**	Penetration (% of Pop)	World Population	Non-Users (Internetless)	World Pop. Change
2016*	3,424,971,237	46.1 %	7,432,663,275	4,007,692,038	1.13 %
2015*	3,185,996,155	43.4 %	7,349,472,099	4,163,475,944	1.15 %
2014	2,956,385,569	40.7 %	7,265,785,946	4,309,400,377	1.17 %
2013	2,728,428,107	38 %	7,181,715,139	4,453,287,032	1.19 %
2012	2,494,736,248	35.1 %	7,097,500,453	4,602,764,205	1.2 %
2011	2,231,957,359	31.8 %	7,013,427,052	4,781,469,693	1.21 %
2010	2,023,202,974	29.2 %	6,929,725,043	4,906,522,069	1.22 %

Source: (www.InternetLiveStats.com)

4. The Structure of Nigeria’s Fibre System

Nigeria’s information and communication technology penetration and tele-density is as shown in table 2. While the country currently boast of primary fibre optics backbone presence in all of the 36 states of the federation including the federal capital territory, most of these infrastructures are situated in the state capitals leaving majority of the local government areas in a dare need of the fibre optics. Also, metropolitan networks only cover

part of the Abuja; the federal capital, Lagos and Port Harcourt [16].

Table 2 showing the Top 10 countries with internet users

#	Country or Region	Population, 2016 Est.	Internet Users 30 June 2016	Internet Penetration	Facebook 30 June 2016
1	China	1,378,561,591	721,434,547	52.3 %	1,800,000
2	India	1,266,883,598	462,124,989	36.5 %	157,000,000
3	United States	323,995,528	286,942,362	88.6 %	201,000,000
4	Brazil	206,050,242	139,111,185	67.5 %	111,000,000
5	Indonesia	258,316,051	132,700,000	51.4 %	88,000,000
6	Japan	126,464,583	115,111,595	91.0 %	26,000,000
7	Russia	146,358,055	103,147,691	70.5 %	12,000,000
8	Nigeria	186,879,760	97,210,000	52.0 %	16,000,000
9	Germany	80,722,792	71,727,551	88.9 %	31,000,000
10	Mexico	123,166,749	69,000,000	56.0 %	69,000,000

Source: (<http://www.internetworldstats.com/top20.htm>)

Current backbone network infrastructure in Nigeria is characterized by widespread, low-capacity networks generally owned and operated by vertically integrated operators focusing on voice services. Incumbent network operators have much less extensive networks than in other part of the world.

Fibre-Optic backbone infrastructure in the states of the federation and the federal capital territory are not interconnected and are concentrated in the state capitals and a few urban areas. latest statistics reported by the Ministry of Communication Technology puts broadband penetration rate at 6% as of December 2012, with average

broadband download speed of 2.26 Mbps and upload speed of 1.57 Mbps. Recognizing the importance of ICTs for economic development, the Communication Technology ministry set up a Presidential Committee in August 2012, tasked with the creation of a National Broadband Plan that aims to increase Nigeria’s broadband penetration seven-fold by 2018[17], [18]. Few states such as Ondo State are having special schemes (Ondonet) inaugurated mainly to supervise the connectivity of broadband infrastructure to the interior towns apart from the state capital having interconnection of broadband infrastructure with other parts of the state [19]. The situation is different in most states of the country as most of them have not embraced fibre optics technology in most of the villages and satellite towns. Presently, there is no long distance national backbone to carry and distribute the capacities provided by submarine cables to the users in offices, schools, and homes in the hinterland.

5. FIBRE OPTICS VERSUS INTERNET PENETRATION

The apparent success recorded in the country’s ICT sector is as a result of the great success made by the telecommunication industry. The situation in the data communication is highly incomparable. The rates of Internet usage and broadband penetration are both still very low.

Though investigation shows that Nigeria is in number 10 position when considering the countries alongside their respective number of internet users but the number is a low percentage of the population of the country.

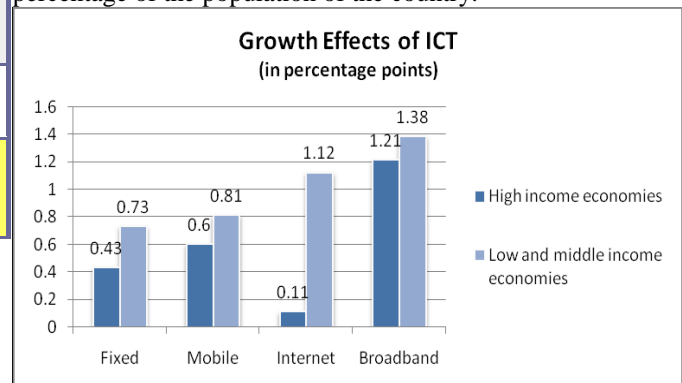


Fig. 2: Growth effect of ICT in Nigeria. (Source: Nigerian National Broadband Plan 2013-2018)

With tele-density in the country growing from below 2 per cent in 2001 to about 65 per cent within 10 years, the broadband segment is yet to attain its rightful place. Recent statistics show that there are over 97.2 million internet users in Nigeria as of June, 2016, which on the surface appears to be a large number but that figure represents only

52 per cent of the population. In reality, the actual fibre optics penetration in Nigeria as published in several studies is in the region of 10% which places the country far behind other African countries like South Africa, Kenya and Ghana in sub Saharan Africa.

Thus, the low ranking of the internet and Nigeria's information and communication sector is as a result of poor data communication system in spite of the opportunities that abound in the broadband infrastructure which could make Nigeria rank among the best in the sub-Sahara region and indeed among the best in developing economies.

According to ITU, advanced mobile-broadband networks (LTE) have spread quickly over the last three years and reach almost four billion people today – corresponding to 53 per cent of the global population. But while the number of mobile-broadband subscriptions continues to grow at double digit rates in developing countries to reach a penetration rate of close to 41 per cent, mobile-broadband penetration growth has slowed overall. Globally, the total number of mobile-broadband subscriptions is expected to reach 3.6 billion by end 2016, compared with 3.2 billion at end 2015.

During a two-day Internet Governance Forum held in Abuja in 2015, it was stated that the Federal Government of Nigeria planned to achieve 30 percent broadband penetration by 2018. However, facts government have not taken measures to accelerate broadband deployment across the country to achieve its lofty dream. Perhaps, creating the right environment for operators to deploy the right infrastructure for more access to broadband services could be a better starting point.

Presently, the country has less than 10% broadband penetration, a poor return for the supposed giant of Africa when compared to other African countries like Ghana that currently has at least 30 percent broadband penetration. Nigeria's broadband plan is from 2014 to 2018. Broadband penetration was at six percent when the roadmap was formulated. Going by the growth index, 10 percent will be achieved by 2018 which is extremely poor for a country like Nigeria. Hence, urgent measures have to be put in place to accelerate its growth. This, the government can do by creating an enabling environment for the broadband sector to thrive.

The difference between the regular internet access and broadband access is that broadband access is a fast Internet, faster than regular Internet. For regular Internet, it is true we have more than 50 per cent penetration but for broadband access, we are still lagging behind. What we need to do is to get every Nigerian to have access to broadband internet. With broadband, you can get almost everything done; you can even do your voice, skype,

whatsapp calls and so many others. But on the narrow band internet, we have lots of limitations that is why there is the need to emphasize access to broadband for our people [20].

6. Causes of Low Internet Penetration in Nigeria

6.1 Little Government Involvement

Over the years, the role of government in improving fibre optics growth and development has not been commensurate with their pronouncement. While much has been said, little is done to put words into action. Lack of proper policies, framework and legislations have created a gap between a balance and a conducive atmosphere for a competitive and symbiotic relationship among the major stakeholders in the telecommunication industry. Governmental institutions of learning and major research organizations barely have access to broadband funding which would have improved knowledge to a large extent in the country. This has created a vacuum in terms of research which would have aided the growth and quick access to information. This poor or little access to information becomes a burden to earnest information seekers as the price becomes too high even as local content is negatively affected.

6.2 Local Content

Most of the local content technologies such as the web pages and websites developed in the country are far below international standard with very few visits. The consequence is the heavy traffic on foreign web pages in developed countries with standardized websites which attracts extra cost with minimal local traffic. It is expected that fibre optic ecosystem innovation should take place in the heart of every layer as this would bring the needed necessary development at all levels of the country. Sadly, the reverse is the case in the country presently.

6.3 Lack of competition

Due to vertically owned integrated operators with an end to end network, competition in the area of fibre optics and broadband system is typically low in the real sense. Since the relationship between operators can be competitive or symbiotic within the players in the industry, competing downstream service providers find it difficult to access an affordable backbone capacity that would provide for improved operation in metropolitan access distribution as is obtainable in developed nations of the world.

6.4 Illiteracy

Experts in the field of fibre optics technology are in short supply in the country. Due to the high cost of fibre optics equipment and installation, individuals who could have helped in this very important area of development are busy in search for food, security and infrastructure for

themselves and their immediate family. This scenario has made fibre optics and broadband penetration to be low in the country. For a better internet penetration in the country, individuals must play their role in pushing for the creation and implementation of an established broadband industry.

6.5 Infrastructure

Infrastructural development plays a major role in fibre optic ecosystem as it helps to control price and innovation. Nigeria is still lagging behind as far as infrastructure is concerned. Even with the liberalization of the telecommunication sector in 2000, the government is still to put in place modalities that would help private investors to thrive. It would have been easier if the government had put in place appropriate infrastructure before it deregulated the telecommunication sector.

6.6 Scarcity of Spectrum

Spectrum refers to the radio frequencies allocated to the mobile industry and other sectors for communication over airwaves. It is a prerequisite for wireless coverage and directly affects the speed, capacity, and reach of mobile Internet services. Availability of spectrum at a subsidized price would have aided investors to delve into broadband circulation which would also lead to internet penetration in the country.

7. Effects of Low Internet Penetration in Nigeria

There are a number of effects that low internet penetration could have on a country. Apart from the fact that it negatively affects the Gross Domestic Product (GDP), there are also direct effects on the citizenry.

7.1 Poor Access to Information

First, it will take a much longer time for information to get to hinter lands with poor internet coverage. Even though some communities with low internet penetration have use transistor radios to get information, these information are only broadcast at specific times in the day whereas, with internet, these information are available on a 24 hours basis as events unfold. The consequence of this is that people with limited internet access are staved of current information which might be beneficial to them at that point in time.

7.2 Brain Drain

There is no gainsaying the fact that students in virtually all levels of education need the internet in order for them to function adequately as students. Nowadays, lecturers in institutions of higher learning give assignments to students

in which they would most likely need the internet. However, in areas with low internet penetration, these students are limited to only lecture materials provided by lecturers which could be very shallow in content. With no little or no internet access, these students are restricted to these shallow materials which does not help their mental development in that area neither does it widen their horizon. The consequence is churning out of graduates who are less equipped for the challenges of the 21st century.

7.3 High Level of Illiteracy

It would not be out of place to refer to illiteracy as a defect and a cankerworm that diminishes the value and worth of a society. Illiteracy is an ugly trend that has continued to hinder the growth of internet in the country. Even areas with a high degree of internet penetration at times have low internet usage because of the high degree of illiteracy in the area. Most of these persons can neither read nor write which makes anything computer or its accessories useless to them.

8. Barriers to Internet Penetration in Nigeria

With an internet penetration rate of 52 percent as of June, 2016, majority of the offline population are in the rural areas with low level of literacy. Summarized below are the most glaring barriers to internet penetration in Nigeria

8.1 Incentives

Nigeria lacks a sufficiently localized content and services. Mobile phones in Nigeria do not support languages. With a large number of existing languages in the country, connectivity devices are predominantly English with font characters that are rarely available for small populations that speak a unique language. Even when these individuals get online, the vast majority of website content are in languages that are different from their mother tongues. Social connectivity is a key incentive for individuals to go online, and the use of social media in Nigeria, rivals that in industrialized countries. A large percentage of the online population in the country visits Facebook on a daily basis, making the site a primary driver of a Nigerian's decision to go online. However, this initial interest in social media has not gone further to include other online uses such as commerce, health, education or transportation. All of these could have a significant impact on Internet adoption while improving quality of life.

8.2 Low incomes and affordability

The large population of people living in extreme poverty does not in any way support internet penetration in the country. With up to 70 percent of Nigeria's population living below the poverty line, the cost of access to the internet and purchase of mobile devices remains at a level that is challenging to a large segment of the total

population of the country. The situation has even worsened with the current recession in the country in which the prices of mobile phones have skyrocketed to more than double their initial price. Sadly, with the planned increment in the prices of data bundle by mobile service providers, it is obvious that there would a reduction in internet usage in the country if the plan is executed.

8.3 User capability

Individuals need a basic language and technical proficiency to capture the full value of the internet. Ability to use smartphones will enable people to share information that relates to those in their groups. Farmers could share information regarding to crop yield and farming methods if they have basic literacy level. Digital literacy level is another significant challenge in Nigeria.

8.4 Infrastructure

For Nigeria to overcome the barrier to low internet penetration, it must overcome an underdeveloped adjacent infrastructure. Power supply must improve as it was responsible for 70 percent of downtime in 2011 alone, [21]. Another infrastructural issue relates to cost of deploying broadband infrastructures in the country as this has pushed the cost of producing services beyond what ordinary consumers are willing and able to pay. The high cost of money paid by telecommunication giants in order to secure the right of way affects the building of infrastructure and contributes largely to low internet penetration in the country.

9. Conclusions and Recommendations

In this paper, an attempt has been made to examine the phenomenon of fibre optics communication in Nigeria with a view to situating its impacts and barriers to internet penetration. The paper expatiated on the concept of fibre optics communication in the country on the premise of assumption that fibre optics penetration would boost internet availability and affordability. To drive home this assertion, the paper explored the trend of fibre optics communication in the country from the beginning of the century when internet first reached the country to the present day. Regarding its impacts, the paper observed that poor fibre optics development in the country has resulted in poor access to information, brain drain and illiteracy. In the light of these findings, this paper submits that poor fibre optics development poses a serious challenge to increased access to information and mass literacy. This affirms the assumption of the paper that poor fibre optics development in the country constitute a hindrance to increased internet penetration

The paper recommends that the Federal Government of Nigeria should urgently increase access to, and usage of internet and broadband in the country. This can be achieved through the revisiting of the Information and Communication Technology (ICT) policy of 2010. Efforts should be made at increasing the literacy level of citizens as its affects internet usage. Policies should be formulated that would make for easy utilization of the capacity of submarine cables to reach hinter lands at a subsidized cost. The localization of submarine cable station should be spread across the country for easy roll out. Finally, effort must be made at ensuring stable power supply in the country as it constitute infrastructural hindrance to the growth of fibre optics communication and subsequently, internet penetration.

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